International Civil Aviation Organization
Western and Central Africa Office

Second Meeting of the AFI Frequency Management Group (AFI/FMG/2)
Dakar, Senegal, 18-19 April 2011

Agenda Item 5.3: Report on CPM 2th meeting (Geneva, Switzerland, 14-25 February 2011)

(*Presented by the Secretariat)*

SUMMARY

This paper presents the agenda and the outcome of the second session of the Conference Preparatory Meeting (CPM) for ITU World Radiocommunication Conference (WRC) scheduled to be held in Geneva, Switzerland from 23 January to 17 February.
It aims to outlining the importance of the involvement for AFI States Aeronautical stakeholders (CAA, ANSPs, Airlines) in the process of the preparation of WRC 12 through CPM sessions.

Action by the meeting is at paragraph 3.

1. INTRODUCTION

1.1 In the framework of the preparation of the World Radiocommunication Conference (WRC) scheduled to be held in Geneva (Switzerland) from 23 January to 17 February 2012 ITU held the second session of the Conference Preparatory Meeting (CPM) in Geneva from 14 to 25 February 2011.

1.2 The agenda of this second meeting was developed to follow the topics of the WRC-12 Agenda as approved by the First session of the CPM which was held during the week following WRC-07.

2. DISCUSSION

2.1 The 2007 Radiocommunication Assembly, by its Resolution ITU-R 2-5, reconfirmed that preparatory studies for the WRC are to be carried out by a Conference Preparatory Meeting (CPM) and appointed Mr**. Albert Nalbandian** (Armenia (Republic of)) as the Chairman of CPM-11 and Mr. **Kamel Abdelkade**r (Tunisia), Mr. **Victor Glushko** (Russian Federation), Mr. **Anders Jonsson** (Sweden), Ms. **Shayla Taylor** (United States of America) and Mr. **Jean-Jacques Massima Landji** (Gabonese Republic) as the Vice-Chairmen.

2.2 On the basis of contributions from the membership of the ITU, the Radiocommunication Study Groups and the Special Committee (SC), concerning the technical, operational and regulatory and procedural matters to be considered by radiocommunication conferences, the CPM prepares a consolidated report for such conferences (see Resolution ITU-R 2-5).

2.3 All administrations of the ITU Member States and the Radiocommunication Sector Members were invited to participate in the preparation of the CPM Report to WRC-07.The Agenda of the CPM second session.

2.4 Under ICAO State Letter **Ref: T7 /7.9.1-0061,** AFI States were informed on the event and encouraged to participate in the second session of CPM, after a properly preparation during the ATU first African Group Preparatory meeting for World Radiocommunication Conference (WRC-12) (***See WP/08 discussed on agenda 5.2***).

2.5 The second session of CPM-11 (CPM11-2) met in Geneva from 14 to 25 February 2011 under the chairmanship of Mr. **Albert Nalbandian** (Armenia (Republic of)) to consider the draft CPM Report together with the SC Report, contributions from the ITU membership and additional material submitted by the Radiocommunication Bureau. There were 1 101 delegates/participants representing 109 Member States and 69 Radiocommunication Sector Members, including international organizations that attended the CPM. CPM11-2 considered 160 input contributions including the draft CPM Report and the SC Report.

2.6 It is useful to note that AFI States attended the CPM 11 second session and delivered the provision driven from the ATU First Preparatory meeting for WRC 12 (Abuja, Nigeria, 1-3 February 2011) during which ICAO views were expressed and promoted. However, the rate of participation of AFI Aeronautical community to this, meeting was very low in spite of the coordination developed by the two ICAO regional offices of ESAF and WACAF.

2.7 Under Chapter 1, the CPM meeting discussed the issues related to **maritime and aeronautical issues (**1.3**, 1.4**, 1.9, and 1.10) and share ICAO views on the agenda item while agenda item 1.7 was discussed under chapter 5.

2.8 The report of the second session of CPM11-2 is attached as **Appendix A** to this Working Paper

2.9 Further to the CPM 2nd meeting, ICAO held the 24th ACP WG/F 24th meeting in EUR Office (Paris) from 21 - 25 March 2011. This meeting gave the opportunity to provide the participants with the CPM second session deliveries.

2.10 AFI States (CAA and ANSPs) attended this meeting, In particular the States tasked by APIRG/17 trough Decision 17/37 to follow up WRC 12 Agenda **item 1.3** (***Ghana***), **item 1.4** (***Kenya***) and **item.4 1.7** (***South Africa***).

On the other hand the nominated AFI/FMG/Rapporteur to ACP WG F and CNS/SG from ASECNA was represented by staff appointed in ASECNA Paris Office.

The list of the AFI Sates Participant is attached as **Appendix B** to this working Paper

2 Action by the meeting

The meeting is invited to:

a) Take note of the information given above
b) Note the low rate of participation of AFI CAAs and ANSPs to the ATU and CPM meetings Mwhile taking into consideration their good rate of participation to the ACP WG F:24th meeting participation
c) Review and comments the outcome of the second session of the CPM11 meeting and accordingly urge the National Authorities of Regulation of Telecommunication and,;
d) Take the suitable Conclusions and Decision for the forthcoming preparatory actions for WRC 12

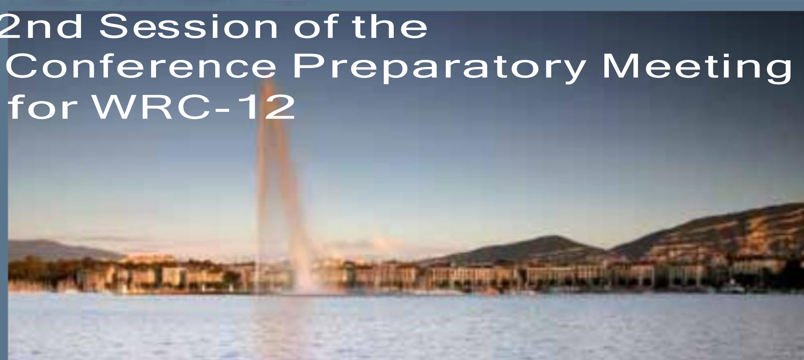
Appendix A

Report of CPM11-2 Session

International Telecommunication Union

CPM1-2

2nd Session of the Conference Preparatory Meeting for WRC-12



CPM Report on technical, operational and regulatory/procedural matters to be considered by the 2012 World Radiocommunication Conference

Radiocommunication Sector

International Telecommunication Union

2nd Session of the Conference reparatory Meeting for WRC-12

CPM Report on technical, operational and regulatory/ procedural matters to be considered by the 2012 World Radiocommunication Conference

Radiocommunication Sector

Preface

This CPM Report to the 2012 World Radiocommunication Conference (WRC-12) was prepared in response to Resolution 1291 (MOD) of the ITU Council to assist those who will be involved in the preparations for and deliberations at WRC-12. The Report was prepared and approved by the Conference Preparatory Meeting (CPM) at its Second Session in Geneva, 14-25 February 2011. The Report is structured to follow the topics of the WRC-12 Agenda and its contents follow the outline approved by the First Session of the CPM which was held during the week following WRC-07. A cross-reference list is provided to facilitate finding specific topics within the framework of the WRC-12 Agenda. This Report comprises six Chapters and one Annex.

The Report represents the best information on technical, operational and regulatory/procedural issues relevant to the WRC-12 Agenda available at the time of its preparation and should provide a good basis for the discussions at the Conference.

François Rancy
Director Radiocommunication Bureau

Cross-reference between the WRC-12 agenda items and the chapters of the CPM Report

WRC-12 agenda item		Part of the CPM Report to WRC-12
1	on the basis of proposals from administrations, taking account of the results of WRC-07 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the bands under consideration, to consider and take appropriate action with respect to the following items:	-
1.1	to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;	Not in scope of CPM
1.2	taking into account the ITU-R studies carried out in accordance with Resolution **951 (Rev.WRC-07)**, to take appropriate action with a view to enhancing the international regulatory framework;	Chapter 6
1.3	to consider spectrum requirements and possible regulatory actions, including allocations, in order to support the safe operation of unmanned aircraft systems (UAS), based on the results of ITU-R studies, in accordance with Resolution **421 (WRC-07)**;	Chapter 1
1.4	to consider, based on the results of ITU-R studies, any further regulatory measures to facilitate introduction of new aeronautical mobile (R) service (AM(R)S) systems in the bands 112-117.975 MHz, 960-1 164 MHz and 5 000-5 030 MHz in accordance with Resolutions **413 (Rev.WRC-07)**, **417 (WRC-07)** and **420 (WRC-07)**;	Chapter 1
1.5	to consider worldwide/regional harmonization of spectrum for electronic news gathering (ENG), taking into account the results of ITU-R studies, in accordance with Resolution **954 (WRC-07)**;	Chapter 3
1.6	to review No. **5.565** of the Radio Regulations in order to update the spectrum use by th passive services between 275 GHz and 3 000 GHz, in accordance with Resolution **950 (Rev.WRC-07)**, and to consider possible procedures for free-space optical-links, taking into account the results of ITU-R studies, in accordance with Resolution **955 (WRC-07)**;	Chapter 4
1.7	to consider the results of ITU-R studies in accordance with Resolution **222 (Rev.WRC-07)** in order to ensure long-term spectrum availability and access t spectrum necessary to meet requirements for the aeronautical mobile-satellite (F service, and to take appropriate action on this subject, while retaining unchanged th generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz;	Chapter 5
1.8	to consider the progress of ITU-R studies concerning the technical and regulatory issues relative to the fixed service in the bands between 71 GHz and 238 GHz, taking into account Resolutions **731 (WRC-2000)** and **732 (WRC-2000)**;	Chapter 3
1.9	to revise frequencies and channelling arrangements of Appendix 17 to the Radio Regulations, in accordance with Resolution **351 (Rev.WRC-07)**, in order to implement new digital technologies for the maritime mobile service;	Chapter 1

WRC-12 agenda item		Part of the CPM Report to WRC-12
1.10	to examine the frequency allocation requirements with regard to operation of safety systems for ships and ports and associated regulatory provisions, in accordance with Resolution **357 (WRC-07)**;	Chapter 1
1.11	to consider a primary allocation to the space research service (Earth-to-space) within the band 22.55-23.15 GHz, taking into account the results of ITU-R studies, in accordance with Resolution **753 (WRC-07)**;	Chapter 4
1.12	to protect the primary services in the band 37-38 GHz from interference resulting from aeronautical mobile service operations, taking into account the results of ITU-R studies, in accordance with Resolution **754 (WRC-07)**;	Chapter 4
1.13	to consider the results of ITU-R studies in accordance with Resolution **551 (WRC-07)** and decide on the spectrum usage of the 21.4-22 GHz band for the broadcasting-satellite service and the associated feeder-link bands in Regions 1 and 3;	Chapter 5
1.14	to consider requirements for new applications in the radiolocation service and review allocations or regulatory provisions for implementation of the radiolocation service in the range 30-300 MHz, in accordance with Resolution **611 (WRC-07)**;	Chapter 2
1.15	to consider possible allocations in the range 3-50 MHz to the radiolocation service for oceanographic radar applications, taking into account the results of ITU-R studies, in accordance with Resolution **612 (WRC-07)**;	Chapter 2
1.16	to consider the needs of passive systems for lightning detection in the meteorological aids service, including the possibility of an allocation in the frequency range below 20 kHz, and to take appropriate action, in accordance with Resolution **671 (WRC-07)**;	Chapter 4
1.17	to consider results of sharing studies between the mobile service and other services in the band 790-862 MHz in Regions 1 and 3, in accordance with Resolution **749 (WRC-07)**, to ensure the adequate protection of services to which this frequency band is allocated, and take appropriate action;	Chapter 3
1.18	to consider extending the existing primary and secondary radiodetermination-satellite service (space-to-Earth) allocations in the band 2 483.5-2 500 MHz in order to make a global primary allocation, and to determine the necessary regulatory provisions based upon the results of ITU-R studies, in accordance with Resolution **613 (WRC-07)**;	Chapter 5
1.19	to consider regulatory measures and their relevance, in order to enable the introduction of software-defined radio and cognitive radio systems, based on the results of ITU-R studies, in accordance with Resolution **956 (WRC-07)**;	Chapter 6
1.20	to consider the results of ITU-R studies and spectrum identification for gateway links for high altitude platform stations (HAPS) in the range 5 850-7 075 MHz in order to support operations in the fixed and mobile services, in accordance with Resolution **734 (Rev.WRC-07)**;	Chapter 3
1.21	to consider a primary allocation to the radiolocation service in the band 15.4-15.7 GHz, taking into account the results of ITU-R studies, in accordance with Resolution **614 (WRC-07)**;	Chapter 2
1.22	to examine the effect of emissions from short-range devices on radiocommunicati services, in accordance with Resolution **953 (WRC-07)**;	Chapter 3

WRC-12 agenda item		Part of the CPM Report to WRC-12
1.23	to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services;	Chapter 2
1.24	to consider the existing allocation to the meteorological-satellite service in the band 7 750-7 850 MHz with a view to extending this allocation to the band 7 850-7 900 MHz, limited to non-geostationary meteorological satellites in the space-to-Earth direction, in accordance with Resolution **672 (WRC-07)**;	Chapter 4
1.25	to consider possible additional allocations to the mobile-satellite service, in accordance with Resolution **231 (WRC-07)**;	Chapter 5
2	to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex 1 to Resolution **27 (Rev.WRC-07)**;	Chapter 6
3	to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference;	Not in scope of CPM
4	in accordance with Resolution **95 (Rev.WRC-07)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;	Chapter 6
5	to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;	Not in scope of CPM
6	to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference;	Not in scope of CPM
7	to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: "Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks", in accordance with Resolution **86 (Rev.WRC-07)**;	Chapter 5
8	in accordance with Article 7 of the Convention:	-
8.1	to consider and approve the Report of the Director of the Radiocommunication Bureau:	Chapter 6
8.1.1	on the activities of the Radiocommunication Sector since WRC-07;	Chapter 6
8.1.2	on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and	Chapter 6
8.1.3	on action in response to Resolution **80 (Rev.WRC-07)**;	Chapter 6
8.2	to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **806 (WRC-07)**,	Chapter 6

CPM Report to WRC-12

CONTENTS

I Introduction to the CPM Report to WRC-12

This CPM Report to WRC-12 is provided to assist the ITU Member States and the Radiocommunication Sector Members who will be involved in preparations for the 2012 World Radiocommunication Conference. It represents the best information on the technical, operational and regulatory/procedural issues relevant to the WRC-12 agenda items available at the time of its preparation.

I.1 Origin and purpose of CPM-11

The World Radiocommunication Conference (WRC-12) will be held from 23 January to 17 February 2012, immediately following the Radiocommunication Assembly (RA-12) (see Resolution 77 (Rev. Guadalajara, 2010)).

The conditions for invitation and admission to the World Radiocommunication Conference are specified in Article 24 of the Convention and in accordance with the relevant Plenipotentiary Conference resolutions.

The agenda for WRC-12 is contained in Council Resolution 1291 (MOD) (see Annex I-1), on the basis of Resolution 805 (WRC-07).

The 2007 Radiocommunication Assembly, by its Resolution ITU-R 2-5, reconfirmed that preparatory studies for the WRC are to be carried out by a Conference Preparatory Meeting (CPM) and appointed Mr. Albert Nalbandian (Armenia (Republic of)) as the Chairman of CPM-11 and Mr. Kamel Abdelkader (Tunisia), Mr. Victor Glushko (Russian Federation), Mr. Anders Jonsson (Sweden), Ms. Shayla Taylor (United States of America) and Mr. Jean-Jacques Massima Landji (Gabonese Republic) as the Vice-Chairmen.

All administrations of the ITU Member States and the Radiocommunication Sector Members were invited to participate in the preparation of the CPM Report to WRC-07.

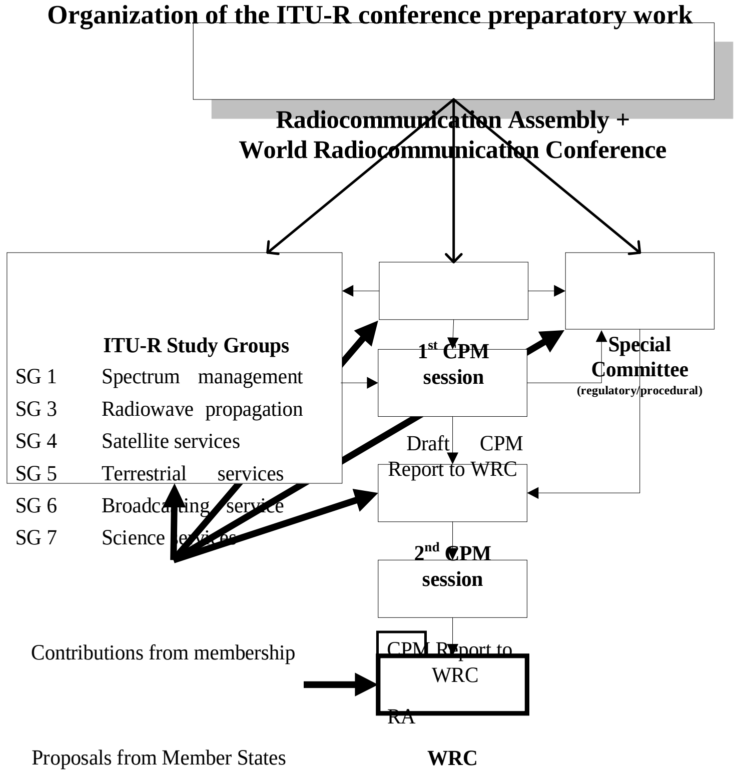
I.2 Organization of the ITU-R preparation for the conference

The organization of the conference preparatory work is shown in Figure I-1.

x
Introduction

FIGURE I-1

Organization of the ITU-R conference preparatory work



On the basis of contributions from the membership of the ITU, the Radiocommunication Study Groups and the Special Committee, concerning the technical, operational and regulatory and procedural matters to be considered by radiocommunication conferences, the CPM prepares a consolidated report for such conferences (see Resolution ITU-R 2-5).

The first session of the 2011 Conference Preparatory Meeting (CPM11-1) was held in Geneva on 19-20 November 2007 and organized the preparatory studies for WRC-12. It also identified studies in preparation for the following WRC. A structure for the CPM Report to WRC-12 was agreed together with a preparatory process, working procedures and a chapter structure. The meeting appointed a Rapporteur for each chapter to assist the Chairman in managing the development and flow of draft report contributions. The results of CPM11-1 were published in Administrative Circular CA/171 of the Radiocommunication Bureau dated 20 December 2007.

CPM11-1 also decided that all appropriate regulatory and procedural studies on relevant agenda items would be carried out by the Special Committee on Regulatory/Procedural Matters (in short the Special Committee, SC), activated by WRC-07 in accordance with Resolution ITU-R 38-3, on the basis of proposals from the membership of the ITU and the relevant ITU-R Study Groups and their subordinate groups. According to Resolution ITU-R 38-3, the results of the studies shall be submitted as contributions to the work of the CPM in preparing its report to the relevant WRC.

The ITU-R preparations for WRC-12 were concentrated in the following responsible groups (listed in the order of the Study Groups):

Study Group 1 chaired by Mr. R.H. Haines (United States of America), WP 1A chaired by Mr. X. Zhou (China (People’s Republic of)) subsequently succeeded by Mr. R. Garcia de Souza (Brazil (Federative Republic of)) and WP 1B chaired by Mr. S. Pastukh (Russian Federation);

Study Group 3 chaired by Mr. B. Arbesser-Rastburg (ESA);

Study Group 4 chaired by Ms. V. Rawat (Canada), WP 4A chaired by Mr. J. Wengryniuk (United States of America) and WP 4C chaired by Mr. A. Vallet (France);

Study Group 5 chaired by Mr. A. Hashimoto (Japan), WP 5A chaired by Mr. J. Costa (Canada), WP 5B chaired by Mr. J. Mettrop (United Kingdom of Great Britain and Northern Ireland) and WP 5C chaired by Mr. C. Glass (United States of America);

Study Group 6 chaired by Mr. C. Dosch (Germany (Federal Republic of));

Joint Task Group 5-6 chaired by Mr. A. Kholod (Switzerland (Confederation of));

Study Group 7 chaired by Mr. V. Meens (France), WP 7B chaired by Mr. B. Kaufman (United States of America) and WP 7C chaired by Mr. E. Marelli (European Space Agency);

The Special Committee on Regulatory/Procedural Matters (SC) chaired by Mr. M. Ghazal (Lebanon).

I.3 Preparation of the CPM Report to WRC-12

Texts for the draft CPM Report have been prepared by the responsible groups identified by CPM11-1 and provided by the Chairmen of these groups to the CPM-11 Chapter Rapporteurs.

The work was coordinated by the Chairman of CPM-11, in consultation with the CPM-11 Steering Committee, as defined in Section 5 of Annex 1 to Resolution ITU-R 2-5.

In accordance with Section 6 of Annex 1 to Resolution ITU-R 2-5, the CPM-11 Management Team meeting was held in Geneva from 26 to 30 July 2010. It consolidated the draft CPM Report which was distributed to all Member States and Radiocommunication Sector Members as Document CPM11-2/1.

The SC met in Geneva from 1 to 5 November 2010, reviewed the regulatory and procedural aspects of the draft CPM Report and prepared its report to the second session of CPM-11, which was subsequently distributed to all Member States and Radiocommunication Sector Members as Document CPM11-2/2.

The Radiocommunication Bureau provided the required assistance in the above-mentioned meetings.

The second session of CPM-11 (CPM11-2) met in Geneva from 14 to 25 February 2011 under the chairmanship of Mr. Albert Nalbandian (Armenia (Republic of)) to consider the draft CPM Report together with the SC Report, contributions from the ITU membership and additional material submitted by the Radiocommunication Bureau.

There were 1 101 delegates/participants representing 109 Member States and 69 Radiocommunication Sector Members, including international organizations that attended the CPM.

CPM11-2 considered 160 input contributions including the draft CPM Report and the SC Report.

At CPM11-2, the contributions were attributed to Working Groups 1 to 6 for preparation of the final text for each Chapter according to the following adopted structure:

Chairman, CPM-11	Mr. A. Nalbandian (ARM)
Vice-Chairman, CPM-11	Mr. K. Abdelkader (TUN)
Vice-Chairman, CPM-11	Mr. A. Jonsson (S)
Vice-Chairman, CPM-11	Mr. V. Glushko (RUS)
Vice-Chairman, CPM-11	Ms. S. Taylor (USA)
Chairman, SC	Mr. M. Ghazal (LBN)
Rapporteur of the Plenary	Mr. G.S. Feldhake (USA)

Secretary, CPM-11 Mr. Ph. Aubineau (ITU BR, Counsellor for the CPM)

CPM11-2 Working Group	**Part of the draft CPM Report (WRC-12 agenda item)**	**Topic**	**WG Chairman**	**ITU BR Secretary**
WG 1	Chapter 1: (AI: 1.3, 1.4, 1.9, 1.10)	Maritime and aeronautical issues	Mr. C. Rissone (F)	Mr. K. Bogens
WG 2	Chapter 2 (AI: 1.14, 1.15, 1.21, 1.23)	Radiolocation and amateur issues	Mr. V. Glushko (RUS)	Mr. S. Buonomo
WG 3	Chapter 3 (AI: 1.5, 1.8, 1.17, 1.20, 1.22)	Fixed, mobile and broadcasting issues	Mr. N.A. Al Rashedi (UAE)	Mr. N. Vassiliev
WG 4	Chapter 4 (AI: 1.6, 1.11, 1.12, 1.16, 1.24)	Science issues	Mr. J.E. Zuzek (USA)	Mr. V. Nozdrin
WG 5	Chapter 5 (AI: 1.7, 1.13, 1.18, 1.25, 7)	Satellite issues	Mr. M. Abe (J)	Mr. N. Malaguti
WG 6	Chapter 6 (AI: 1.2, 1.19, 2, 4, 8.1, 8.2)	Future work programme and other issues	Mr. A. Zourmba (CME)	Mr. N. Venkatesh

The meeting was successful in approving the CPM Report to WRC-12.

I.4 Presentation and structure of the Report

The Report is structured to follow the topics of the WRC-12 agenda. Its outline was developed and approved by the first session of CPM-11.

The Report comprises six Chapters, defined in accordance with the adopted structure described in section I.3 above.

A cross-reference list between the Chapters of this Report and the WRC-12 agenda items is provided at the beginning of this Report to facilitate the identification of specific topics within the framework of the WRC-12 agenda. A list of abbreviations is also provided at the beginning of this Report.

The Report also contains an Annex providing a list of the ITU-R Recommendations including certain draft new and revised Recommendations which are referred to in the text of the Report. The final version of this list reflecting the decisions of the 2012 Radiocommunication Assembly will be made available to the 2012 World Radiocommunication Conference.

ANNEX I-1

RESOLUTION 1291 (MOD)

(adopted by correspondence)

Place, dates and agenda of the World Radiocommunication Conference (WRC-12)

The Council,

noting

that Resolution 805 of the World Radiocommunication Conference (Geneva, 2007):

a) resolved to recommend to the Council that a world radiocommunication conference be held in 2011 for a period of four weeks;

b) recommended its agenda, and invited the Council to finalize the agenda and arrange for the convening of WRC-11 and to initiate as soon as possible the necessary consultation with Member States,

resolves

to convene a World Radiocommunication Conference (WRC-12) in Geneva (Switzerland) from 23 January to 17 February 2012, preceded by the Radiocommunication Assembly from 16 to 20 January 2012, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-07 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the bands under consideration, to consider and take appropriate action with respect to the following items:

1.1 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;

1.2 taking into account the ITU-R studies carried out in accordance with Resolution **951 (Rev.WRC-07)**, to take appropriate action with a view to enhancing the international regulatory framework;

1.3 to consider spectrum requirements and possible regulatory actions, including allocations, in order to support the safe operation of unmanned aircraft systems (UAS), based on the results of ITU-R studies, in accordance with Resolution **421 (WRC-07)**;

1.4 to consider, based on the results of ITU-R studies, any further regulatory measures to facilitate introduction of new aeronautical mobile (R) service (AM(R)S) systems in the bands 112-117.975 MHz, 960-1 164 MHz and 5 000-5 030 MHz in accordance with Resolutions **413 (Rev.WRC-07)**, **417 (WRC-07)** and **420 (WRC-07)**;

1.5 to consider worldwide/regional harmonization of spectrum for electronic news gathering (ENG), taking into account the results of ITU-R studies, in accordance with Resolution **954 (WRC-07)**;

1.6 to review No. **5.565** of the Radio Regulations in order to update the spectrum use by the passive services between 275 GHz and 3 000 GHz, in accordance with Resolution **950 (Rev.WRC-07)**, and to consider possible procedures for free-space optical-links, taking into account the results of ITU-R studies, in accordance with Resolution **955 (WRC-07)**;

1.7 to consider the results of ITU-R studies in accordance with Resolution **222 (Rev.WRC-07)** in order to ensure long-term spectrum availability and access to spectrum necessary to meet requirements for the aeronautical mobile-satellite (R) service, and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz;

1.8 to consider the progress of ITU-R studies concerning the technical and regulatory issues relative to the fixed service in the bands between 71 GHz and 238 GHz, taking into account Resolutions **731 (WRC-2000)** and **732 (WRC-2000)**;

1.9 to revise frequencies and channelling arrangements of Appendix 17 to the Radio Regulations, in accordance with Resolution **351 (Rev.WRC-07)**, in order to implement new digital technologies for the maritime mobile service;

1.10 to examine the frequency allocation requirements with regard to operation of safety systems for ships and ports and associated regulatory provisions, in accordance with Resolution **357 (WRC-07)**;

1.11 to consider a primary allocation to the space research service (Earth-to-space) within the band 22.55-23.15 GHz, taking into account the results of ITU-R studies, in accordance with Resolution **753 (WRC-07)**;

1.12 to protect the primary services in the band 37-38 GHz from interference resulting from aeronautical mobile service operations, taking into account the results of ITU-R studies, in accordance with Resolution **754 (WRC-07)**;

1.13 to consider the results of ITU-R studies in accordance with Resolution **551 (WRC-07)** and decide on the spectrum usage of the 21.4-22 GHz band for the broadcasting-satellite service and the associated feeder-link bands in Regions 1 and 3;

1.14 to consider requirements for new applications in the radiolocation service and review allocations or regulatory provisions for implementation of the radiolocation service in the range 30-300 MHz, in accordance with Resolution **611 (WRC-07)**;

1.15 to consider possible allocations in the range 3-50 MHz to the radiolocation service for oceanographic radar applications, taking into account the results of ITU-R studies, in accordance with Resolution **612 (WRC-07)**;

1.16 to consider the needs of passive systems for lightning detection in the meteorological aids service, including the possibility of an allocation in the frequency range below 20 kHz, and to take appropriate action, in accordance with Resolution **671 (WRC-07)**;

1.17 to consider results of sharing studies between the mobile service and other services in the band 790-862 MHz in Regions 1 and 3, in accordance with Resolution **749 (WRC-07)**, to ensure the adequate protection of services to which this frequency band is allocated, and take appropriate action;

1.18 to consider extending the existing primary and secondary radiodetermination-satellite service (space-to-Earth) allocations in the band 2 483.5-2 500 MHz in order to make a global primary allocation, and to determine the necessary regulatory provisions based upon the results of ITU-R studies, in accordance with Resolution **613 (WRC-07)**;

1.19 to consider regulatory measures and their relevance, in order to enable the introduction of software-defined radio and cognitive radio systems, based on the results of ITU-R studies, in accordance with Resolution **956 (WRC-07)**;

1.20 to consider the results of ITU-R studies and spectrum identification for gateway links for high altitude platform stations (HAPS) in the range 5 850-7 075 MHz in order to support operations in the fixed and mobile services, in accordance with Resolution **734 (Rev.WRC-07)**;

1.21 to consider a primary allocation to the radiolocation service in the band 15.4-15.7 GHz, taking into account the results of ITU-R studies, in accordance with Resolution **614 (WRC-07)**;

1.22 to examine the effect of emissions from short-range devices on radiocommunication services, in accordance with Resolution **953 (WRC-07)**;

1.23 to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services;

1.24 to consider the existing allocation to the meteorological-satellite service in the band 7 750-7 850 MHz with a view to extending this allocation to the band 7 850-7 900 MHz, limited to non-geostationary meteorological satellites in the space-to-Earth direction, in accordance with Resolution **672 (WRC-07)**;

1.25 to consider possible additional allocations to the mobile-satellite service, in accordance with Resolution **231 (WRC-07)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex 1 to Resolution **27 (Rev.WRC-07)**;

3 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference;

4 in accordance with Resolution **95 (Rev.WRC-07)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

5 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

6 to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference;

7 to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: “Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks”, in accordance with Resolution **86 (Rev.WRC-07)**;

8 in accordance with Article 7 of the Convention:

8.1 to consider and approve the Report of the Director of the Radiocommunication Bureau:

8.1.1 on the activities of the Radiocommunication Sector since WRC-07;

8.1.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

8.1.3 on action in response to Resolution **80 (Rev.WRC-07)**;

8.2 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **806 (WRC-07)**,

instructs the Director of the Radiocommunication Bureau

to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and the Special Committee on Regulatory/ Procedural Matters and to prepare a report to WRC-12,

instructs the Secretary-General

1 to make all the necessary arrangements, in agreement with the Director of the Radiocommunication Bureau, for the convening of the Conference;

2 to communicate this Resolution to international and regional organizations concerned.

CHAPTER 1

Maritime and aeronautical issues

(Agenda items 1.3, 1.4, 1.9, 1.10)

CONTENTS

AGENDA ITEM 1.3

*1.3 to consider spectrum requirements and possible regulatory actions, including allocations, in order to support the safe operation of unmanned aircraft systems (UAS), based on the results of ITU-R studies, in accordance with Resolution **421 (WRC-07)**;*

Resolution **421 (WRC-07)**: *Consideration of appropriate regulatory provisions for the operation of unmanned aircraft systems*

1/1.3/1 Executive summary

A significant increase of the worldwide use of unmanned aircraft systems is expected in the future. The seamless operation of unmanned aircraft with piloted aircraft in non-segregated airspaces is becoming vital for the further development of unmanned aircraft applications that will fill many diverse requirements. Therefore, globally harmonized spectrum is required to satisfy this need. WRC-12 Agenda item 1.3 seeks to identify spectrum that can be used to meet this demand. The envisioned unmanned aircraft systems infrastructure will be composed of terrestrial and satellite components.

Report ITU-R M.2171 provides the analyses for determining the amount of spectrum required for the operation of a prospected number of unmanned aircraft systems sharing non-segregated airspace with manned aircraft as required by Resolution **421 (WRC-07)** and in response to WRC-12 Agenda item 1.3. Deployment of unmanned aircraft systems will require access to both terrestrial and satellite spectrum.

The maximum amount of spectrum required for unmanned aircraft systems are:

– 34 MHz for terrestrial component,

– 56 MHz for satellite component.

Seven methods have been proposed to satisfy this agenda item. Compatibility and characteristics issues are raised in the corresponding methods.

Five methods are proposed for the satellite component:

– Method A1 proposes the use of the current AMS(R)S allocations for both links (unmanned aircraft to satellite and unmanned aircraft control station (mobile and fixed) to satellite);

– Method A2 proposes the use of the current MSS, AMSS and AMS(R)S allocations for both links (unmanned aircraft to satellite and unmanned aircraft control station (mobile and fixed) to satellite) and FSS allocations (only for the fixed unmanned aircraft control station to satellite link) in accordance with the Radio Regulations;

– Method A3 proposes the use of the current FSS allocations by adding a new footnote pointing toward a WRC Resolution/Recommendation (except frequency bands covered by Appendices **30**, **30A** and **30B** to the Radio Regulations);

– Method A4 proposes to restrict the communication link between unmanned aircraft and satellite to AMS(R)S allocations, to confirm the use of AMS(R)S allocations for the radiocommunication link between unmanned aircraft control station and the satellite and to allow the use of the FSS allocations for this link (except frequency bands covered by Appendices **30**, **30A** and **30B** to the Radio Regulations);

– Method A5 proposes new AMS(R)S allocations.

Method B proposes new AM(R)S allocations for the terrestrial component.

Method C, covering both terrestrial and satellite components, proposes no change to the Table of Frequency Allocations (RR Article **5**) for frequency bands for which the studies have not been completed.

1/1.3/2 Background

Unmanned aircraft systems (UAS) consist of an unmanned aircraft (UA) and associated unmanned aircraft control station (UACS). UA are aircraft that do not carry a human pilot, and may fly autonomously or be piloted remotely. UAS operations have been limited to segregated airspace where separation from other air traffic can be assured. However, it is planned to expand UAS deployment outside of segregated airspace.

The development of UAS is based on recent technological advances in aviation, electronics and structural materials, making the economics of UAS operations more favourable, particularly for more repetitive, routine and long-haul duration applications. The current state of the art in UAS design and operation, is leading to the rapid development of UAS applications to fill many diverse requirements. There are a large variety of existing and envisioned applications of UAS such as cargo transportation, fire-fighting, flood monitoring, search and rescue, disaster operations management, oceanographic and atmospheric observations, weather forecasting, geological survey, monitoring of gas pipelines and electricity distribution systems, city and highway traffic, border patrol, law enforcement, counter drug operations, crop and harvest monitoring, broadcast and airborne relay-type services, etc. Further details on UAS applications in non-segregated airspace can be found in Report ITU-R M.2171.

Thus, the operation of UA outside segregated airspace requires addressing the same issues as manned aircraft, namely safe and efficient integration into the air traffic control system.

1/1.3/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Reports: Reports ITU-R M.2171, ITU-R M.2204, ITU-R M.2205.

New relevant ITU-R Reports: Reports ITU-R M.[UAS-BANDS-NEW-ALLOC] and ITU-R M.[UAS-PERF-AND-REQ].

1/1.3/3.1 Radiocommunication system spectrum studies

Radiocommunication links used by UAS can be segmented amongst the following categories, each of them having specific spectrum requirements including satellite and terrestrial ones:

1/1.3/3.1.1 Command and control

As a replacement of the control stick of a manned aircraft the remote pilot needs this link to command the aircraft during flight. This link will also provide the pilot with the aircraft information needed, such as speed, heading, position, etc. The required data rate is very much dependent on the capabilities of the UAS. The more the aircraft is able to control its flight autonomously the less data need to be transferred.

1/1.3/3.1.2 Relay of air traffic control

Safe operation of aircraft manned or unmanned depends on the communication with air traffic control (ATC). The rules of air traffic rely on the fact that the pilot reacts according to instructions received from ATC. If the pilot does not sit in the aircraft then a voice channel has to be maintained to relay information from the ATC radio in the aircraft to the pilot and back. This ATC relay communication also includes future ATC data link communications.

1/1.3/3.1.3 Relay of sense and avoid data

Sense and avoid corresponds to the piloting principle "see and avoid" used in all air space volumes where the pilot is responsible for ensuring separation from nearby aircraft, terrain and obstacles. Despite the fact that under instrument flight rules part of this responsibility is transferred to ATC, the pilot is required to observe the airspace in his vicinity. Modern aircraft are equipped with a number of sensors to support this requirement, such as: radar airborne collision avoidance system, automatic dependant system-broadcast and universal access transceiver (UAT). Under special conditions (taxi, take-off and landing) it may be also required to provide the remote pilot with visual information. Therefore the relay of sense and avoid data is the transmission of this information from these sensors to the remote pilot is part of the control communications.

1/1.3/3.2 Sense and avoid system spectrum studies

The safe flight operation of UA necessitates advanced techniques to detect and track nearby aircraft, terrain, and obstacles to navigation through sensors. Studies related to the sense and avoid function of UAS are being completed.

1/1.3/3.3 Spectrum needs to support command and control, relay of ATC and relay of sense and avoid

Based on the requirement per UA, ITU-R studies have been completed to define the overall amount of spectrum needed to support the operation of unmanned aircraft seamlessly with piloted aircraft in non-segregated airspaces. For more detailed information see Report ITU-R M.2171.

1/1.3/3.4 Compatibility studies

ITU-R has considered a number of frequency bands with respect to this agenda item. Some bands were considered as not requiring further study. For other bands as listed below ITU-R has undertaken compatibility studies.

The compatibility studies are structured as follows:

- For terrestrial component
  - in the existing AM(R)S allocation in the 960-1 164 MHz band;
  - in possible new or modified AM(R)S allocations in the 5 000-5 030, 5 030-5 091 and 5 091-5 150 MHz and 15.4-15.5 GHz bands.
- For satellite component
  - in the existing AMS(R)S allocation in the 5 030-5 091 MHz band;
  - in possible new AMS(R)S allocations (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]).

1/1.3/4 Analysis of the results of studies

Studies initially focus on existing allocations. They take into consideration links using terrestrial and/or satellite systems.

1/1.3/4.1 Spectrum requirements to support command and control, relay of ATC and relay of sense and avoid

Market surveys and commercial and government forecasts were used to predict the number of UA available to operate in the 2030 time-frame. This time-frame was used as it represents the time when the UAS demand will be established and approaching maturity.

Deployment of UAS will require access to both terrestrial and satellite spectrum. The maximum UAS spectrum requirements as identified in Report ITU-R M.2171 are:

– 34 MHz for a terrestrial line-of-sight (LoS) system;

– 56 MHz for satellite beyond line-of-sight (BLoS) system.

1/1.3/4.2 Spectrum needs to support the UAS sense and avoid function

Based on a review of the spectrum needs of UAS sense and avoid and the existing ARNS allocations in Report ITU-R M.2204 the existing ARNS allocations appear to be sufficient to support UAS sense and avoid operations.

1/1.3/4.3 Compatibility studies and other considerations

1/1.3/4.3.1 Compatibility studies

1/1.3/4.3.1.1 Satellite component

1/1.3/4.3.1.1.1 Existing allocation

ITU-R has considered a number of frequency bands with respect to the satellite component of this agenda item. Some bands were considered as not requiring further study. Studies performed (see Report ITU-R M.2205) show that it is possible to design a satellite system for UAS operation in the existing AMS(R)S allocation in the band 5 030-5 091 MHz shared with the microwave landing system (MLS) under certain conditions outlined in the Report. See also RR No. **5.444**. Moreover these studies have also shown that the spectrum requirements for the satellite component can be met in this allocation under certain conditions outlined in the Report.

1/1.3/4.3.1.1.2 Possible new allocations

Compatibility studies are being conducted for new AMS(R)S allocations (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]).

1/1.3/4.3.1.2 Terrestrial component

1/1.3/4.3.1.2.1 Existing allocation

Report ITU-R M.2205 shows that portion(s) of the existing AM(R)S allocation in the band 960-1 164 MHz can be used in some countries to support some UAS terrestrial spectrum requirements under the conditions used in this Report. However, the band cannot be used to meet the entire 34 MHz terrestrial spectrum requirement for UAS operations due to the existing and planned system (distance-measuring equipment, secondary surveillance radar, UAT, AM(R)S and ARNS systems), but 10.4 MHz of spectrum within this band would suffice to meet all UAS CNPC requirements except for backup links, video, and downlinking of airborne weather-radar data in some countries.

1/1.3/4.3.1.2.2 Possible new allocations

ITU-R is studying the possibility whether a terrestrial UA control and non-payload radiocommunication system under new proposed AM(R)S allocation and MLS under ARNS allocation could operate in the band 5 030-5 091 MHz under certain conditions (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]). These compatibility studies include analysis of the new proposed AM(R)S systems and MLS operating under the existing ARNS allocation as well as systems operating under the existing AMS(R)S allocation. The results of these studies have been reviewed by ICAO and the ICAO comments have been addressed.

Compatibility studies are also ongoing in the bands 5 000-5 030 MHz and 5 091-5 150 MHz and 15.4-15.5 GHz to satisfy the 34 MHz terrestrial component spectrum requirement in portion(s) of either of these bands, as appropriate (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]).

Studies carried out by some administrations on the band 15.4-15.5 GHz with a view to a possible new allocation for AM(R)S for UAS have shown that:

- compatibility between UACS and RLS receivers can only be provided in a separation distance of over 400 km, and airborne radars will cause interference to UAS airborne receivers at line-of-sight distances of over 827 km. Thus, co-frequency operation of UAS and RLS in the band 15.4-15.5 GHz is not feasible (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]);
- protection of ARNS from interference from UAS airborne transmitters requires separation distances exceeding line-of-sight distances (more than 903 km). Sharing would require frequency-site planning, the implementation of which could be difficult owing to the numerous UAS systems expected to operate simultaneously in non-segregated airspace;
- compatibility between UAS airborne transmitters and RAS station receivers operating in the adjacent band 15.35-15.4 GHz could be not feasible within line-of-sight distances (464 km) with any directions of the maximum of the RAS receiver antenna pattern.

Some of these studies were presented at CPM-11 (February 2011) and were not reviewed during CPM. The preliminary results of these studies will be considered and reviewed, if appropriate, within WG 5B and included in the ITU-R Report M.[UAS-BANDS-NEW-ALLOC]).

1/1.3/4.3.2 Other considerations

1/1.3/4.3.2.1 Satellite component

Existing systems in the bands 1 545-1 555 MHz (space-to-Earth), 1 610-1 626.5 MHz (space-to-Earth and Earth-to-space), and 1 646.5-1 656.5 MHz (Earth-to-space) may be used to meet some of the UAS requirements subject to the conditions in the Radio Regulations. Each of these bands has its advantages and disadvantages and opinions vary as to which bands are appropriate and needed. However, taking into account the existing extensive use of these bands and the limited spectrum available, they cannot accommodate the full projected future satellite spectrum requirements of UAS. To this effect, in order to fulfil the longer-term requirements of UAS, other appropriate bands with larger bandwidth are necessary.

The use of UA in FSS networks, for the link between UA and satellite and the link between mobile UACS and satellite, will require sharing studies with services to which the frequency band is allocated in particular terrestrial services.

Usage of FSS

For the link between UA and the satellite:

View 1 The use of FSS systems for the link between UA and satellite is not in line with the service/station definitions in the RR.

View 2 UAS BLoS communications can be conducted using some existing FSS allocations through the use of a footnote referencing a WRC Resolution/Recommendation.

The WRC Resolution/Recommendation will be used to provide the appropriate system performance and regulatory procedures necessary to ensure the safe operation of UAS.

For the link between mobile UACS and the satellite:

View 1 The use of FSS systems for the link between mobile UACS and satellite is not in line with the service/station definitions in the RR.

View 2 UAS BLoS communications can be conducted using some existing FSS allocations through the use of a footnote referencing a WRC Resolution/Recommendation.

The WRC Resolution/Recommendation will be used to provide the appropriate system performance and regulatory procedures necessary to ensure the safe operation of UAS.

For the link between fixed UACS and the satellite:

View 1 The use of FSS systems is not possible unless in FSS bands that have a specific footnote pointing toward a WRC Resolution/Recommendation which described the conditions of use FSS allocations (except frequency bands covered by Appendixes **30**, **30A** and **30B** to the Radio Regulations).

View 2 The use of FSS systems between fixed UACS and satellite is in line with the service/station definitions in the RR.

Usage of MSS and AMSS for all control and non-payload radiocommunication UAS links

View 1 The use of systems belonging to MSS and AMSS is not in accordance with the definition of the services of the RR and principles of use of these services contain in the RR (see preamble in section 1/1.3/5.1).

View 2 The use of systems belonging to MSS and AMSS is in line with the service/station definitions in the RR.

1/1.3/4.3.2.2 Terrestrial component

The terrestrial communication between an unmanned aircraft and the UACS has to be considered as AM(R)S and should be operated in a frequency band allocated to this service.

1/1.3/5 Methods to satisfy the agenda item

1/1.3/5.1 Methods to satisfy the UAS radiocommunication requirements

The methods below have been so far developed and any method or a combination of these methods may be used.

Notwithstanding No. **191** of the ITU Constitution, RR Nos. **1.59** and **4.10** and taking into account the following points, the methods outlined below are proposed to satisfy the agenda item:

1) All the allocations have to be used in such a way that the systems envisaged for UAS control and non-payload radiocommunications under Agenda item 1.3 comply with ICAO SARPs.

2) ICAO SARPs require the use of appropriately designated frequency spectrum to support safety-of-life services.

3) Any new allocation must be compatible with existing allocations, supported by necessary studies to ensure the compatibility between these allocations.

1/1.3/5.1.1 Satellite component

1/1.3/5.1.1.1 Method A1

Use of the current AMS(R)S allocations for both links (UA to satellite and UACS (mobile and fixed) to satellite) (see Report ITU-R M.2205). Therefore no changes are required to the RR.

1/1.3/5.1.1.2 Method A2

In accordance with the Radio Regulations:

- use of the current MSS, AMSS and AMS(R)S for the link between the UA and the satellite and for the link between the UACS (mobile) and the satellite;
- use of the current MSS, AMSS, AMS(R)S and FSS for the link between the UACS (fixed) and the satellite.

Therefore, no changes are required to the RR.

See Report ITU-R M.2205 and Report ITU-R M.[UAS-PERF-AND-REQ].

1/1.3/5.1.1.3 Method A3

UAS would operate using frequency bands allocated to FSS on a primary status (see Report ITU-R M.[UAS-PERF-AND-REQ]). The definition of FSS accommodates the link between a fixed UACS earth station and satellite, In order to accommodate UAS mobile links under FSS, this method would require the addition of new footnotes that would allow radiocommunication means between:

a) UA and satellite;

b) UACS (mobile) and satellite,

in portions of the existing 11/12/14 GHz and 20/30 GHz FSS allocations (except frequency bands covered by RR Appendices **30**, **30A** and **30B**). The footnotes would reference to a WRC Resolution specifying the technical, regulatory and operational requirements that the UAS operation in non-segregated airspace would have to satisfy.

1/1.3/5.1.1.4 Method A4

In this method, provisions are established such that:

- the links between the satellite and a UA shall operate within the AMS(R)S; and
- the links between the satellite and a UACS shall operate within either the AMS(R)S or FSS under certain conditions.

This method would require the addition of a new footnote that should refer to a WRC Resolution.

1/1.3/5.1.1.5 Method A5

New AMS(R)S allocations for both links (UA to satellite and UACS (mobile and fixed) to satellite) in frequency bands yet to be determined subject to satisfactory results of compatibility studies (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]).

1/1.3/5.1.2 Terrestrial component

1/1.3/5.1.2.1 Method B

New AM(R)S allocation in all or portion(s) of the bands 5 000-5 150 MHz or/and 15.4-15.5 GHz subject to satisfactory results of compatibility studies (see Report ITU-R M.[UAS-BANDS-NEW-ALLOC]), taking into account that at the time of the CPM-11 (February 2011) the status of the sharing studies in the frequency band 5 030-5 091 MHz is more mature with respect to other bands.

In the case of a new AM(R)S allocation in the band 5 030-5 091 MHz, it might be appropriate to study another coordination mechanism for the existing allocation to AMS(R)S in the 5 030-5 091 MHz band, currently under RR No. **9.21**, such as the appropriate/applicable provisions referred to in RR No. **9.11A**. A possible example of this approach is given below (see section 6).

1/1.3/5.1.3 Both terrestrial and satellite components

1/1.3/5.1.3.1 Method C

No change to the Table of Frequency Allocations (RR Article **5**) for frequency bands for which the studies have not been completed. This method is equally applied to the terrestrial and satellite component.

1/1.3/5.2 Methods to satisfy the UAS sense and avoid requirements

Studies in Report ITU-R M.2204 indicate that the existing ARNS allocations can be used to support UAS sense and avoid operations so no change to the existing ARNS allocations is proposed.

1/1.3/5.3 Views

Due to the complexity of matter, it was agreed that the advantages and disadvantages of various methods be reflected under "views" from proponent and opponent of each method. Analysis of the results of studies also provides materials on the subject matter.

View 1 (Both terrestrial and satellite components)

Radiocommunication services which are not afforded the status of safety service, if used for UAS system would:

a) On a *de facto* basis upgrade that service to a service providing a safety and regulatory of flight.

b) Such general upgrading would create serious inconsistencies and imbalance between the use of a portion or portions of a given frequency band associated with that service and other usage of the same band used for other application e.g. use of commercial FSS or MSS systems for UAS.

c) The procedures for coordination as stipulated in RR Article **9** and Appendix **5** are quite different for MSS and FSS e.g. for FSS, the concept of coordination arc is used in which, apart from satellite networks located within the coordination arc (which are identified as affected), no other technical examinations are carried out by the Bureau. Whereas for the case of AMS(R)S, at least the examinations of $\Delta T/T$ is performed. This provides some degree of actual coordination between the satellite networks in question.

d) Administrations effecting coordination in the case of non-safety service usually negotiate among themselves on a reciprocal and package deal basis, giving concession on acceptance of interference in a reciprocal manner whereas in the case of safety services such concession on acceptance of interference is almost minimal or no concession is given at all.

e) As a general rule, the allocation to a service or identification of an allocation for certain application is made once the results of successful compatibility studies between the new service/application and existing services have been carried out, taking into account the nature of service and the class of stations and the corresponding status of allocation of the concerned services.

f) The use of a given band(s) for a given service must be in strict conformity with the definition of the service as stipulated in the RR, unless accompanied by necessary and the appropriate procedure in form of a footnote to the allocation pointing towards a WRC Resolution specifying the condition of that use and any other regulatory measures to be observed in order to be in full conformity with the Radio Regulations.

g) Use of MSS and AMSS for UAS:

– WRC-95 based on the conclusions reached at Voluntary Group of Experts initiated the application of the concept of generic allocation. To this effect, WRC-97 used that concept and made some generic allocation in the band 1.5/1.6 GHz for MSS involving AMS(R)S. Since then considerable difficulties were encountered by membership for several years resulting WRC-12 Agenda item 1.7 to find a solution for the resolution of difficulties. The proposal to use MSS and AMSS, that are non-safety services, for AMS(R)S, which is a safety service, would result in having generic definition for MSS covering different service definitions; AMS(R)S, AMS(OR)S and by extension MMSS, LMSS. It may unintentionally result in a generic definition for MS covering AM(R)S, AM(OR)S and by extension MMS, LMS. This may further impact all other services. The issue then needs to be discussed and examined by a General WRC similar to that held in 1979 for more than 12 weeks involving the participation and attendance of all users of the entire radiocommunication community.

– Moreover aeronautical mobile-satellite networks/systems may comprise geostationary and non-geostationary-satellite networks/systems. Unlike the geostationary-satellite networks that are normally coordinated using the $\Delta T/T$ coordination criteria, there is no other criteria, apart from frequency overlap, for the identification of affected administration operating non-geostationary-satellite systems. This means that there are therefore a high probability that a MSS geostationary-satellite network even if successfully coordinated be interfered by a non-geostationary-satellite system for the reasons given above. Consequently, the MSS system having such an unsecure and uncertain coordination status could hardly be considered as a communication link to support UAS used for safety and regularity of flights according to the definition of AMS(R)S.

h) Use of FSS for UAS:

– In addition to the explanation provided in paragraph c) above, it is to be noted that according to the statistics available, more than 60% of FSS assignments recorded in the Master International Frequency Register (MIFR) under RR No. **11.41** under “non-interference, non-protection” status which are further governed by RR No. **11.42** requiring that to take necessary action to either cease emission or reduce the interference (as results of non-coordinated status). Consequently, the use of such an FSS assignment with a doubtful regulatory status could hardly satisfy the requirements of the UAS having the status of safety and regularity of flight according to the definition of AMS(R)S.

– In view of the above, there is severe uncertainty in using FSS and MSS for UAS having the status of safety and regularity of flight according to the definition of AMS(R)S.

– Moreover, should such application be authorized by WRC-12, it requires introduction of a new footnote allowing such use in certain specific frequency FSS bands pointing to a WRC Resolution describing the condition of use of that specific band(s). Such a WRC Resolution should have an Annex describing the regulatory course of action to be taken for the earth station of the FSS in those certain frequency bands to be used as feeder links between the UA control station and the satellite. The coordination procedures for each such specific earth station, together with its characteristics, should be subject to a publication of a special section by the BR publicly making available this information in order to ensure the required safety aspect of the subject radio link.

i) The footnotes referred to in the regulatory part of Method A3 results in a major departure from the fundamental principle of frequency allocation and definition of services aiming to authorize the use of FSS for mobile MSS earth stations.

View 2 (Both terrestrial and satellite components)

Terrestrial component

Method B can fulfil the spectrum requirements for the terrestrial component of UAS, subject to, as stated in the method, satisfactory results of compatibility studies.

Satellite component

Current satellite systems providing safety and regularity of flight radiocommunications for aviation purposes satisfy existing ICAO SARPs which specify *inter alia* RF characteristics, priority and pre-emptive access requirements and performances requirements (including security). These systems operate under an AMS(R)S allocation or under an AMS(R)S allocation through generic MSS allocations which do not exclude aeronautical usage (therefore appropriately allocated to AMS(R)S as stipulated in Annex 10 to the Convention on International Civil Aviation) and FSS allocations in accordance with the RR.

Methods A1 and A2 can both fulfil the spectrum requirements of the satellite component for UAS. These methods lead to the same regulatory solution, which is no change to the RR.

Method A3 implies modification of the sharing condition in the frequency band allocated to FSS and listed in the method. The required sharing studies should be completed and satisfactory results should be obtained.

The example regulatory implementation of this method does not establish priority in the RR for UAS control links over any other radiocommunication.

The spectrum requirement for mobile UACS, if any, will only be met in combination with other methods.

Dependent on the outcome of sharing studies Method A5 could fulfil the spectrum requirements for UAS. However results of studies indicate that there is no need for additional spectrum.

View 3 (Satellite component)

Under Method A3, unmanned aircraft satellite communications can be conducted using some of the existing FSS allocations through the use of a WRC Resolution/Recommendation. The WRC Resolution/Recommendation will be used to provide appropriate RF performance and regulatory procedures necessary to ensure the safe operation of the UAS. Further, the relative priority between FSS networks is maintained.

Method A3 provides the advantage of near-term implementation by using existing infrastructure, while the disadvantage of the other methods is that they rely on the costly development and lengthy time to launch new satellite systems to meet the UAS spectrum needs. Additionally, other methods will be disadvantaged by the limited bandwidth of currently available spectrum for AMS(R)S systems.

A further advantage of Method A3 is that safe operation of UAS is assured through the above-mentioned WRC Resolution/Recommendation that will provide the specific details of how to ensure the RF performance and ITU regulatory procedures necessary to support safe operation of UAS. Such specifics would be included in contracts between the UAS operators and the FSS operators.

Additionally, RF performance requirements are assured through bilateral coordinations triggered by RR Article **9** provisions between FSS satellite operators.

A disadvantage of Methods A1 and A2 is that they do not recognize the satellite coordinations triggered by the provisions of RR Article **9**. These coordinations lead to bilateral agreements between satellite operators that ensure the necessary RF performance is attained by FSS networks to support safe operation of UAS.

A disadvantage of Method A4 is that it would preclude AMS(R)S operation under AMSS and MSS allocations for all UAS satellite communications. By contrast, an advantage of Method A3 is that it goes beyond requirements normally included in ICAO SARPs for AMS(R)S operations.

View 4 (Both terrestrial and satellite components)

Disadvantages of Methods A1, A2, A3, A4, A5 and B:

– For any frequency bands considered for UAS the ITU-R compatibility studies are not completed and the sharing conditions with services allocated in accordance with the RR are not defined (the conditions specified in Resolution **421 (WRC-07)** "*invites ITU-R*" are not met). Moreover there are currently no UAS technical characteristics agreed within ITU-R and also methodologies with results of compatibility assessment.

– The usage of any frequency bands for UAS without finalizing the compatibility studies does not allow to provide safety operation of UAS and service stations affected by UAS.

– Current provisions of the Radio Regulations do not seem to be sufficient for the use of existing allocations for UAS.

– Existing technical and regulatory provisions of the RR may not be provided for sharing between radio services if UAS will be applied.

View 5 (Both terrestrial and satellite components)

Methods A1, A4, A5 and B allow ICAO to develop SARPs which would facilitate automatic compliance to the requirements of Article 8 of the Convention on International Civil Aviation, thus allowing UAS to fly internationally without the need for bilateral coordination.

Methods A2 and A3: it is unlikely that these methods will facilitate international use of UAS in non-segregated airspace, as it will not satisfy ICAO safety requirements, and therefore not facilitate automatic compliance to Article 8 of the Convention on International Civil Aviation.

View 6 (Terrestrial component)

Disadvantages of Method B:

– Would increase the possibility of interference to incumbent MLS system in 5 030-5 091 MHz band.

– It would be difficult and even impractical to meet frequency separation and geographical separation requirements in sharing the 5 030-5 091 MHz band with MLS.

– Regulatory measures to protect existing co-primary services from AM(R)S and the services in the adjacent bands and technical/operational restrictions on AM(R)S have yet to be determined.

1/1.3/6 Regulatory and procedural considerations

1/1.3/6.1 Regulatory and procedural considerations for the UAS radiocommunication requirements

The following examples of regulatory text were provided by one or more administrations.

1/1.3/6.1.1 Satellite component

1/1.3/6.1.1.1 Method A1

No modifications to the RR and no new WRC Resolution/Recommendation (see section 1/1.3/5.1.1.1).

1/1.3/6.1.1.2 Method A2

No modifications to the RR and no new WRC Resolution/Recommendation (see section 1/1.3/5.1.1.2).

1/1.3/6.1.1.3 Method A3

ADD

5.A103 Earth stations on board unmanned aircraft (UA) and their associated control stations (UACSs) that operate as part of an unmanned aircraft system (UAS) may receive from geostationary-satellite networks in a primary allocation of the fixed-satellite service (space-to-Earth) in the following frequency bands: 10.95-11.20 GHz, 11.45-11.70 GHz, 11.70-12.20 GHz (Region 2 only), 12.20-12.50 GHz (Region 3 only), 12.50-12.75 GHz (Regions 1 and 3 only) 17.3-17.7 GHz (Region 1 only) and portion(s) of the frequency range 17.7-20.2 GHz. Such operations shall be in accordance with the provisions of Resolution **[A1.3_SAT_UAS_FSS] (WRC-12)**. The use of these frequency bands by the aforementioned UA and UACS stations is limited to UAS control link communications in the space-to-Earth direction. Moreover, the operation of UAS control links in any of the above specified frequency bands does not establish priority in the Radio Regulations over any station operating in a primary service allocated to these bands, including stations operating in the fixed-satellite service, nor does it establish priority in relation to other communication links within the fixed-satellite service. The UAS control link is comprised of any radio link used for the transmission of UAS telecommand and telemetry data, transmission of sense and avoid data from the UA to the associated UACS, and relay of voice communication between the Air Traffic Control (ATC) and the UACS.

ADD

5.B103 Earth stations on board unmanned aircraft (UA) and their associated control stations (UACSs) that operate as part of an Unmanned Aircraft System (UAS) may transmit to geostationary-satellite networks in a primary allocation of the fixed-satellite service (Earth-to-space) in the following frequency bands: 14.00-14.50 GHz, and portion(s) of the frequency range 27.5-30 GHz. Such operations shall be in accordance with the provisions of Resolution **[A1.3_SAT_UAS_FSS] (WRC-12)**. The use of these frequency bands by the aforementioned UA and UACS stations is limited to UAS control link communications in the Earth-to-space direction. Moreover, the operation of UAS control links in any of the above specified frequency bands does not establish priority in the Radio Regulations over any station operating in a primary service allocated to these bands, including stations operating in the fixed-satellite service, nor does it establish priority in relation to other communication links within the fixed-satellite service. The UAS control link is comprised of any radio link used for the transmission of UAS telecommand and telemetry data, transmission of sense and avoid data from the UA to the associated UACS, and relay of voice communication between the Air Traffic Control (ATC) and the UACS.

A possible example of a WRC Resolution

ADD

RESOLUTION [A1.3_SAT_UAS_FSS] (WRC-12)

Use of FSS frequency bands not subject to Appendices 30, 30A, 30B for the control communications of unmanned aircraft systems in non-segregated airspaces with geostationary-satellites operating in the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that worldwide use of unmanned aircraft systems (UAS) is expected to increase significantly in the future;

b) that unmanned aircraft (UA) need to operate seamlessly with piloted aircraft in non-segregated airspace and that there is a need to provide spectrum for that purpose;

c) that the operation of UAS in non-segregated airspace requires reliable communication links, in particular to relay the air traffic control communications and for the remote pilot to control the flight;

d) that, in accordance with the Convention on International Civil Aviation, all aeronautical systems must meet standards and recommended practices (SARPs) requirements;

e) that SARPs require the use of appropriately designated frequency spectrum to support safety-of-life services;

f) that satellite radiocommunications are an essential part of UAS operations, in particular to relay transmissions beyond the horizon and include links between the unmanned aircraft and the satellite, and links between the UA Control Station (UACS) and the satellite;

g) that systems providing UAS satellite communications may also operate in bands allocated to the AMS(R)S, the AMSS and the MSS;

h) that satellite systems operating in the fixed-satellite service (FSS) bands have the capability to provide the communication links mentioned in *considering f)*;

i) that Annex 10 to the Convention on International Civil Aviation contains SARPs for aeronautical radionavigation and radiocommunication systems used by international civil aviation,

considering further

a) that there is a need to limit the number of communication equipment on board a UA;

b) that, as a dedicated satellite system for UAS is not likely, it is necessary to take into account the existing and future satellite systems to accommodate the growth of the use of UAS;

c) that there are various technical methods that may be used to increase the reliability of digital communication links, e.g. modulation, coding, redundancy, etc.;

d) that for the UAS communications for the control of UA, relay of air traffic control (ATC) voice communications, and sense and avoid, relate to safe operation of UAS and have certain technical, operational, and regulatory requirements;

e) that the requirements in *considering further d)* can be specified for UAS use of FSS networks,

recognizing

a) that Recommendation **724 (WRC-07)** notes that FSS is not a safety service;

b) that No. **1.59** applies and provides the definition of a safety service as any radiocommunication service used permanently or temporarily for the safeguarding of human life and property,

resolves

1 that for the communications for control of the UA, relay of ATC voice and data communications, and sense and avoid data transmission, between a UA and the UACS via geostationary-satellite in the FSS, in the frequency band(s) specified in Nos. **5.A103** and **5.B103** may be used, provided that the technical requirements contained in Annex 1 of this Resolution are met;

2 that the use of such links shall comply with the appropriate SARPs established by the ICAO,

requests the Secretary-General

to bring this Resolution to the attention of ICAO.

ANNEX 1 TO RESOLUTION [A1.3_SAT_UAS_FSS] (WRC-12)

Technical characteristics of fixed-satellite service systems to support control communication links of unmanned aircraft systems

1 Introduction

UAS that require links beyond-line-of-sight (BLoS) need satellite communications to maintain aircraft control, relay ATC voice communications through the UA, and pass sense and avoid data between the UA and the UACS. It is likely that UA will utilize terrestrial radiocommunications for critical low-altitude operations, such as take-off and landing, but switch over to satellite communications for the majority of their flight. These satellite links need to achieve high availability to meet national and international aviation requirements when flying in non-segregated airspace. The primary BLoS communication links between the satellites, the UA, the UACS, and ATC are shown in Figure 1.

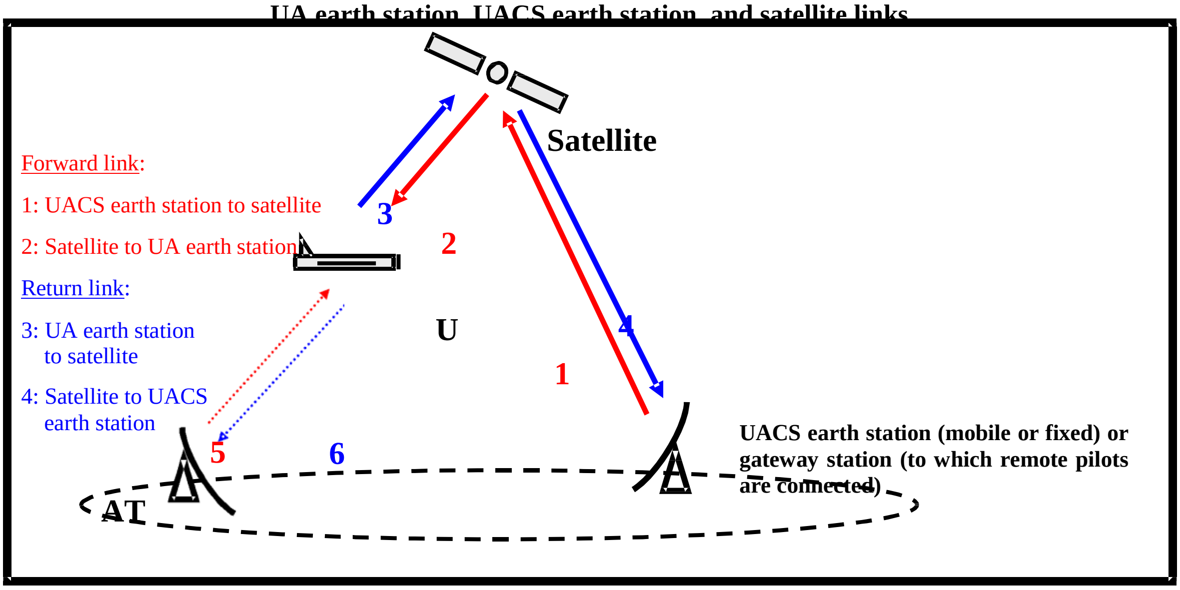
This annex contains the performance criteria that must be met and the technical characteristics of UAS control links necessary to meet them. Meeting these technical criteria will allow UAS to use FSS allocations.

The UACS earth station and UA earth station are operated to the same regulatory limits as a conventional FSS earth station.

The technical characteristics of UAS to be used in assessing the forward and return UAS link performance via a FSS network is provided in section 2.

FIGURE 1

UA earth station, UACS earth station, and satellite links



2 Technical requirements

The technical characteristics of UAS to be used in assessing the forward and return UAS link performance via a FSS network is provided below. It is emphasized that an administration may implement a UAS with characteristics different than those listed below within its national airspace.

a) Frequency bands.

Space-to-Earth

- 10.95-11.20 GHz
- 11.45-11.70 GHz
- 11.70-12.20 GHz (Region 2 only)
- 12.20-12.50 GHz (Region 3 only)
- 12.50-12.75 GHz (Regions 1 and 3 only)
- 17.3-17.7 GHz (Region 1 only)
- portion(s) of the frequency range 17.7-20.2 GHz

Earth-to-space

- 14.00-14.50 GHz
- portion(s) of the frequency range 27.5-30 GHz

b) Minimum required availability for the end-to-end forward (up 1 and down 2) link and end-to-end return (up 3 and down 4) link – refer to Figure 1.

- End-to-end forward (UACS ES to UA ES) link availability: exceed XX% under the conditions contained in this Annex.
- End-to-end return (UA ES to UACS ES) link availability: exceed XX% under the conditions contained in this Annex.
- In practice, the allocation of availability to the up and down portions of each end-to-end link will not be the same; however, the combined availability of the up and down links should meet the end-to-end availability cited herein.

c) Geographic coverage area where the UAS requirements will have to be met.

- Using appropriately located satellites, the availability referenced in b) should be met with the UA or UACS at any longitude and less than ±75 degrees latitude. The availability referenced in b) should be met with the satellite equivalent isotropically radiated power (e.i.r.p.), *G*/*T* and saturated flux-density (s.f.d.) at the locations of the UACS earth station and UA earth station.
- Global operations are expected covering all longitudes and latitudes to ±75 degrees. Ranges of operation can extend to transcontinental and transoceanic distances. Flight times can extend to many days of either loitering over a specific area or flying point-to-point paths.

d) The rain conditions (i.e. rain rates) in which the links must operate.

- UACS earth stations should be designed to achieve the availability referenced in b) while accommodating the rain rates experienced in their location. Recommendation ITU-R P-837 should be used to determine the maximum UACS earth station rain rates (links 1 and 4 in Figure 1) for 0.01% of the average year and any other rain-related information.
- UA earth stations should be designed to achieve the availability referenced in b) while accommodating rain rates up to and including 20 mm/hr for 0.01% of the average year (links 2 and 3 in Figure 1). For safety reasons aircraft will be operated to mitigate very high rain rates either by flying at altitudes above the rain or by changing their flight plan to fly where rain rates are lower. Recommendation ITU-R P-837 should be used to determine any other rain-related information.

e) Carrier characteristics.

It is noted that other carrier characteristics may also be suitable to achieve the required performance in b).

- Information rate. Forward link 10 kbit/s. Return link 320 kbit/s.
- Occupied bandwidth. Forward link 9 kHz. Return link 290 kHz.
- Modulation type. QPSK
- Forward error-correction rate. Rate 3/4 concatenated with Reed Solomon (212,236).
- Minimum required $C/(N + I)$: 3.8 dB.

f) Minimum and maximum antenna sizes and corresponding gains of the UACS earth station and UA earth station antennas.

- UACS earth station antennas should be sized to achieve the availability defined in b) for the rain rates experienced at their location d), as well as the other technical requirements cited in this Annex.
- The minimum UA earth station antenna diameter should be 0.5 metres (20/30 GHz) and 0.8 metres (12/14 GHz). Maximum UA earth station antenna diameters are limited by the size and weight constraint of the UA airframe, so maximum diameters of 1.2 m are anticipated. The peak antenna gain values to be used in UAS control link performance calculations using the aforementioned antenna diameters and frequencies are provided below:
  - 14 GHz UA antenna transmit gain 38 dBi (0.8 metre) – 42 dBi (1.2 metre).
  - 12 GHz UA antenna receive gain 36 dBi (0.8 metre) – 40 dBi (1.2 metre).

– 30 GHz UA antenna transmit gain 40 dBi (0.5 metre) – 48 dBi (1.2 metre).

– 20 GHz UA antenna receive gain 37 dBi (0.5 metre) – 44 dBi (1.2 metre).

g) Pointing accuracy of the UA earth station antenna.

– The 12/14 GHz UA earth station antenna tracking error should not exceed ±0.40 degrees peak[1].

– The 20/30 GHz UA earth station antenna tracking error should not exceed ±0.40 degrees peak[2].

h) Maximum and minimum e.i.r.p. density of the UA CS earth station and UA earth station.

– 14 GHz UA CS earth station and UA earth station should meet the following off-axis e.i.r.p. density levels under clear-sky conditions in the plane of the geostationary-satellite orbit location:

Angle off-axis maximum e.i.r.p. per 4 kHz

$1.5° \leq \theta \leq 7°$	$15 - 10 \log (N) - 25 \log \theta$ dBW/4 kHz
$7° < \theta \leq 9.2°$	$-6 - 10 \log (N)$ dBW/4 kHz
$9.2° < \theta \leq 48°$	$18 - 10 \log (N) - 25 \log \theta$ dBW/4 kHz
$48° < \theta \leq 85°$	$-24 - 10 \log (N)$ dBW/4 kHz
$85° < \theta \leq 180°$	$-14 - 10 \log (N)$ dBW/4 kHz

where θ is the angle in degrees from the line connecting the antenna to the target satellite. The e.i.r.p. density should be met with the maximum antenna pointing error referenced in g). For digital SCPC using frequency division multiplex access (FDMA) or time division multiple access (TDMA) technique, *N* is equal to one. For digital SCPC using code division multiple access (CDMA) technique, *N* is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

– 30 GHz UA CS earth station and UA earth station should meet the following off-axis e.i.r.p. density levels under clear-sky conditions in the plane of the geostationary-satellite orbit location:

Angle off-axis maximum e.i.r.p. per 40 kHz

$2.0° \leq \theta \leq 7°$	$(18.5 - 25 \log \theta) - 10 \log (N)$ dB (W/40 kHz)
$7° < \theta \leq 9.23°$	$-2.63 - 10 \log (N)$ dB (W/40 kHz)
$9.23° < \theta \leq 48°$	$(21.5 - 25 \log \theta) - 10 \log (N)$ dB (W/40 kHz)
$48° < \theta \leq 180°$	-10.5 dB $- 10 \log (N)$ (W/40 kHz).

where θ is the angle in degrees from the line connecting the antenna to the target satellite. The e.i.r.p. density should be met with the maximum antenna pointing error referenced in g). For digital SCPC using frequency division multiplex access (FDMA) or time division multiple access (TDMA) technique, *N* is equal to one. For digital SCPC using code division multiple access (CDMA) technique, *N* is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

---

[1] Additional study is required to verify the correct antenna tracking/pointing error.

[2] Additional study is required to verify the correct antenna tracking/pointing error.

i) Minimum *G*/*T* of the receiving UA CS earth station and UA earth station.

– The UA earth station system noise temperature should not exceed 270º Kelvin at the antenna feed flange. *G*/*Ts* will depend on the antenna size used. UA CS earth station *G*/*Ts* are the same as conventional FSS systems.

1/1.3/6.1.1.4 Method A4

A possible example of a WRC Resolution

ADD

RESOLUTION [B1.3] (WRC-12)

Provisions of spectrum for command and control, sense and avoid data as well as air traffic control relay for unmanned aircraft systems operations

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that unmanned aircraft (UA) operate in an integrated manner with manned aircraft;

b) that the command and control of such systems by a remote pilot and associated on-board systems is analogous to that exercised by a pilot of a manned aircraft;

c) that the provision of sense and avoid data to the remote pilot is sufficient to operate in accordance with airspace regulation applicable to the airspace in which the UAS is operating;

d) that the relay of air traffic control information provides the means of completing the communication link between air traffic control and the UA pilot;

e) that the actions of a pilot are regarded as being part of the safety-of-life system;

f) that the provision of command and control and sense and avoid links between a UA and the remote pilot can be regarded as safety of life;

g) that when operating a UA beyond line-of-sight communications may be provided via a satellite link or via an airborne (terrestrial) relay,

recognizing

a) that the definition of aeronautical mobile-satellite (R) service includes the link between the UA and the satellite and can cover the link between the UA pilot and the satellite;

b) that the fixed-satellite service can also be to provide the feeder link between the UA pilot and the satellite;

c) that civil aeronautical radio systems, used for safety and regularity of flight, are internationally standardized through ICAO in spectrum allocated to recognized safety-of-life services;

d) that Article 48 of the Constitution of the International Telecommunication Union covers the use of spectrum by Member States for national defence services,

resolves

1 that terrestrial radio systems used for the provision of command and control, sense and avoid data as well as air traffic control relay between a ground pilot and a civil unmanned aircraft system (UAS) shall operate in spectrum allocated to the aeronautical mobile (R) service;

2 that satellite radio systems used for the provision of command and control, sense and avoid data as well as air traffic control relay between a remote pilot and a civil UAS shall operate in spectrum allocated to the aeronautical mobile-satellite (R) service, except for those links identified in *resolves* 3;

3 that the fixed-satellite service may be used to provide the feeder link between the civil UA control station and the satellite for the aeronautical mobile-satellite (R) service;

4 that where the fixed-satellite service is used to provide a link as described in *resolves* 3 the aeronautical mobile-satellite (R) service system provider must ensure that the link meets the ICAO SARPs performance requirements.

1/1.3/6.1.1.5 Method A5

Needs to be developed.

1/1.3/6.1.2 Terrestrial component

1/1.3/6.1.2.1 Method B

NOC

5.444

MOD

4 800-5 570 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
5 030-5 091	AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE-SATELLITE (R) ADD 5.C103 AERONAUTICAL MOBILE (R) ADD 5.D103 ~~5.367~~ 5.444	
...		

ADD

5.C103 The use of the band 5 030-5 091 MHz by aeronautical mobile-satellite (R) service is subject to coordination under No. **9.11A**.

ADD

5.D103 The use of the band 5 030-5 091 MHz by the aeronautical mobile (R) service is limited to internationally standardized aeronautical systems. Moreover, the use of the band 5 030-5 091 MHz by the aeronautical mobile (R) service is subject to application of Resolution **[C1.3] (WRC-12)**.

MOD

5.367 *Additional allocation*: The bands 1 610-1 626.5 MHz, 5 000-5 030 MHz and 5 091~~00~~-5 150 MHz are also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. **9.21**.

Reasons: Since the band 5 030-5 091 MHz is proposed to be included in the body of the Table of Frequency Allocations, the modified footnote reflects this change.

ADD

RESOLUTION [C1.3] (WRC-12)

Coordination procedure between AM(R)S and ARNS in the band 5 030-5 091 MHz[3]

considering

TBD

noting

TBD

resolves

1 before any assignment to AM(R)S is notified to the BR in frequency bands 5 030-5 091 MHz the following procedures shall be applied in order to protect ARNS:

1.1 TBD

1.2 TBD

…

Regulatory examples for other bands referred to in section 1/1.3/5.1.2.1 need to be developed when studies are similarly carried out.

---

[3] Note: Concerning the protection of ARNS from AM(R)S, CPM11-2 received a contribution (CPM11-2 Document 80) related to additional measures as follows:

"To any AM(R)S systems in this band operating within XXX km from the border of the territory of those countries that have ICAO standard ARNS systems operating in this band, additional agreement seeking procedures under RR No. **9.21** are needed. And those AM(R)S systems shall not cause harmful interference to, nor claim protection from, and shall not impose constraints on current ICAO standard ARNS systems in this band."

After discussions, CPM11-2 proposed that it could be more appropriate to reflect the matter in a WRC Resolution describing the required coordination procedure to satisfy the concern raised in the contribution.

1/1.3/6.1.3 Both terrestrial and satellite components

1/1.3/6.1.3.1 Method C

No change to the Table of Frequency Allocations (RR Article **5**) for frequency bands for which the studies have not been completed. This method is equally applied to the terrestrial and satellite component.

1/1.3/6.2 Regulatory and procedural considerations for the UAS sense and avoid requirements

No regulatory and procedural considerations are required to address the UAS sense and avoid portion of Resolution **421 (WRC-07)**.

AGENDA ITEM 1.4

*1.4 to consider, based on the results of ITU-R studies, any further regulatory measures to facilitate introduction of new aeronautical mobile (R) service (AM(R)S) systems in the bands 112-117.975 MHz, 960-1 164 MHz and 5 000-5 030 MHz in accordance with Resolutions **413 (Rev.WRC-07)**, **417 (WRC-07)** and **420(WRC-07)**;*

1/1.4/1 Resolution 413 (Rev.WRC-07)

Use of the band 108-117.975 MHz by the aeronautical mobile (R) service

1/1.4/1.1 Executive summary

At WRC-07 the allocation to the AM(R)S in the band 108-112 MHz was further limited only to ground-based systems that transmit navigational information in support of air navigation functions, while the band 112-117.975 MHz was opened to all AM(R)S systems subject to Resolution **413 (Rev.WRC-07)**. Studies have been completed on the investigation of any compatibility issues between the analogue broadcasting and AM(R) services that may arise from the introduction of AM(R)S systems in the band 112-117.975 MHz. These studies indicate that no harmful interference will arise from the introduction of AM(R)S systems in the band 112-117.975 MHz into analogue FM broadcasting receivers below 108 MHz and that the both services can operate on a compatible basis. Hence no specific ITU material needs to be developed for the protection of analogue FM broadcasting receivers below 108 MHz from AM(R)S emissions in the band 112-117.975 MHz.

Regarding the compatibility with digital broadcasting service below 108 MHz, the matter will be pursued under traditional ITU-R activities and outside the WRC process. The method to satisfy this part of the agenda item proposes modification to Resolution **413 (Rev.WRC-07)** in such a way that "*invites ITU-R* 1" is suppressed.

1/1.4/1.2 Background

At WRC-03, an allocation in the band 108-117.975 MHz was made to the AM(R)S limited to systems that transmit navigation and surveillance information in accordance with international aviation standards. At WRC-07 AM(R)S in the band 108-112 MHz was further limited only to ground-based systems that transmit navigational information in support of air navigation functions, while the band 112-117.975 MHz was opened to all AM(R)S systems subject to Resolution **413 (Rev.WRC-07)**. In conjunction with this change, WRC-12 Agenda item 1.4 was adopted to determine if "further regulatory measures" are necessary to "facilitate introduction of new AM(R)S in the band(s) 112-117.975 MHz …". Studies were performed to address this question.

1/1.4/1.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations and Reports: Recommendations ITU-R BS.412, ITU-R BS.450, ITU-R BS.704 and Report ITU-R M.2147.

Studies have been completed on the investigation of any compatibility issues between the analogue broadcasting systems and systems operating in AM(R)S that may arise from the introduction of AM(R)S systems in the band 112-117.975 MHz.

1/1.4/1.4 Analysis of the results of studies

ITU-R studies, Report ITU-R M.2147, indicate that no harmful interference will arise from the introduction of AM(R)S systems in the band 112-117.975 MHz into analogue FM broadcasting receivers below 108 MHz and that the both services can operate on a compatible basis.

1/1.4/1.5 Method to satisfy Resolution 413 (Rev.WRC-07)

1/1.4/1.5.1 Method A: Resolution 413 (Rev.WRC-07) amendment

ITU-R studies indicate that no specific ITU material needs to be developed for the protection of analogue FM broadcasting receivers below 108 MHz from AM(R)S emission in the band 112-117.975 MHz. As a consequence Resolution **413 (Rev.WRC-07)** is to be amended in such a way that "*invites ITU-R* 1" is suppressed.

Advantages

- No undue constraints are placed on analogue FM broadcasting as well as on AM(R)S systems.
- No need for RR amendments other than those for Resolution **413 (Rev.WRC-07)**.

Disadvantages

None.

1/1.4/1.6 Regulatory and procedural considerations

In the method below it is proposed that the modification to Resolution **413 (Rev.WRC-07)** would apply from the date of the end of WRC-12.

1/1.4/1.6.1 Method A: Resolution 413 (Rev.WRC-07) amendment

MOD

RESOLUTION 413 (Rev.WRC-~~07~~12)

Use of the band 108-117.975 MHz by the aeronautical mobile (R) service

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

…

h) that theis WRC-07Confe~~rence~~ has modified the allocation of the band 112-117.975 MHz to the aeronautical mobile (R) services (AM(R)S) in order to make available this frequency band for new AM(R)S systems, and in doing so enabled further technical developments, investments and deployment;

…

recognizing

…

b) that, in accordance with Annex 10 ~~of~~to the Convention ~~of the International Civil Aviation Organization (ICAO)~~ on ~~i~~International ~~c~~Civil ~~a~~Aviation, all aeronautical systems must meet standards and recommended practices (SARPs) requirements;

…

resolves

1 that any aeronautical mobile (R) service systems operating in the band 108-117.975 MHz shall not cause harmful interference to, nor claim protection from ARNS systems operating in accordance with international aeronautical standards;

2 that any AM(R)S systems planned to operate in the frequency band 108-117.975 MHz shall, as a minimum, meet the FM broadcasting immunity requirements contained in Annex 10 ~~of~~to the ~~ICAO~~ Convention on International Civil Aviation for existing aeronautical radionavigation systems operating in this frequency band;

3 that AM(R)S systems operating in the band 108-117.975 MHz shall place no additional constraints on the broadcasting service or cause harmful interference to stations operating in the bands allocated to the broadcasting service in the frequency band 87-108 MHz and No. **5.43** does not apply to systems identified in *recognizing d)*;

4 that frequencies below 112 MHz shall not be used for AM(R)S systems excluding the ICAO systems identified in *recognizing d)*;

5 that any AM(R)S operating in the frequency band 108-117.975 MHz shall meet SARPs requirements published in Annex 10 ~~of~~to the ~~ICAO~~ Convention on International Civil Aviation~~;~~,

~~6 that WRC-11 should consider, based on the results of the ITU-R studies mentioned under *invites ITU-R*, any further regulatory measure to facilitate introduction of new AM(R)S systems,~~

invites ITU-R

~~1 to study any compatibility issues between the broadcasting and AM(R) services that may arise from the introduction of AM(R)S systems in the band 112-117.975 MHz, and to develop new or revised ITU-R Recommendations as appropriate;~~

~~2~~ to study any compatibility issues between the broadcasting and AM(R) services in the band 108-117.975 MHz that may arise from the introduction of appropriate digital sound broadcasting systems, described in Recommendation ITU-R BS.1114, and to develop new or revised ITU-R Recommendations as appropriate~~;~~,

~~3 to report to WRC-11 on the results of these studies,~~

1/1.4/2 Resolution 417 (WRC-07)

Use of the band 960-1 164 MHz by the aeronautical mobile (R) service

1/1.4/2.1 Executive summary

WRC-07 has allocated the band 960-1 164 MHz to the AM(R)S. This allocation is to support the introduction of applications and concepts in air traffic management supporting safety critical aeronautical communication. The ITU-R has therefore conducted studies on operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and certain ARNS systems operating in the same frequency band. The studies provide separation distances below which site-specific compatibility studies should be performed in order to ensure that in particular non-ICAO standardized ARNS systems are protected.

In order not to cause harmful interference to the RNSS systems in the adjacent band 1 164-1 215 MHz, the ITU-R has developed equivalent isotropically radiated power limits to be imposed on any AM(R)S station.

One method is proposed to satisfy the agenda item, requiring a modification of Resolution **417 (WRC-07)**.

1/1.4/2.2 Background

At WRC-07 an AM(R)S allocation was made in the band 960-1 164 MHz limited to systems operating in accordance with international aviation standards. In addition, Agenda item 1.4 and Resolution **417 (WRC-07)** were adopted to study operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and the ARNS systems identified in *considering f)* and *g)* of Resolution **417 (WRC-07)**. Resolution **417 (WRC-07)** *invites ITU-R* in accordance with *resolves* 5 to study operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and the RNSS operating in the band 1 164-1 215 MHz. Studies were performed to address this question.

1/1.4/2.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R M.1787 and ITU-R M.1318.

New relevant ITU-R Recommendation and Report: Recommendation ITU-R M.[CHAR-RX3] and Report ITU-R M.[AM(R)S_1GHz_SHARING].

Studies are being carried out to define the operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and non International Civil Aviation Organization (ICAO) ARNS systems as indicated in *considering f)* and *g)* of Resolution **417 (WRC-07)**.

Therefore studies of interference impact on non-ICAO ARNS system operation from the proposed AM(R)S systems were carried out in the frequency band 960-1 164 MHz. Scenarios for both single and multiple interferences were considered in these studies. It was shown that the required separation distance exceed the line-of-sight distance between ARNS system and the expected AM(R)S systems in the scenarios of single and multiple interferences caused to non-ICAO ARNS system operation. Therefore sharing between AM(R)S systems and non-ICAO ARNS systems is feasible only under condition of frequency separation and/or imposing technical and operational constraints on AM(R)S systems.

Studies have also been completed to define the operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and the RNSS operating in the band 1 164-1 215 MHz.

1/1.4/2.4 Analysis of the results of studies

1/1.4/2.4.1 Sharing with non ICAO ARNS systems

ITU-R studies, Report ITU-R M.[AM(R)S_1GHz_SHARING], indicate that sharing the 960-1 164 MHz frequency band between networks in the AM(R)S and non-ICAO national systems in the ARNS as indicated in *considering f)* and *g)* of Resolution **417 (WRC-07)** would be feasible with frequency off-set and/or distance separation. Administrations planning to use AM(R)S systems in the frequency band 960-1 164 MHz within radio line-of-sight with non-ICAO ARNS systems operated in some countries listed in RR No. **5.312** shall coordinate with administrations these systems.

1/1.4/2.4.2 Sharing with RNSS

Report ITU-R M.[AM(R)S_1GHz_SHARING], identifies technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and RNSS systems operating above 1 164 MHz.

For both the AM(R)S ground station and airborne station e.i.r.p. cases, it is expected that a technical determination of whether a different protection level is required for non-aeronautical RNSS receivers will be made within the ITU-R and included in Report ITU-R M.[AM(R)S_1GHz_SHARING] in time to be reflected in administration proposals to WRC-12.

It is assumed that compatibility issues between RNSS and AM(R)S operating on the same aircraft will be addressed within ICAO.

1/1.4/2.5 Method to satisfy Resolution 417 (WRC-07)

1/1.4/2.5.1 Method B: Resolution 417 (WRC-07) amendment

Amend Resolution **417 (WRC-07)** in order to:

a) introduce operational and technical means to facilitate sharing between AM(R)S systems and non-ICAO ARNS systems in the band 960-1 164 MHz, as indicated in *considering f)* and *g)* of Resolution **417 (WRC-07)**, and

b) introduce e.i.r.p. limits on AM(R)S systems below 1 164 MHz to protect RNSS systems above 1 164 MHz noting that review within the ITU-R of the impact on non-aeronautical RNSS receivers is ongoing, and the results of this review, expected in time for WRC-12, need to be taken into account.

Advantages

– It will allow the operation of the AM(R)S system with appropriate protection of non-ICAO ARNS systems in the frequency band 960-1 164 MHz and RNSS systems operating above 1 164 MHz.

Disadvantages

None.

1/1.4/2.6 Regulatory and procedural considerations

1/1.4/2.6.1 Method B: Resolution 417 (WRC-07) amendment

MOD

RESOLUTION 417 (Rev.WRC-~~07~~12)

Use of the band 960-1 164 MHz by the aeronautical mobile (R) service

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that WRC-07~~this Conference~~ has allocated the band 960 to 1 164 MHz to the aeronautical mobile (R) service (AM(R)S) in order to make available this frequency band for new AM(R)S systems, and in doing so enabled further technical developments, investments and deployment;

b) the current allocation of the frequency band 960-1 164 MHz to the aeronautical radionavigation service (ARNS);

~~*c)* the use of the band 960-1 215 MHz by the ARNS is reserved on a worldwide basis for the operation and development of airborne electronic aids to air navigation and any directly associated ground-based facilities per No. **5.328**;~~

~~d~~c) that new technologies are being developed to support communications and air navigation, including airborne and ground surveillance applications;

~~e~~d) that the ~~this new~~ allocation of the frequency band 960-1 164 MHz to the aeronautical mobile (R) service is intended to support the introduction of applications and concepts in air traffic management which are data intensive and which could support data links that carry safety critical aeronautical data;

~~f~~e) that in countries listed in No. **5.312** the frequency band 960-1 164 MHz is also used by systems in the ARNS for which standards and recommended practices (SARPs) have not been developed nor published by the International Civil Aviation Organization (ICAO);

~~g~~f) that, furthermore, the frequency band 960-1 164 MHz is also used by a non-ICAO system operating in the ARNS that has characteristics similar to those of ICAO standard distance measuring equipment~~;~~,

~~*h)* that this allocation was made knowing that studies are ongoing with respect to the technical characteristics, sharing criteria and sharing capabilities;~~

~~*i)* that the frequency band 117.975-137 MHz currently allocated to the AM(R)S is reaching saturation within certain areas of the world, therefore that band would not be available to support additional medium- and long-range data communications;~~

~~*j)* that, additional information is needed on the new technologies which will be used, other than the AM(R)S system identified in *recognizing c)*, the amount of spectrum required, and the characteristics and sharing capabilities/conditions. Therefore, studies are urgently required on which AM(R)S systems will be used, the amount of spectrum required and the characteristics and conditions for sharing with ARNS systems,~~

recognizing

~~*a)* that precedence must be given to the ARNS operating in the frequency band 960-1 164 MHz;~~

~~b~~a) that Annex 10 ~~of~~to the Convention ~~of the ICAO~~on International Civil Aviation contains SARPs for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

~~c~~b) that all compatibility issues between the ICAO Standard Universal Access Transceiver (UAT) operating under an AM(R)S allocation and other systems which operate in the same frequency range ~~excluding the system identified in *considering f)*,~~ have been addressed;

~~d~~c) that in the frequency band 1 024-1 164 MHz the sharing conditions are more complex than in the band 960-1 024 MHz,

noting

a) that~~, excluding the system identified in *recognizing c)*, no~~ compatibility criteria ~~currently exist~~ between AM(R)S systems proposed for operations in the frequency band 960-1 164 MHz and ICAO-standardized ~~the existing~~ aeronautical systems in the band will be developed in ICAO~~,~~;

b) that compatibility criteria between AM(R)S systems operating in the frequency band 960-1 164 MHz and RNSS receivers on the same aircraft will be developed in ICAO,

resolves

1 that any AM(R)S system operating in the frequency band 960-1 164 MHz shall meet SARPs requirements published in Annex 10 ~~of~~to the ~~ICAO~~ Convention on International Civil Aviation;

2 that any operation of AM(R)S systems ~~operating~~ in the band 960-1 164 MHz with aircraft stations operating within 934 km and/or ground stations operating within 465 km from the border of the territory of countries mentioned in No. **5.312** ~~shall not cause harmful interference to, nor claim protection~~is subject to the coordination agreement to be obtained from~~, and shall not impose constraints on the operation and planned development~~ the concerned administrations mentioned in No. **5.312** for the protection of aeronautical radionavigation systems (see *considering e)*) operating in the same band in these countries, No. **9.21** does not apply;

~~3 that compatibility studies between AM(R)S systems operating in the band 960-1 164 MHz and ARNS systems in *considering f)* and *g)* need to be conducted to develop sharing conditions to ensure that the conditions of *resolves* 2 are satisfied, and that ITU-R Recommendations are developed as appropriate;~~

3 that administrations authorizing AM(R)S systems in the band 960-1 164 MHz, shall take into account the sharing conditions on the coexistence with systems in ARNS identified under *considering f)* established in the Annex to this Resolution;

4 that compatibility between any AM(R)S systems in the band 960-1 164 MHz and systems in *considering f)* is a matter to be dealt with in ICAO;

~~4 that the result of the studies pursuant to *resolves* 3 shall be reported to WRC-11 and the decision should be taken by WRC-11 to review, if appropriate, regulatory provisions in *resolves* 2 taking into account protection requirements of ARNS systems identified in *considering f)* and *g)* and the need for global facilitation of AM(R)S operating in accordance with ICAO standards;~~

5 that administrations intending to implement AM(R)S in the band 960-1 164 MHz in order not to cause harmful interference to the radionavigation-satellite service in the band 1 164-1 215 MHz shall utilize the criteria set forth below:

– any ground station operating under the AM(R)S allocation in the band 960-1 164 MHz, shall limit its maximum equivalent isotropically radiated power (e.i.r.p.) to the values presented in the following table:

Emissions in the band 960-1 164 MHz (Total e.i.r.p. in the band 960-1 164 MHz as a function of the carrier central frequency)		Emissions in the band 1 164-1 215 MHz	
AM(R)S centre frequency < 1 146.45 MHz	AM(R)S centre frequency 1 146.45-1 164 M Hz	1 164-1 197.6 MHz	1 197.6-1 215 MHz
N/A*	Linearly decreasing from 34 to −62.9 dBW*	−90.8 dBW in any 1 MHz of the ban d 1 164-1 197.6 MHz	−90.8 dBW in any 1 MHz of the band 1 197.6-1 215 MHz

* The fundamental AM(R)S ground and airborne station emission limit values below 1 164 MHz are based solely on aeronautical RNSS receivers and will require further review within ITU-R to consider non-aeronautical RNSS receiver parameters as they are developed. The limit values in these cells may need to be adjusted depending on the final outcome of this review as expressed in Report ITU-R M.[AM(R)S_1GHz_SHARING].

– any aircraft station operating under the AM(R)S allocation in the band 960-1 164 MHz, shall limit its maximum equivalent isotropically radiated power (e.i.r.p.) to the values presented in the following table:

Emissions in the band 960-1 164 MHz (Total e.i.r.p. in the band 960-1 164 MHz as a function of the carrier central frequency)		Emissions in the band 1 164-1 215 MHz	
AM(R)S centre frequency < 1 146.45 MHz	AM(R)S centre frequency 1 146.45-1 164 MHz	1 164-1 197.6 MHz	1 197.6-1 215 MHz
N/A*	Linearly decreasing from 37.75 to −59.2 dBW*	−84 dBW in any 1 MHz of the band 1 164-1 197.6 MHz	−92.4 dBW in any 1 MHz of the band 1 197.6-1 215 MHz

* The fundamental AM(R)S ground and airborne station emission limit values below 1 164 MHz are based solely on aeronautical RNSS receivers and will require further review within ITU-R to consider non-aeronautical RNSS receiver parameters as they are developed. The limit values in these cells may need to be adjusted depending on the final outcome of this review as expressed in Report ITU-R M.[AM(R)S_1GHz_SHARING].

~~5 that frequencies in the band 960-1 164 MHz shall not be used by an AM(R)S system, except for the AM(R)S system identified in *recognizing c)*, until all potential compatibility issues with the ARNS and, as necessary, the radionavigation-satellite service (RNSS) in the adjacent band have been resolved, also taking into account *recognizing d)*,~~

~~*invites*~~

~~administrations and ICAO, for the purposes of conducting the ITU-R studies mentioned in *resolves* 3 and 5, to provide to ITU-R the technical and operational characteristics of systems involved,~~

~~*invites ITU-R*~~

~~1 to conduct studies in accordance with *resolves* 3 and 5 on operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and ARNS systems identified in *considering f)* and *g)*;~~

~~2 to conduct studies in accordance with *resolves* 5 on operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-1 164 MHz and the RNSS operating in the band 1 164-1 215 MHz;~~

~~3 to report the results of the studies to WRC-11,~~

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

ANNEX TO RESOLUTION 417 (Rev.WRC-12)

Coexistence with systems in the aeronautical radionavigation service identified under considering f) and the aeronautical mobile (R) service in the band 960-1 164 MHz

Editorial note: The contents of this Annex will be developed based on the contents of Report ITU-R M.[AM(R)S_1GHz_SHARING]

1/1.4/3 Resolution 420 (WRC-07)

Consideration of the frequency bands between 5 000 and 5 030 MHz for aeronautical mobile (R) service surface applications at airports

1/1.4/3.1 Executive summary

This section provides the results and analysis of studies, and methods to satisfy two distinct issues referred to in Resolution **420 (WRC-07)** under WRC-12 Agenda item 1.4. These are:

1) spectrum requirements for surface applications at airports around 5 GHz; and

2) compatibility issues of AM(R)S with RNSS and RAS.

With regard to the first issue, studies have been performed to investigate, with priority, AM(R)S spectrum requirements for surface applications at airports in the 5 GHz range, in order to determine if they can be fulfilled in the band 5 091-5 150 MHz. Within the ITU-R two methods are developed in this regard.

Method C1: Out of the total identified spectrum requirement, the need for safety critical AM(R)S spectrum will not exceed 50 MHz and that the additional identified spectrum requirement needs to be met by other means, i.e. in allocations to radiocommunication services other than AM(R)S. AM(R)S spectrum requirements for surface applications at airports in the 5 GHz range can be fulfilled in the band 5 091-5 150 MHz and no modification to RR Article **5** is required.

Method C2: AM(R)S spectrum requirements for surface communications at airports cannot be fulfilled in the band 5 091-5 150 MHz and hence more spectrum will be needed. A modification to RR Article **5** is required.

Regarding compatibility between AM(R)S and RAS, ITU-R studies indicate that compatibility with the RAS operating in the band 4 990-5 000 MHz would require to restrict the AM(R)S use to surface applications at airports. In addition, these studies provide specific separation distances within which site-specific compatibility analysis should be performed in order to ensure that RAS is protected.

For compatibility with RNSS feeder links in the 5 000-5 010 MHz band, studies have shown that compatibility is feasible, assuming conditions as specified in Report ITU-R M.2168-1. With regard to the band 5 010-5 030 MHz, neither the AM(R)S operational environment nor the RNSS signal characteristics are sufficiently defined to finalize ITU-R studies, no allocation is proposed for the AM(R)S in this band.

1/1.4/3.2 Background

Report ITU-R M.2120 was produced in response toWRC-07 Agenda item 1.6 Resolution **414 (WRC-07).** This Report estimated the AM(R)S spectrum requirement for surface applications at airports at between 60 and 100 MHz noting that this value would be refined through further study. At WRC-07 the frequency band 5 091-5 150 MHz was allocated to AM(R)S but due to uncertainty in the spectrum requirement and the perceived lack of maturity with respect to compatibility studies between AM(R)S and RNSS in the bands 5 000-5 010 and 5 010-5 030 MHz as well as AM(R)S and RAS in the band 4 990-5 000 MHz, proposals for an allocations to AM(R)S in these bands were rejected. However, WRC-12 Agenda item 1.4 and Resolution **420 (WRC-07)** were adopted. Resolution **420 (WRC-07)** invites the ITU to determine if AM(R)S spectrum requirements for surface applications at airports could be satisfied in the already-allocated 5 091-5 150 MHz band and in case this is not possible to “further investigate the feasibility of an allocation for AM(R)S for surface applications at airports, study the technical and operational issues relating to the protection of RNSS in the bands between 5 000 and 5 030 MHz and of the RAS in the band 4 990-5 000 MHz from AM(R)S, and develop appropriate Recommendations”.

Since WRC-07 the aviation community has continued with its development of a surface based wireless local area network (LAN) for use at airports. Work in standardizing the system has continued in Radio Technical Commission for Aeronautics (RTCA) and more recently in European Organization for Civil Aviation Equipment (EUROCAE). The work of EUROCAE is supported under European Union’s Single European Sky ATM Research & Development activities with a completion time-scale of 2013. This time-scale will include laboratory and field validation.

In addition, in January 2010 ICAO agreed to form a specific working group aimed at producing ICAO international standards and recommended practices for such a system.

1/1.4/3.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations and Reports: Recommendations ITU-R M.1318, ITU-R M.1450 and ITU-R M.1582, Reports ITU-R M.2120 and ITU-R M.2168-1.

New relevant ITU-R Recommendations and Reports: Recommendations ITU-R M.[S-E RX+TX] and ITU-R M.[E-S TX+RX], and Report ITU-R M.[5GHz_SURF].

1/1.4/3.3.1 Spectrum requirements for surface applications at airports at around 5 GHz

Studies have been performed to investigate, with priority, AM(R)S spectrum requirements for surface applications at airports in the 5 GHz range, in order to determine if they can be fulfilled in the band 5 091-5 150 MHz.

Initial work performed in the WRC-07 study cycle concluded in Report ITU-R M.2120 on an initial estimate of spectrum requirements for “approximately 60-100 MHz in some portion of the 5 000-5 150 MHz band” for AM(R)S surface applications at airports. It was recognized that further study was needed to determine a precise amount of spectrum required as standards for the new system are developed. This work is reflected in Report ITU-R M.[5GHz_SURF] which contains details of the studies performed in relation to the spectrum requirements for surface applications at airports in the 5 GHz range.

1/1.4/3.3.2 Compatibility of AM(R)S with RNSS and RAS

In addition, follow-on studies were conducted with incumbent services in/near the 5 000-5 010 MHz and 5 010-5 030 MHz bands.

1/1.4/3.4 Analysis of the results of studies

1/1.4/3.4.1 Spectrum requirements for surface applications at airports around 5 GHz

The ITU-R studies conclude that the total identified spectrum requirement to support surface applications at airports is 130 MHz.

View 1: Some members are of the view that of the total identified spectrum requirement of 130 MHz, the required AM(R)S spectrum will not exceed 50 MHz. It should be noted that the additional identified spectrum requirement other than AM(R)S needs to be met by other means such as from allocations to the corresponding services other than AM(R)S. The answer to *resolves* 1 of Resolution **420 (WRC-07)** is that AM(R)S spectrum requirements for surface applications at airports in the 5 GHz range can be fulfilled in the band 5 091-5 150 MHz.

View 2: Some other members are of the view that based on the follow-on study it is clear that the answer to *resolves* 1 of Resolution **420 (WRC-07)** is that AM(R)S spectrum requirements for surface communications at airports in the 5 GHz range cannot be fulfilled in the band 5 091-5 150 MHz, i.e., more than 59 MHz of spectrum will be needed to fulfil airport surface network spectrum requirements. This is especially true taking into account four additional factors: (1) the band 5 091-5 150 MHz is also allocated and intended for use by the airport security system, which per the terms of Recommendation ITU-R M.1827 cannot share spectrum with the airport surface system, (2) the fact that channelization limits within the airport system standard result in a granularity such that only 55, 50, or 40 MHz is actually usable for the system depending on whether 5, 10 or 20 MHz system channels are used, and (3) guardbands may be required in order to control emissions into adjacent bands, and (4) in some countries geographic separation of AM(R)S from co-frequency aeronautical mobile telemetry may not be possible, which could render some frequencies unusable.

1/1.4/3.4.2 Compatibility of AM(R)S with RNSS and RAS

Follow-on studies were conducted with incumbent services in/near the 5 000-5 010 MHz and 5 010-5 030 MHz bands. The results of those studies were as follows:

Regarding compatibility between AM(R)S and RAS:

– For compatibility with the RAS operating in the band 4 990-5 000 MHz, restriction of the AM(R)S to surface applications at airports results in compatibility conditions with the RAS similar to that service with the mobile (except aeronautical mobile) service, and, as such, compatibility can be assured through geographic separation. In the condition that RAS observatories are in close proximity to an airport, local coordination can be used to resolve any remaining issues. Based on Recommendation ITU-R RA.769, the operation of AM(R)S applications for airport surface in the band 5 000-5 010 MHz could exceed the protection limits for radio astronomy in the band 4 990-5 000 MHz out to ranges of 72 km for the 5 000-5 010 MHz band for flat terrain. In order to be conservative for separation distances less than 150 km, site-specific compatibility studies including local conditions should be performed to ensure that RAS is protected.

Regarding compatibility between AM(R)S and RNSS:

– For compatibility with RNSS (Earth-to-space) feeder links in the 5 000-5 010 MHz band, analyses have shown that compatibility is feasible, assuming conditions as specified in Report ITU-R M.2168-1. In particular the maximum instantaneous aggregate transmit e.i.r.p. from AM(R)S systems will be limited such that they not increase the noise temperature of RNSS space station receivers more than 2% for any RNSS satellite in view.

– For compatibility with RNSS (space-to-Earth) feeder links in the 5 010-5 030 MHz bands separation distances would be required to enable AM(R)S to operate without causing interference to RNSS earth stations. These distances could range from 100-320 km or more depending on assumptions and whether the AM(R)S and RNSS stations are within radio LOS of each other. If that separation distance cannot be maintained, site-specific analysis would be required.

– For compatibility with RNSS (space-to-Earth) service links in the 5 010-5 030 MHz band, the flexibility built into the IEEE 802.16e standard, on which the AM(R)S system is based, allows for the AM(R)S to be configured to appear non-continuous to the RNSS receiver. However, depending on the assumptions and analysis methodology used, the AM(R)S duty cycle would need to be reduced in order to ensure RNSS link receivers are protected. Since neither the AM(R)S operational environment nor the RNSS signal characteristics are sufficiently defined to make a credible estimate of input parameters, it is not possible to reach a conclusion. As a result, no allocation is proposed for the AM(R)S in this band.

1/1.4/3.5 Methods to satisfy Resolution 420 (WRC-07)

Method C1 – No changes to Article **5** of the Radio Regulations are required as a result of studies conducted within the ITU-R in response toWRC-12 Agenda item 1.4 Resolution **420 (WRC-07)**. Also suppress Resolution **420 (WRC-07)**.

Advantages

– Potential harmful interference from any proposed AM(R)S systems to the operation of global and regional RNSS systems and networks in the band 5 000-5 030 MHz would be avoided.

Disadvantages

– This method may not address the potential shortfall of AM(R)S spectrum to meet airport surface applications requirements.

Method C2 – Add a primary AM(R)S allocation for 5 000-5 010 MHz, with no changes to the band 5 010-5 030 MHz, in the Table of Allocations of RR Article **5** along with a Resolution that provides necessary measures to protect the RNSS and the RAS. Also suppress Resolution **420 (WRC-07)**.

Advantages

– Provides a primary AM(R)S allocation, with additional bandwidth to address emerging requirements for the airport surface network.

– Provides an explicit requirement for protection of the RNSS and the RAS.

– Reduce the risk of interference from proposed AM(R)S systems to RNSS systems and networks operating in the frequency band 5 010-5 030 MHz.

Disadvantages

– Any identified non AM(R)S spectrum requirement may need to be met by different means such as from allocations to radiocommunication services other than AM(R)S.

– Only provides 10 MHz of additional spectrum for AM(R)S in a band that is separated by more than 80 MHz from the existing AM(R)S 5 GHz allocation.

1/1.4/3.6 Regulatory and procedural considerations

1/1.4/3.6.1 Method C1 example regulatory text

SUP

RESOLUTION 420 (WRC-07)

Consideration of the frequency bands between 5 000 and 5 030 MHz for aeronautical mobile (R) service surface applications at airports

1/1.4/3.6.2 Method C2 example regulatory text

MOD

4 800-5 570 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
5 000-5 010	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (Earth-to-space) 5.367 <u>ADD 5.A104</u>	
...		

ADD

5.A104 *Additional allocation:* The band 5 000-5 010 MHz is also allocated to the aeronautical mobile (R) service. Resolution **[A1.4_5GHZ_AM(R)S] (WRC-12)** shall apply.

ADD

RESOLUTION [A1.4_5GHZ_AM(R)S] (WRC-12)

Use of the 5 000-5 010 MHz band by the aeronautical mobile (R) service and protection of the radionavigation-satellite and the radio astronomy services

The World Radiocommunication Conference (Geneva, 2012),

considering

a) the current allocation of the frequency band 5 000-5 010 MHz to the aeronautical mobile-satellite (R) service (AMS(R)S) subject to agreement obtained under No. **9.21**, the aeronautical radionavigation service (ARNS) and the radionavigation-satellite service (RNSS) (Earth-to-space);

b) that this Conference has made an allocation to the aeronautical mobile (R) service (AM(R)S) in the band 5 000-5 010 MHz limited to systems operating in accordance with recognized international aeronautical standards;

c) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the band 5 000-5 010 MHz;

d) that compatibility between AM(R)S systems and aeronautical radionavigation systems operating in accordance with international aeronautical standards is ensured by ICAO,

recognizing

a) that ICAO publishes recognized international aeronautical standards and recommended practices (SARPs) for AM(R)S;

b) that ITU-R studies demonstrate the compatibility of surface-based AM(R)S systems with planned RNSS systems in the band 5 000-5 010 MHz, and with the radio astronomy service operating in the band 4 990-5 000 MHz;

c) that the RNSS will need continued access to the band 5 000-5 010 MHz for feeder links;

d) that spectrum efficiency is enhanced in situations where new applications can be implemented compatibly in bands to be used by multiple services;

e) that restriction of the AM(R)S to surface applications at airports results in conditions such that compatibility with the radio astronomy service can be assured through geographic separation and/or coordination as necessary,

noting

a) that ITU-R is developing new Recommendations regarding the technical characteristics and operational parameters for the RNSS in the band 5 000-5 010 MHz;

b) that the use of the band 5 000-5 010 MHz by the AM(R)S needs to ensure protection of the current and planned use of this band by the RNSS;

c) that the use of the band 5 000-5 010 MHz by the AM(R)S needs to ensure protection of the current and planned RNSS systems operating in 5 010-5 030 MHz;

d) that the use of the band 5 000-5 010 MHz by the AM(R)S needs to ensure protection of the current and planned RAS systems operating in 4 990-5 000 MHz,

resolves

1 that stations in the AM(R)S operating in the band 5 000-5 010 MHz shall meet SARPs requirements published in Annex 10 to the Convention on International Civil Aviation and the maximum instantaneous equivalent isotropically radiated power for the aggregate transmissions in any given direction from all AM(R)S at a single airport operating in the 5 000-5 010 MHz band shall not exceed the following values, which will ensure protection of RNSS systems operating in this band:

40.2-40.6 dBm/10 MHz* below 5 degree elevations;

35.0-37.1 dBm/10 MHz* at or above 5 degree elevations;

* It is expected that a technical determination of the final e.i.r.p. level will be made within ITU-R in time to be reflected in administration proposals to WRC-12.

2 that AM(R)S use in the band 5 000-5 010 MHz shall be limited to surface applications at airports;

3 that administrations, in making assignments, shall first satisfy the requirements for the AM(R)S in the band 5 091-5 150 MHz before making AM(R)S assignments in the 5 000-5 010 MHz band;

4 that, notwithstanding No. **4.10**, in the case where transmissions from RNSS earth stations exceed AM(R)S interference thresholds, AM(R)S stations operating in the band 5 000-

5 010 MHz shall cease their use of certain frequencies when sufficient geographic separations cannot be maintained;

5 that if the separation distance for AM(R)S stations operating in the band 5 000-5 010 MHz with respect to stations in the RAS operating in the band 4 990-5 000 MHz is less than 150 km, site-specific compatibility studies including local conditions shall be undertaken in order to ensure that RAS is protected,

invites ICAO

to take account of the power limits in *resolves* 1 when developing SARPs for AM(R)S systems in the 5 000-5 010 MHz band,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

SUP

RESOLUTION 420 (WRC-07)

Consideration of the frequency bands between 5 000 and 5 030 MHz for aeronautical mobile (R) service surface applications at airports

AGENDA ITEM 1.9

*1.9 to revise frequencies and channelling arrangements of Appendix **17** to the Radio Regulations, in accordance with Resolution **351 (Rev.WRC-07)**, in order to implement new digital technologies for the maritime mobile service;*

Resolution **351 (Rev.WRC-07)**: *Review of the frequency and channel arrangements in the HF bands allocated to the maritime mobile service contained in Appendix **17** with a view to improving efficiency through the use of new digital technology by the maritime mobile service*

1/1.9/1 Executive summary

The goal of the agenda item is to facilitate the introduction of new digital technologies within RR Appendix **17** without causing harmful interference to the global maritime distress and safety system (GMDSS).

Two methods have been identified to satisfy the agenda item. These methods both require modification to RR Appendix **17**, Parts A and B, modification of RR Article **59** and adoption of a WRC-12 Resolution on "Application and abrogation of certain provisions of the Radio Regulations as revised by WRC-12".

The outcome of this agenda item also supports the suppression of Resolution **351 (Rev.WRC-07)**.

1/1.9/2 Background

Ships have traditionally made extensive use of the HF bands for long-distance safety and general communications using Morse telegraphy, radio telex and radio telephony. The introduction of the global maritime distress and safety system (GMDSS) removed the dependence on Morse telegraphy by introducing a standard radio telex system known as narrow-band direct-printing (NBDP).

The spectrum needs of the MMS in the HF bands are based on the introduction of new data exchange technologies into the MMS as an alternative standard for radio telex, which is in rapid decline. The International Maritime Organization (IMO) has noted that NBDP is currently used for the broadcasting of maritime safety information (MSI), ship reporting, weather forecasts and for business communications, e.g. by fishing fleets, but remains part of the International Convention for the Safety of Life at Sea (SOLAS) requirements for vessels sailing in sea areas A3[1] and A4[2]. All these functions could be provided by alternative data communication technologies. However, there are some administrations that continue to use NBDPs not only for MSI operations but also for public services.

Within the MMS, there is an opportunity to improve the utilization of the allocated spectrum by allowing data transmissions to use certain parts of RR Appendix **17** currently designated for use by

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1 **Sea Area A3**: An area that is beyond the range of MF and VHF coastal stations providing continuous digital selective calling alerting (about 150 miles from the coast) but within coverage of geostationary maritime communication satellites. This covers the areas between roughly 76° North and 76° South.

2 **Sea Area A4:** An area that is beyond the range of coverage of geostationary maritime communication satellites. The most important of these is the area around the north pole as the south pole is mostly land.

voice channels. This provides additional flexibility within the spectrum allocated to the MMS for data exchange technologies.

NBDP remains a carriage requirement in SOLAS Chapter IV together with the option of using Inmarsat satellite systems and remains useful for distress communications in the polar regions where there is no coverage from geostationary satellites (sea area A4).

This functionality could be preserved using the HF distress and safety frequencies listed in RR Appendix **15**.

Radio telex is now an old and limited system and is rarely supported by coast stations around the world. At WRC-03, RR Appendix **17** was modified by the addition of a new footnote *p)* which permitted initial testing and possible future introduction in certain bands of new digital technologies. These new digital technologies are becoming widely used.

The following graphical presentation represents all the bands allocated to the MMS on an exclusive basis and listed in RR Appendix **17**.

Each band is represented by two columns, the left column gives the frequency separation and the particularity of the band, i.e. if included in RR Appendix **25**, and if identified by WRC-03 for introduction of new digital technologies footnote *p)* and the restrictions *j), n), o)*, see RR Appendix **17**).

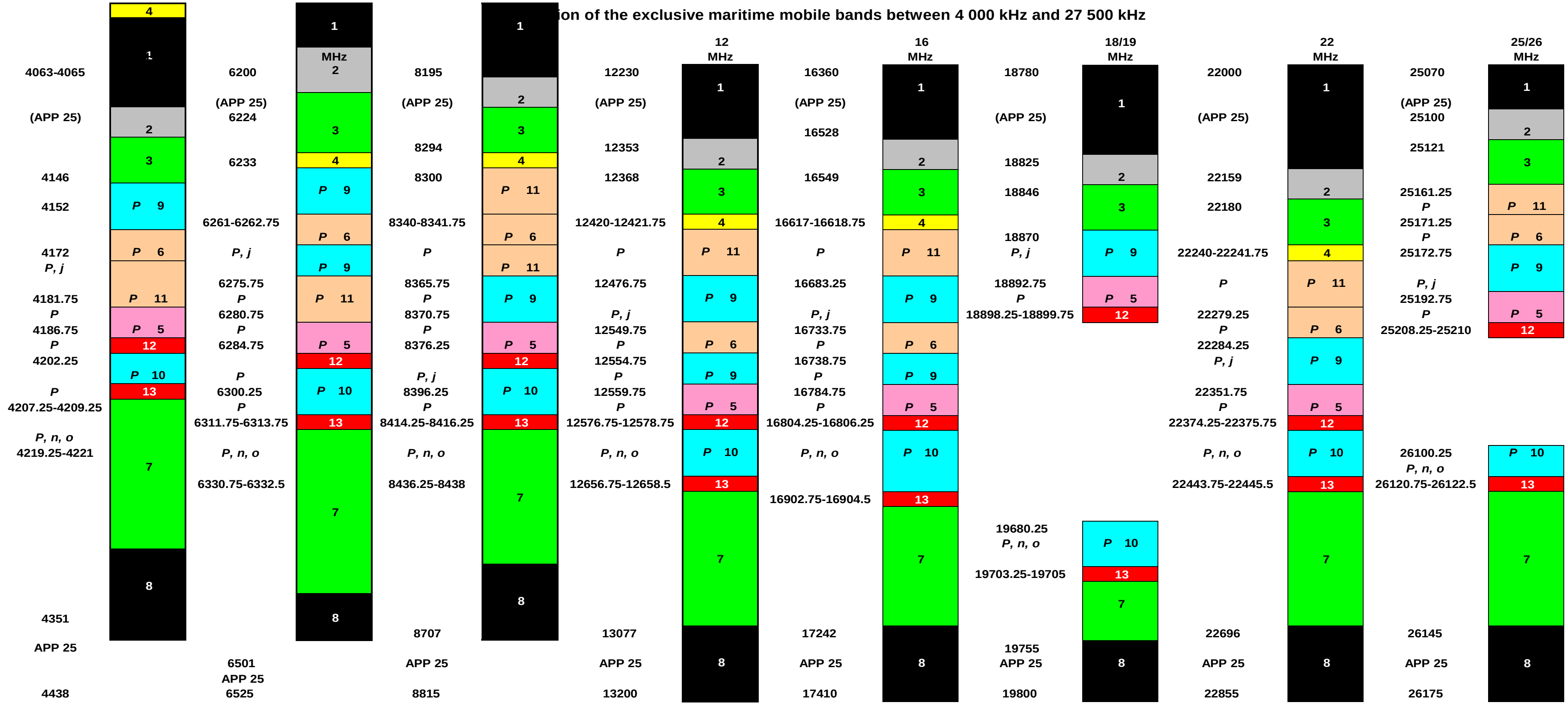
The right column gives the description of the usage of the band (call block from 1 to 13). For clarity the footnote *p)* status of RR Appendix **17** has also been reproduced in this column.

The blocks 1 and 8 have a special status, they deal with radio telephony. The block 8 represents RR Appendix **25**, Section II which is an allotment plan and therefore should not be changed.

All the blocks (except block 7) have a frequency bandwidth imposed varying from 0.5 to 4 kHz.

The blocks 12 and 13 should be left unchanged, because they deal with digital selective calling (DSC) and are involved in the GMDSS.

ion of the exclusive maritime mobile bands between 4 000 kHz and 27 500 kHz



1 — *Ship stations*, telephony, duplex operation (two-frequency channels), (frequencies paired with those in No. 8), (App. 17, Part B, Section I)

2 — *Ship stations and coast stations*, telephony, simplex operation (single-frequency channels) intership cross-band operation (two frequencies), ((Appendix 17, Part B, Section I, Sub-Section B)

3 — Ship stations, wide-band telegraphy, facsimile and special transmission systems, (Appendix 17, Part A) Oceanographic

4 — data transmission stations, (Appendix 17, Part A, Note c))

5 — *Ship stations*, narrow-band direct-printing telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK (non-paired frequencies), and A1A Morse telegraphy (working), (Appendix 17, Part B, Section III)

6 — *Ship stations*, A1A Morse telegraphy, calling, (Appendix 17, Part B, Section IV)

7 — *Coast stations*, wide-band and A1A Morse telegraphy, facsimile and special and data transmission systems and direct printing telegraphy systems, (Appendix 17, Part A)

8 — *Coast stations*, telephony, duplex operation (two-frequency channels), (frequencies paired with those in No. 1), (App. 17, Part B, Section I and APP. 25, Section II)

9 — *Ship stations*, narrow-band direct-printing telegraphy and data transmission systems at speeds not exceeding and 100 bauds for FSK (Appendices 17, Part B, Section II) and 200 bauds for PSK (frequencies paired with those in No. 10), (Appendix 17, Part B, Section II)

10 — *Coast stations*, narrow-band direct-printing telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK (frequencies paired with those in No. 9), (Appendix 17, Part B, Section II)

11 — *Ship stations*, A1A Morse telegraphy, working, (Appendix 17, Part B, Section V)

12 — *Ship stations*, digital selective calling, (Appendix 17, Part A)

13 — *Coast stations*, digital selective calling, (Appendix 17, Part A)

or P 10 — These sub-bands, except the frequencies referred to in Notes *j*), *n*) and *o*), may be used for the initial testing and the possible future introduction within the maritime mobile service of new digital technologies. Stations using these sub-bands for this purpose shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article 5.

1/1.9/3 Summary of technical and operational studies and relevant ITU R Recommendations

Existing relevant ITU-R Recommendation: ITU-R M.1798.

During this study period, the ITU-R has revised the Recommendation ITU-R M.1798 in order to introduce a new system for wideband HF data transmission.

The studies also considered the following points drawn from the IMO position:

> *"1 The frequencies currently allocated for use by the GMDSS need to be retained because IMO has no intention to change the requirements for NBDP and DSC at this moment in time and these requirements should be retained in Appendix* ***15****.*
>
> *2 The frequencies for MSI within Appendix* ***15*** *need to be retained, recognizing their essential role in the promulgation of MSI in Sea Area A4.*
>
> *3 It has to be noted that the spectrum that would have to remain dedicated to NBDP and DSC, in order to support the functional requirements of distress communications and the promulgation of MSI, only amounted to a small fraction of the Appendix* ***17*** *bands, the major portion of which would then become available for new digital technologies for the maritime mobile service.*
>
> *4 The frequency bands allocated for Morse could be used for technologies within the maritime community giving in the same time the possibility for the Administrations who wish to continue to use them to do so without claiming protection.*
>
> *5 IMO recognizes that the channel bandwidths within Appendix* ***17*** *are only adequate for narrow-band systems. Therefore IMO supports the idea of the creation of wide band channels within Appendix* ***17*** *for new technologies."*

1/1.9/4 Analysis of the results of studies

Because the allotment Plan contained in RR Appendix **25** is based on the frequencies allocated for radiotelephony use in RR Appendix **17**, the proposed changes to RR Appendix **17** mitigate any impact to administration allotments in RR Appendix **25**.

It is proposed to allow the use of digitally modulated emissions to the maximum extent in terms of capacity of bandwidth and potential number of channels, while avoiding potential impacts to allotments in RR Appendix **25**.

Recommendation ITU-R M.1798 has been reviewed and revised.

1/1.9/5 Methods to satisfy the agenda item

1/1.9/5.1 Method A1

This method proposes to modify Part A of RR Appendix **17** to promote the implementation of new digital technologies, while protecting existing applications.

To realize the goals mentioned above it is proposed:

– to reduce the current frequencies identified for NBDP use to a core band, which will include the GMDSS distress and safety requirement (see RR Appendix **15**), with the addition of some channels, in order to support current usage and to preclude the usage of other technologies in these core bands;

– to release, after the transition period, the NBDP frequencies not included in the core bands for new exchange technologies (e.g. see Recommendation ITU-R M.1798) while allowing administrations that choose to continue to use those bands for NBDP, to do so without claiming protection or causing interference;

– to release the frequency bands designated for facsimile, wideband telegraphy and Morse telegraphy A1A/A1B for digitally modulated emissions while allowing administrations that choose to continue to use them for facsimile, wideband telegraphy and Morse telegraphy A1A/A1B, without claiming protection or causing interference;

– to not specify any bandwidth in the bands dedicated for digitally modulated emissions;

– to keep the frequency bands designated for duplex radiotelephony (linked with RR Appendix **25**). However some administrations may allow stations to use digitally modulated data emissions in the radiotelephony bands, in accordance with the RR Appendix **25** allotment Plan, without claiming protection from other stations and without causing any interference to other stations in the MMS using radiotelephony.

In Part B of RR Appendix **17** changes are proposed accordingly to Part A.

In order to avoid interference between digital and analogue technologies and to ensure a smooth introduction of digital data technologies the following measures are proposed:

– to establish a transition period, during which the authorized usage of NBDP is unchanged and administrations that introduce digital communications are encouraged to coordinate with the affected administrations;

– to cease NBDP transmission outside the core band at the end of the transition period. However administrations may continue to use NBDP technology without claiming protection from or causing interference to stations in the MMS using digitally modulated emissions;

– to set 1 January 2017 as the date for the cessation of NBDP transmission outside the core band (end of the transition period);

– to allow the use of digitally modulated emissions without a transition period in the frequency bands designated for wideband telegraphy, facsimile and Morse telegraphy A1A/A1B;

– to encourage administrations making assignments to stations using digitally modulated emissions to effect coordination with potentially affected administrations from 1 January 2017;

– do not change the bands dedicated for the radiotelephony simplex operations but make provision for the use of digitally modulated emissions on the basis of not claiming protection from other stations and not causing any interference to other stations in the MMS using radiotelephony;

– do not modify RR Appendix **25** but allow the use of digitally modulated emissions in radiotelephony bands by administrations in accordance with the RR Appendix **25** allotment Plan subject to not causing harmful interference to nor claiming protection from other stations in the MMS using radiotelephony;

– to provide some flexibility to administrations to introduce new simplex radiotelephony channels (analogue or digital) in a portion of the bands 4, 6, 8 MHz in accordance with provision RR No. **52.177**, subject to not claiming protection from other stations in the MMS using digital modulated emissions.

To support the changes to RR Appendix **17**:

1) It is proposed to modify RR Article **59**, and add a new RR No. **59.A109**.

2) Further, to accommodate a transition period a WRC-12 Resolution is proposed.

1/1.9/5.2 Method A2

This method proposes to modify Part A and B of RR Appendix **17** to promote the implementation of new digital technologies, while protecting existing applications.

– The bandwidth and channelling arrangements for new digital technologies should be specified in Appendix **17**. Recommendation ITU-R M.1798 describes two 3 kHz bandwidth systems and one wideband system using 10-20 kHz bandwidth. Therefore, the basic bandwidth for new digital technologies should be 3 kHz, and should allow use of multiple 3 kHz contiguous channels for wideband systems.

– The retained NBDP bands should be reduced to allow for digital technologies. However, sufficient pair channels should remain to accommodate existing public services.

– The MSI frequencies should be included in the NBDP core bands in order to show a clear indication and provide adequate protection.

– For efficient use of the spectrum, the frequency bands in Part A for new digital technologies should be adjusted to 3 kHz bandwidth channels, however allowing for contiguous multiple 3 kHz channels for wideband system.

– The additional frequencies for new digital technologies should identify paired channels for coast stations and ship stations.

1/1.9/6 Regulatory and procedural considerations

1/1.9/6.1 Method A1

Example of modifications to RR Appendix **17** in accordance with the method described in section 1/1.9/5.1

MOD

APPENDIX 17 (Rev.WRC-~~07~~12)

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

(See Article 52)

PART A – Table of subdivided bands (WRC-~~07~~12)

In the Table, where appropriate[1], the assignable frequencies in a given band for each usage are:

– indicated by the lowest and highest frequency, in heavy type, assigned in that band;

– regularly spaced, the number of assignable frequencies (*f.*) and the spacing in kHz being indicated in italics.

MOD

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 063	6 200	8 195	12 230	16 360	18 780	22 000	25 070
Frequencies assignable to ship stations for oceanographic data transmission *c)*	**4 063.3** to **4 064.8** *6 f. 0.3 kHz*							
Limits (kHz)	4 065	6 200	8 195	12 230	16 360	18 780	22 000	25 070
Frequencies assignable to ship stations for telephony, duplex operation *a) i) hh)*	**4 066.4** to **4 144.4** *27 f. 3 kHz*	**6 201.4** to **6 222.4** *8 f. 3 kHz*	**8 196.4** to **8 292.4** *33 f. 3 kHz*	**12 231.4** to **12 351.4** *41 f. 3 kHz*	**16 361.4** to **16 526.4** *56 f. 3 kHz*	**18 781.4** to **18 823.4** *15 f. 3 kHz*	**22 001.4** to **22 157.4** *53 f. 3 kHz*	**25 071.4** to **25 098.4** *10 f. 3 kHz*
Limits (kHz)	4 146	6 224	8 294	12 353	16 528	18 825	22 159	25 100

[1] Within the non-shaded boxes.

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
Limits (kHz)	4 146	6 224	8 294	12 353	16 528	18 825	22 159	25 100
Frequencies assignable to ship stations and coast stations for telephony, simplex operation *a) hh)*	**4 147.4** to **4 150.4** *2 f.* *3 kHz*	**6 225.4** to **6 231.4** *3 f.* *3 kHz*	**8 295.4** to **8 298.4** *2 f.* *3 kHz*	**12 354.4** to **12 366.4** *5 f.* *3 kHz*	**16 529.4** to **16 547.4** *7 f.* *3 kHz*	**18 826.4** to **18 844.4** *7 f.* *3 kHz*	**22 160.4** to **22 178.4** *7 f.* *3 kHz*	**25 101.4** to **25 119.4** *7 f.* *3 kHz*
Limits (kHz)	4 152	6 233	8 300	12 368	16 549	18 846	22 180	25 121
Frequencies assignable to ship stations for ~~wide-band telegraphy, facsimile and special transmission systems~~data transmission *p) ee)*	~~**4 154**~~ ~~to~~ ~~**4 170**~~ ~~*5 f.*~~ ~~*4 kHz*~~	~~**6 235**~~ ~~to~~ ~~**6 259**~~ ~~*7 f.*~~ ~~*4 kHz*~~	~~**8 302**~~ ~~to~~ ~~**8 338**~~ ~~*10 f.*~~ ~~*4 kHz*~~	~~**12 370**~~ ~~to~~ ~~**12 418**~~ ~~*13 f.*~~ ~~*4 kHz*~~	~~**16 551**~~ ~~to~~ ~~**16 615**~~ ~~*17 f.*~~ ~~*4 kHz*~~	~~**18 848**~~ ~~to~~ ~~**18 868**~~ ~~*6 f.*~~ ~~*4 kHz*~~	~~**22 182**~~ ~~to~~ ~~**22 238**~~ ~~*15 f.*~~ ~~*4 kHz*~~	~~**25 123**~~ ~~to~~ ~~**25 159**~~ ~~*10 f.*~~ ~~*4 kHz*~~
Limits (kHz)	4 172	6 261	8 340	12 420	16 617	18 870	22 240	25 161.25
Frequencies assignable to ship stations for oceanographic data transmission *c) p)*		~~**6 261.3**~~ ~~to~~ ~~**6 262.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**8 340.3**~~ ~~to~~ ~~**8 341.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**12 420.3**~~ ~~to~~ ~~**12 421.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**16 617.3**~~ ~~to~~ ~~**16 618.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~		~~**22 240.3**~~ ~~to~~ ~~**22 241.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	
Limits (kHz)	4 172	6 262.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*								
Limits (kHz)	4 175.25	6 266.25	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25
Frequencies (paired) assignable to ship stations for narrow-band direct-printing (NBDP) telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) j) ~~m) p)~~*	**4 17~~2~~5.5** to **4 1~~81.5~~78** *~~18~~6 f.* *0.5 kHz*	**6 26~~3~~6.5** to **6 2~~75~~68.5** *~~2~~5 f.* *0.5 kHz*						
Limits (kHz)	4 178.25	6 268.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*								
Limits (kHz)	4 181.75	6 275.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~g)~~ p) m)*								
Limits (kHz)	4 186.75	6 280.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25
~~Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK~~Frequencies assignable to ship stations for data transmission *d) ~~m)~~ p) aa) bb) cc)*		~~**6 281** to **6 284.5**~~ *~~8 f. 0.5 kHz~~*						
Limits (kHz)	4 186.75	6 284.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	4	6	8	12	16	18/19	22	25/26	
Limits (kHz)	4 186.75	6 284.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 161.25	
~~Working frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~<ins>Frequencies assignable to ship stations for data transmission</ins> *~~e) f)~~ <ins>m)</ins> p)*	~~**4 187 to 4 202**~~ *~~31 f. 0.5 kHz~~*	~~**6 285 to 6 300**~~ *~~31 f. 0.5 kHz~~*	~~**8 342 to 8 365.5**~~ *~~48 f. 0.5 kHz~~*	~~**12 422 to 12 476.5**~~ *~~110 f. 0.5 kHz~~*	~~**16 619 to 16 683**~~ *~~129 f. 0.5 kHz~~*		~~**22 242 to 22 279**~~ *~~75 f. 0.5 kHz~~*	~~**25 161.5 to 25 171**~~ *~~20 f. 0.5 kHz~~*	(WRC-07)
Limits (kHz)	4 202.25	6 300.25	8 365.75	12 476.75	16 683.25	18 870	22 279.25	25 171.25	
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~<ins>Frequencies assignable to ship stations for data transmission</ins> *~~g)~~ p) <ins>m)</ins>*									
Limits (kHz)	4 202.25	6 300.25	8 370.75	12 476.75	16 683.25	18 870	22 284.25	25 172.75	
~~Working frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~<ins>Frequencies assignable to ship stations for data transmission</ins> *~~e) f)~~ p) <ins>m)</ins>*			~~**8 371 to 8 376**~~ *~~11 f. 0.5 kHz~~*						
Limits (kHz)	4 202.25	6 300.25	8 376.25	12 476.75	16 683.25	18 870	22 284.25	25 172.75	
Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK *d) j) ~~m) p)~~*			**8 376.5** to **8 3~~96~~<ins>78.5</ins>** *~~40~~<ins>5</ins> f. 0.5 kHz*	~~**12 477 to 12 549.5**~~ *~~146 f. 0.5 kHz~~*	~~**16 683.5 to 16 733.5**~~ *~~101 f. 0.5 kHz~~*	~~**18 870.5 to 18 892.5**~~ *~~45 f. 0.5 kHz~~*	~~**22 284.5 to 22 351.5**~~ *~~135 f. 0.5 kHz~~*	~~**25 173 to 25 192.5**~~ *~~40 f. 0.5 kHz~~*	
<ins>Limits (kHz)</ins>	<ins>4 202.25</ins>	<ins>6 300.25</ins>	<ins>8 378.75</ins>	<ins>12 476.75</ins>	<ins>16 683.25</ins>	<ins>18 870</ins>	<ins>22 284.25</ins>	<ins>25 172.75</ins>	
<ins>Frequencies assignable to ship stations for data transmission</ins> *<ins>d) p) aa) bb) cc)</ins>*									
<ins>Limits (kHz)</ins>	<ins>4 202.25</ins>	<ins>6 300.25</ins>	<ins>8 396.25</ins>	<ins>12 517.25</ins>	<ins>16 693.25</ins>	<ins>18 892.75</ins>	<ins>22 351.75</ins>	<ins>25 192.75</ins>	
<ins>Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK</ins> *<ins>d) j)</ins>*				<ins>**12 517.5**</ins> <ins>to</ins> <ins>**12 522**</ins> *<ins>10 f. 0.5 kHz</ins>*	<ins>**16 693.5**</ins> <ins>to</ins> <ins>**16 696.5**</ins> *<ins>7 f. 0.5 kHz</ins>*				
<ins>Limits (kHz)</ins>	<ins>4 202.25</ins>	<ins>6 300.25</ins>	<ins>8 396.25</ins>	<ins>12 522.25</ins>	<ins>16 696.75</ins>	<ins>18 892.75</ins>	<ins>22 351.75</ins>	<ins>25 192.75</ins>	

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
<u>Frequencies assignable to ship stations for data transmission</u> *<u>d) p) aa) bb) cc)</u>*								
Limits (kHz)	4 202.25	6 300.25	8 396.25	12 549.75	16 733.75	18 892.75	22 351.75	25 192.75
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~<u>Frequencies assignable to ship stations for data transmission</u> *~~g)~~ <u>m)</u> p)*								
Limits (kHz)	4 202.25	6 300.25	8 396.25	12 554.75	16 738.75	18 892.75	22 351.75	25 192.75
~~Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK~~<u>Frequencies assignable to ship stations for data transmission</u> *<u>aa) bb) cc)</u> d) ~~m)~~ p)*				~~**12 555 to 12 559.5**~~ *~~10 f. 0.5 kHz~~*	~~**16 739 to 16 784.5**~~ *~~92 f. 0.5 kHz~~*			
Limits (kHz)	4 202.25	6 300.25	8 396.25	12 559.75	16 784.75	18 892.75	22 351.75	25 192.75

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
Limits (kHz)	4 202.25	6 300.25	8 396.25	12 559.75	16 784.75	18 892.75	22 351.75	25 192.75
Frequencies (non paired) assignable to ship stations for ~~NBDP telegraphy and~~ data transmission systems ~~at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK and for A1A or A1B Morse telegraphy (working)~~ *b) p) dd) m) gg)*	~~**4 202.5**~~ ~~to~~ ~~**4 207**~~ ~~*10 f.*~~ ~~*0.5 kHz*~~	~~**6 300.5**~~ ~~to~~ ~~**6 311.5**~~ ~~*23 f.*~~ ~~*0.5 kHz*~~	~~**8 396.5**~~ ~~to~~ ~~**8 414**~~ ~~*36 f.*~~ ~~*0.5 kHz*~~	~~**12 560**~~ ~~to~~ ~~**12 576.5**~~ ~~*34 f.*~~ ~~*0.5 kHz*~~	~~**16 785**~~ ~~to~~ ~~**16 804**~~ ~~*39 f.*~~ ~~*0.5 kHz*~~	~~**18 893**~~ ~~to~~ ~~**18 898**~~ ~~*11 f.*~~ ~~*0.5 kHz*~~	~~**22 352**~~ ~~to~~ ~~**22 374**~~ ~~*45 f.*~~ ~~*0.5 kHz*~~	~~**25 193**~~ ~~to~~ ~~**25 208**~~ ~~*31 f.*~~ ~~*0.5 kHz*~~
Limits (kHz)	4 207.25	6 311.75	8 414.25	12 576.75	16 804.25	18 898.25	22 374.25	25 208.25
Frequencies assignable to ship stations for digital selective calling *k) l)*	**4 207.5** to **4 209** *4 f.* *0.5 kHz*	**6 312** to **6 313.5** *4 f.* *0.5 kHz*	**8 414.5** to **8 416** *4 f.* *0.5 kHz*	**12 577** to **12 578.5** *4 f.* *0.5 kHz*	**16 804.5** to **16 806** *4 f.* *0.5 kHz*	**18 898.5** to **18 899.5** *3 f.* *0.5 kHz*	**22 374.5** to **22 375.5** *3 f.* *0.5 kHz*	**25 208.5** to **25 209.5** *3 f.* *0.5 kHz*
Limits (kHz)	4 209.25	6 313.75	8 416.25	12 578.75	16 806.25	18 899.75	22 375.75	25 210
Limits (kHz)	4 209.25	6 313.75	8 416.25	12 578.75	16 806.25	19 680.25	22 375.75	26 100.25
Frequencies assignable to coast stations for data transmission *n) o) p) aa) bb) cc)*								
Limits (kHz)	4 213.75	6 317.75	8 416.25	12 619.75	16 816.75	19 703.25	22 443.75	26 120.75
Frequencies (paired) assignable to coast stations for NBDP and data transmission systems, at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK ~~*d) n) o) p)*~~	**4 2~~09.5~~14** to **4 21~~9~~5.5** *~~20~~4 f.* *0.5 kHz*	**6 3148** to **6 3~~30~~19.5** *~~34~~ f.* *0.5 kHz*	**8 416.5** to **8 4~~36~~18.5** *~~40~~5 f.* *0.5 kHz*	**12 ~~579~~620** to **12 6~~56.5~~24** *~~156~~9 f.* *0.5 kHz*	**16 8~~06.5~~17** to **16 ~~902.5~~819.5** *~~193~~6 f.* *0.5 kHz*	~~**19 680.5**~~ ~~to~~ ~~**19 703**~~ ~~*46 f.*~~ ~~*0.5 kHz*~~	~~**22 376**~~ ~~to~~ ~~**22 443.5**~~ ~~*136 f.*~~ ~~*0.5 kHz*~~	~~**26 100.5**~~ ~~to~~ ~~**26 120.5**~~ ~~*41 f.*~~ ~~*0.5 kHz*~~
Limits (kHz)	4 215.75	6 319.75	8 418.75	12 624.25	16 819.75	19 703.25	22 443.75	26 120.75
Frequencies assignable to coast stations for data transmission *d) p) aa) bb) cc)*								
Limits (kHz)	4 219.25	6 330.75	8 436.25	12 656.75	16 902.75	19 703.25	22 443.75	26 120.75
Frequencies assignable to coast stations for digital selective calling *l)*	**4 219.5** to **4 220.5** *3 f.* *0.5 kHz*	**6 331** to **6 332** *3 f.* *0.5 kHz*	**8 436.5** to **8 437.5** *3 f.* *0.5 kHz*	**12 657** to **12 658** *3 f.* *0.5 kHz*	**16 903** to **16 904** *3 f.* *0.5 kHz*	**19 703.5** to **19 704.5** *3 f.* *0.5 kHz*	**22 444** to **22 445** *3 f.* *0.5 kHz*	**26 121** to **26 122** *3 f.* *0.5 kHz*
Limits (kHz)	4 221	6 332.5	8 438	12 658.5	16 904.5	19 705	22 445.5	26 122.5

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Frequencies assignable to coast stations for wide-band ~~and A1A or A1B Morse telegraphy~~, facsimile, special and data transmission systems and direct-printing telegraphy systems *m) p) ee) ff)*								
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*end*)

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145
Frequencies assignable to coast stations for telephony, duplex operation *a) hh)*	**4 352.4** to **4 436.4** *29 f. 3 kHz*	**6 502.4** to **6 523.4** *8 f. 3 kHz*	**8 708.4** to **8 813.4** *36 f. 3 kHz*	**13 078.4** to **13 198.4** *41 f. 3 kHz*	**17 243.4** to **17 408.4** *56 f. 3 kHz*	**19 756.4** to **19 798.4** *15 f. 3 kHz*	**22 697.4** to **22 853.4** *53 f. 3 kHz*	**26 146.4** to **26 173.4** *10 f. 3 kHz*
Limits (kHz)	4 438	6 525	8 815	13 200	17 410	19 800	22 855	26 175

NOC

a)

MOD

b) Until 1 January 2017, ~~S~~see Part B, Section III. After this date Section III will no longer apply and has to be deleted by a future competent WRC.

NOC

c) and *d)*

SUP

e)

SUP

f)

SUP

g)

NOC

h) to *l)*

MOD

m) Frequencies from these frequency bands may also be used for A1A or A1B Morse telegraphy ~~(working) (see Part B, Section II)~~subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

NOC

n) and *o)*

MOD

p) These sub-bands, except the frequencies referred to in Notes *i), j), n)* and *o)*, may be used for ~~the initial testing and the possible future introduction within the maritime mobile service of new digital technologies. Stations using these sub-bands for this purpose shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article 5~~digitally modulated emissions for maritime mobile service (e.g. as described in Recommendation ITU-R M.1798). The provisions of No. **15.8** apply.

ADD

aa) Until 1 January 2017, these bands may be used by narrow-band direct-printing applications. Before 1 January 2017, administrations who introduce digitally modulated emissions for radiocommunications are urged to take all practicable steps to prevent interference to the narrow-band direct-printing applications in the band.

ADD

bb) From 1 January 2017 these bands, except the frequencies referred to in Notes *n)* and *o)*, may be used by narrow-band direct-printing applications by administrations, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

cc) From 1 January 2017 administrations who will make assignments to stations using digitally modulated emissions are encouraged to effect coordination with potentially affected administrations.

ADD

dd) These bands may be used by narrow-band direct-printing applications by the administrations, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

ee) Frequencies from these bands may be used for wideband telegraphy, facsimile, A1A/A1B Morse telegraphy and special data transmission on the condition that interference is not caused to and protection is not claimed from stations in the maritime mobile service using digitally modulated emissions.

ADD

ff) The bands 4 345-4 351 kHz, 6 495-6 501 kHz, 8 701-8 707 kHz may be used for simplex (single-sideband) telephone operation (regularly spaced by 3 kHz), in accordance with provision No. **52.177**, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

gg) When assigning frequencies in the bands 4 202.25-4 207.25 kHz, 6 300.25-6 311.75 kHz, 8 396.25-8 414.25 kHz, 12 559.75-12 576.75 kHz and 16 784.75-16 804.25 kHz administrations shall take all necessary precautions in order not to cause interference on the DSC distress frequencies 4 207.5 kHz, 6 312 kHz, 8 414.5 kHz, 12 577 kHz and 16 804.5 kHz.

ADD

hh) The bands 4 066.4-4 150.4 kHz, 4 352.4-4 436.4 kHz, 6 201.4-6 231.4 kHz, 6 502.4-6 523.4 kHz, 8 196.4-8 298.4 kHz, 8 708.4-8 813.4 kHz, 12 231.4-12 366.4 kHz, 13 078.4-13 198.4 kHz, 16 361.4-16 574.4 kHz, 17 243.4-17 408.4 kHz, 18 781.4-18 844.4 kHz, 19 756.4-19 798.4 kHz, 22 001.4-22 178.4 kHz, 22 697.4-22 853.4 kHz, 25 071.4-25 119.4 kHz, 26 146.4-26 173.4 kHz may be used, in accordance with the Appendix **25** allotment Plan, for digitally modulated emissions as described in Recommendation ITU-R M.1798 on condition that it shall not cause harmful interference to, or claim protection from other stations in the maritime mobile service using radiotelephony operations. The digitally modulated emissions may be used provided that their occupied bandwidth does not exceed 2 800 Hz, it is situated wholly within one frequency channel and the peak envelope power of coast stations does not exceed 10 kW and the peak envelope power of ship stations does not exceed 1.5 kW per channel.

MOD

PART B – Channelling arrangements (WRC-~~07~~12)

NOC

Section I – Radiotelephony

MOD

Section II – Narrow-band direct-printing telegraphy (paired frequencies)

1 Each coast station which uses paired frequencies is assigned one or more frequency pairs from the following series; each pair consists of a transmitting and a receiving frequency.

2 The speed of the narrow-band direct-printing telegraphy and data systems shall not exceed 100 Bd for FSK and 200 Bd for PSK.

Table of frequencies for two-frequency operation by coast stations (kHz)
to be used before 1 January 2017

NOC

The table itself is unchanged.

ADD

**Table of frequencies for two-frequency operation by coast stations (kHz)
to be used from 1 January 2017**

Channel No.	4 MHz band [1]		6 MHz band		8 MHz band	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
1					8 376.5 [2]	8 376.5 [2]
2					8 417	8 377
3					8 417.5	8 377.5
4					8 418	8 378
5					8 418.5	8 378.5
6						
7						
8	4 214	4 176	6 318	6 266.5		
9	4 214.5	4 176.5	6 318.5	6 267		
10	4 215	4 177	6 319	6 267.5		
11	4 177.5 [2]	4 177.5 [2]	6 268 [2]	6 268 [2]		
12	4 215.5	4 178	6 319.5	6 268.5		
13						

[1] Ship stations may use the coast station receiving frequencies for transmitting A1A or A1B Morse telegraphy (working), with the exception of channel No. 11 (see Appendix **15**).

[2] For the conditions of use of this frequency, see Article **31**.

Table of frequencies for two-frequency operation by coast stations (kHz)

Channel No.	12 MHz band		16 MHz band	
	Transmit	Receive	Transmit	Receive
21			16 817	16 693.5
22			16 817.5	16 694
23			16 818	16 694.5
24			16 695 [2]	16 695 [2]
25			16 818.5	16 695.5
26			16 819	16 696
27			16 819.5	16 696.5
82	12 620	12 517.5		
83	12 620.5	12 518		
84	12 621	12 518.5		
85	12 621.5	12 519		
86	12 622	12 519.5		
87	12 520 [2]	12 520 [2]		
88	12 622.5	12 520.5		
89	12 623	12 521		
90	12 623.5	12 521.5		
91	12 624	12 522		

MOD

Section III – Narrow-band direct-printing telegraphy (non-paired frequencies)

until 1 January 2017 (after this date the entire section will no longer apply and has to be deleted by a future competent WRC)

SUP

Section IV – Morse telegraphy (calling)

SUP

Section V – Morse telegraphy (working)

ADD

RESOLUTION [A1.9_NBDP] (WRC-12)

Application and abrogation of certain provisions of the Radio Regulations as revised by WRC-12

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that this conference has adopted a revision to the Radio Regulations (RR) in accordance with its terms of reference which will enter into force on [1 January 2013];

b) that some of the provisions, as amended by this conference, need to apply as of a later date;

c) that as a general rule, new and revised Resolutions and Recommendations enter into force at the time of signing of the Final Acts of a conference;

d) that as a general rule, Resolutions and Recommendations which a WRC has decided to suppress are abrogated at the time of the signing of the Final Acts of the conference,

resolves

1 that, as of 1 January 2017, the following provisions of the RR, which are suppressed by this Conference, shall be abrogated: “Table of frequencies for two-frequency operation by coast stations (kHz) to be used before 1 January 2017”, Section II of Part B of Appendix **17**;

2 that, as of 1 January 2017, the following provisions, as established by this Conference, shall enter into force: “Table of frequencies for two-frequency operation by coast stations (kHz) to be used from 1 January 2017”, Section II of Part B of Appendix **17**.

MOD

ARTICLE 59

Entry into force and provisional application of the Radio Regulations (WRC-~~2000~~12)

ADD

59.A109 – the revised provisions for which other effective dates of application are stipulated in Resolution **[A1.9_NBDP] (WRC-12)**:

SUP

RESOLUTION 351 (Rev.WRC-07)

Review of the frequency and channel arrangements in the HF bands allocated to the maritime mobile service contained in Appendix 17 with a view to improving efficiency through the use of new digital technology by the maritime mobile service

1/1.9/6.2 Method A2

Example of modifications to RR Appendix **17** in accordance with the method described in section 1/1.9/5.2

MOD

APPENDIX 17 (Rev.WRC-~~07~~12)

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

(See Article 52)

PART A – Table of subdivided bands (WRC-~~07~~12)

In the Table, where appropriate[1], the assignable frequencies in a given band for each usage are:

– indicated by the lowest and highest frequency, in heavy type, assigned in that band;

– regularly spaced, the number of assignable frequencies (*f.*) and the spacing in kHz being indicated in italics.

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 063	6 200	8 195	12 230	16 360	18 780	22 000	25 070
Frequencies assignable to ship stations for oceanographic data transmission *c)*	**4 063.3** to **4 064.8** *6 f.* *0.3 kHz*							
Limits (kHz)	4 065	6 200	8 195	12 230	16 360	18 780	22 000	25 070
Frequencies assignable to ship stations for telephony, duplex operation *a) i) gg)*	**4 066.4** to **4 144.4** *27 f.* *3 kHz*	**6 201.4** to **6 222.4** *8 f.* *3 kHz*	**8 196.4** to **8 292.4** *33 f.* *3 kHz*	**12 231.4** to **12 351.4** *41 f.* *3 kHz*	**16 361.4** to **16 526.4** *56 f.* *3 kHz*	**18 781.4** to **18 823.4** *15 f.* *3 kHz*	**22 001.4** to **22 157.4** *53 f.* *3 kHz*	**25 071.4** to **25 098.4** *10 f.* *3 kHz*
~~Limits (kHz)~~	4 146	6 224	8 294	12 353	16 528	18 825	22 159	25 100

[1] Within the non-shaded boxes.

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
Limits (kHz)	4 146	6 224	8 294	12 353	16 528	18 825	22 159	25 100
Frequencies assignable to ship stations and coast stations for telephony, simplex operation *a) gg)*	**4 147.4** to **4 150.4** *2 f.* *3 kHz*	**6 225.4** to **6 231.4** *3 f.* *3 kHz*	**8 295.4** to **8 298.4** *2 f.* *3 kHz*	**12 354.4** to **12 366.4** *5 f.* *3 kHz*	**16 529.4** to **16 547.4** *7 f.* *3 kHz*	**18 826.4** to **18 844.4** *7 f.* *3 kHz*	**22 160.4** to **22 178.4** *7 f.* *3 kHz*	**25 101.4** to **25 119.4** *7 f.* *3 kHz*
Limits (kHz)	4 152	6 233	8 300	12 368	16 549	18 846	22 180	25 121
~~Frequencies assignable to ship stations for wide-band telegraphy, facsimile and special transmission systems~~ Frequencies assignable to ship stations for data transmissions *p) ee)*	~~**4 154**~~ ~~to~~ ~~**4 170**~~ ~~*5 f.*~~ ~~*4 kHz*~~ **4 154.5** to **4 169.5** *6 f.* *3 kHz*	~~**6 235**~~ ~~to~~ ~~**6 259**~~ ~~*7 f.*~~ ~~*4 kHz*~~ **6 235** to **6 259** *9 f.* *3 kHz*	~~**8 302**~~ ~~to~~ ~~**8 338**~~ ~~*10 f.*~~ ~~*4 kHz*~~ **8 302** to **8 338** *13 f.* *3 kHz*	~~**12 370**~~ ~~to~~ ~~**12 418**~~ ~~*13 f.*~~ ~~*4 kHz*~~ **12 370** to **12 418** *17 f.* *3 kHz*	~~**16 551**~~ ~~to~~ ~~**16 615**~~ ~~*17 f.*~~ ~~*4 kHz*~~ **16 551.5** to **16 614.5** *22 f.* *3 kHz*	~~**18 848**~~ ~~to~~ ~~**18 868**~~ ~~*6 f.*~~ ~~*4 kHz*~~ **18 847.5** to **18 868.5** *8 f.* *3 kHz*	~~**22 182**~~ ~~to~~ ~~**22 238**~~ ~~*15 f.*~~ ~~*4 kHz*~~ **22 181.5** to **22 238.5** *20 f.* *3 kHz*	~~**25 123**~~ ~~to~~ ~~**25 159**~~ ~~*10 f.*~~ ~~*4 kHz*~~ **25 123** to **25 138** *6 f.* *3 kHz*
Limits (kHz)	4 172	6 261	8 340	12 420	16 617	18 870	22 240	25 1~~61~~39.~~2~~5
Frequencies assignable to ship stations for oceanographic data transmission *c) p)*		~~**6 261.3**~~ ~~to~~ ~~**6 262.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**8 340.3**~~ ~~to~~ ~~**8 341.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**12 420.3**~~ ~~to~~ ~~**12 421.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	~~**16 617.3**~~ ~~to~~ ~~**16 618.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~		~~**22 240.3**~~ ~~to~~ ~~**22 241.5**~~ ~~*5 f.*~~ ~~*0.3 kHz*~~	
Limits (kHz)	4 172	6 262.75	8 341.75	12 421.75	16 618.75	18 870	22 241.75	25 139.5
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*						**18 871.5** *1 f.* *3 kHz*		
Limits (kHz)	4 172	6 262.75	8 341.75	12 421.75	16 618.75	18 87~~0~~3.25	22 241.75	25 1~~61~~39.~~2~~5
Frequencies (paired) assignable to ship stations for narrow-band direct-printing (NBDP) telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) j) ~~m) p)~~*	**4 172.5** to ~~**4 181.5**~~**4** **178** *~~18~~12 f.* *0.5 kHz*	**6 263** to ~~**6 275**~~**6** **268.5** *~~25~~12 f.* *0.5 kHz*				**18 873.5** to **18 880** *14 f.* *05 kHz*		
Limits (kHz)	4 1~~81~~78.~~7~~25	6 2~~75~~68.75	8 341.75	12 421.75	16 618.75	18 8~~7~~80.75	22 241.75	25 1~~61~~39.~~2~~5

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 178.25	6 268.75	8 341.75	12 421.75	16 618.75	18 880.75	22 241.75	25 139.5
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*	**4 180** *1 f.* *3 kHz*	**6 270.5** to **6 273.5** *2 f.* *3 kHz*				**18 883.5** to **18 886.5** *2 f.* *3 kHz*		
Limits (kHz)	4 181.75	6 275	8 341.75	12 421.75	16 618.75	18 889	22 241.75	25 139.5
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~g~~m) p)*	**4 183.25** *1 f.* *3 kHz*	**6 276.5** to **6 279.5** *2 f.* *3 kHz*						
Limits (kHz)	4 18~~6~~4.75	6 28~~0~~1~~.75~~	8 341.75	12 421.75	16 618.75	18 87089	22 241.75	25 1~~61~~39.~~2~~5
~~Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK~~Frequencies assignable to ship stations for data transmission *d) ~~m)~~ p) aa) bb) cc)*		**6 28~~1~~2.5** ~~to~~ ~~**6 284.5**~~ *~~8~~1 f.* *~~0.5~~3 kHz*						
Limits (kHz)	4 18~~6~~4.75	6 284~~.75~~	8 341.75	12 421.75	16 618.75	18 87089	22 241.75	25 1~~61~~39.~~2~~5

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 18~~6~~4.75	6 284~~.75~~	8 341.75	12 421.75	16 618.75	18 87089	22 241.75	25 1~~61~~39.~~2~~5
~~Working frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~e) f~~m) p)*	**4 18~~7~~6.25** to **4 20~~2~~1.25** *~~31~~6 f.* *~~0.5~~3 kHz*	**6 285.5** to **6 ~~300~~297.5** *~~31~~5 f.* *~~0.5~~3 kHz*	**8 34~~2~~3.25** to **8 36~~5~~4.25** *~~48~~8 f.* *~~0.5~~3 kHz*	**12 42~~2~~3.75** to **12 47~~6~~4.75** *~~110~~18 f.* *~~0.5~~3 kHz*	**16 61921** to **16 6831** *~~129~~21 f.* *~~0.5~~3 kHz*		**22 24~~2~~3.5** to **22 27~~9~~6.5** *~~75~~12* *~~0.5~~3 kHz*	~~**25 161.5**~~ ~~to~~ ~~**25 171**~~ *~~20 f.~~* *~~0.5 kHz~~*
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299~~.25~~	8 365.75	12 476.75	16 683.25	18 87089	22 27~~9~~8~~.25~~	25 1~~71~~39.~~2~~5
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~g)~~ m) p)*			**8 368** to **8 374** *3 f.* *3 kHz*				**22 279.5** to **22 282.5** *2 f.* *3 kHz*	
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299~~.25~~	8 37~~0~~6.~~7~~25	12 476.75	16 683.25	18 87089	22 284.25	25 1~~72~~39.~~7~~5
~~Working frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~ *~~e) f) p)~~*			~~**8 371**~~ ~~to~~ ~~**8 376**~~ *~~11 f.~~* *~~0.5 kHz~~*					
~~Limits (kHz)~~	~~4 202.25~~	~~6 300.25~~	~~8 376.25~~	~~12 476.75~~	~~16 683.25~~	~~18 870~~	~~22 284.25~~	~~25 172.75~~
Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK *d) j) ~~m) p)~~*			**8 376.5** to **8 3~~96~~83.5** *~~40~~15 f.* *0.5 kHz*	~~**12 477**~~ ~~to~~ ~~**12 549.5**~~ *~~146 f.~~* *~~0.5 kHz~~*	~~**16 683.5**~~ ~~to~~ ~~**16 733.5**~~ *~~101 f.~~* *~~0.5 kHz~~*	~~**18 870.5**~~ ~~to~~ ~~**18 892.5**~~ *~~45 f.~~* *~~0.5 kHz~~*	~~**22 284.5**~~ ~~to~~ ~~**22 351.5**~~ *~~135 f.~~* *~~0.5 kHz~~*	~~**25 173**~~ ~~to~~ ~~**25 192.5**~~ *~~40 f.~~* *~~0.5 kHz~~*
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299~~.25~~	8 3~~96~~83.~~2~~75	12 ~~549~~476.75	16 ~~73~~683.~~7~~25	18 8~~92~~89~~.75~~	22 ~~351~~284.~~7~~25	25 ~~192.75~~139.5
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*			**8 385.5** to **8 394.5** *4 f.* *3 kHz*				**22 286** to **22 289** *2 f.* *3 kHz*	
Limits (kHz)	4 202.75	6 299	8 396.25	12 476.75	16 683.25	18 889	22 290.75	25 139.5
Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK *d) j)*				**12 477** to **12 522.5** *92 f.* *0.5 kHz*	**16 683.5** to **16 698.5** *31 f.* *0.5 kHz*		**22 291** to **22 297** *13 f.* *0.5 kHz*	
Limits (kHz)	4 202.75	6 299	8 396.25	12 522.75	16 698.75	18 889	22 297.25	25 139.5

(WRC-07)

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 202.75	6 299	8 396.25	12 522.75	16 698.75	18 889	22 297.25	25 139.5
Frequencies assignable to ship stations for data transmission *d) p) aa) bb) cc)*				**12 524.25** to **12 548.25** *9 f. 3 kHz*	**16 700.5** to **16 733.5** *12 f. 3 kHz*		**22 299.5** to **22 350.5** *18 f. 3 kHz*	
Limits (kHz)	4 202.75	6 299	8 396.25	12 549.75	16 735	18 889	22 352.5	25 139.5
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~g)~~ m) p)*				**12 551.25** to **12 554.25** *2 f. 3 kHz*	**16 736.5** to **16 739.5** *2 f. 3 kHz*			
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299.~~25~~	8 396.25	12 55~~4~~5.75	16 7~~38~~41.~~75~~	18 8~~92~~89.~~75~~	22 35~~1~~2.~~7~~5	25 1~~92~~39.~~7~~5
~~Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK~~Frequencies assignable to ship stations for data transmission *d) ~~m)~~ p) aa) bb) cc)*				**12 55~~5~~7.25** to **12 55~~59~~60.25** *~~10~~2 f. ~~0.5~~3 kHz*	**16 7~~39~~42.5** to **16 784.5** *~~92~~15 f. ~~0.5~~3 kHz*			
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299.~~25~~	8 396.25	12 5~~59~~61.75	16 78~~4~~6.~~75~~	18 8~~92~~89.~~75~~	22 35~~1~~2.~~7~~5	25 1~~92~~39.~~7~~5

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
Limits (kHz)	4 202.~~2~~75	6 ~~300~~299~~.25~~	8 396.25	12 5~~59~~61.75	16 78~~4~~6~~.75~~	18 8~~92~~89~~.75~~	22 35~~1~~2.~~7~~5	25 1~~92~~39.~~7~~5
Frequencies (non paired) assignable to ship stations for ~~NBDP telegraphy and~~ data transmission systems ~~at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK and for A1A or A1B Morse telegraphy (working)~~ *b) m) p) dd)*	**4 20~~2~~5~~.5~~** ~~to~~ ~~**4 207**~~ *1~~0~~ f.* *~~0.5~~3 kHz*	**6 300.5** to **6 3~~11~~09.5** *~~23~~4 f.* *~~0.5~~3 kHz*	**8 39~~6~~7.75** to **8 41~~4~~2.75** *~~3~~6 f.* *~~0.5~~3 kHz*	**12 56~~0~~3.25** to **12 57~~6~~5.25** *~~34~~5 f.* *~~0.5~~3 kHz*	**16 78~~5~~7.5** to **16 80~~4~~2.5** *~~39~~6 f.* *~~0.5~~3 kHz*	**18 89~~3~~0.5** to **18 89~~8~~6.5** *~~11~~3 f.* *~~0.5~~3 kHz*	**22 3524** to **22 3742** *~~45~~7 f.* *~~0.5~~3 kHz*	**25 19342** to **25 2085** *~~31~~22 f.* *~~0.5~~3 kHz*
Limits (kHz)	4 207.25	6 311.75	8 414.25	12 576.75	16 804.25	18 898.25	22 374.25	25 208.25
Frequencies assignable to ship stations for digital selective calling *k) l)*	**4 207.5** to **4 209** *4 f.* *0.5 kHz*	**6 312** to **6 313.5** *4 f.* *0.5 kHz*	**8 414.5** to **8 416** *4 f.* *0.5 kHz*	**12 577** to **12 578.5** *4 f.* *0.5 kHz*	**16 804.5** to **16 806** *4 f.* *0.5 kHz*	**18 898.5** to **18 899.5** *3 f.* *0.5 kHz*	**22 374.5** to **22 375.5** *3 f.* *0.5 kHz*	**25 208.5** to **25 209.5** *3 f.* *0.5 kHz*
Limits (kHz)	4 209.25	6 313.75	8 416.25	12 578.75	16 806.25	18 899.75	22 375.75	25 210
Limits (kHz)	4 209.25	6 313.75	8 416.25	12 578.75	16 806.25	19 680.25	22 375.75	26 100.25
Frequencies (paired) assignable to coast stations for NBDP and data transmission systems, at speeds not exceeding 100 bauds for FSK and 200 bauds for PSK *d)*		**6 314** *1 f.* *0.5 kHz*				**19 680.5** *1 f.* *0.5 kHz*	**22 376** *1 f.* *0.5 kHz*	**26 100.5** *1 f.* *0.5 kHz*
Limits (kHz)	4 209.25	6 314.25	8 416.25	12 578.75	16 806.25	19 680.75	22 376.25	26 100.75
Frequencies assignable to coast stations for data transmission *n) o) p) aa) bb) cc)*						**19 682.25** *1 f.* *3 kHz*	**22 378** to **22 381** *2 f.* *3 kHz*	**26 103.5** to **26 118.5** *6 f.* *3 kHz*
Limits (kHz)	4 209.25	6 314.25	8 416.25	12 578.75	16 806.25	19 683.75	22 382.75	26 120.75
Frequencies (paired) assignable to coast stations for NBDP and data transmission systems, at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) n) o) ~~p)~~*	**4 209.5** to **4 21~~9~~5.5** *~~20~~13 f.* *0.5 kHz*	**6 314.5** to **6 3~~30~~19.5** *~~34~~12 f.* *0.5 kHz*	**8 416.5** to **8 4~~36~~23.5** *~~40~~15 f.* *0.5 kHz*	**12 579** to **12 6~~56~~24.5** *~~156~~93 f.* *0.5 kHz*	**16 806.5** to **16 ~~902~~821.5** *~~193~~32 f.* *0.5 kHz*	**19 68~~0~~4~~.5~~** to **19 ~~703~~690.5** *~~46~~14 f.* *0.5 kHz*	**22 37683** to **22 ~~443~~389~~.5~~** *13~~6~~ f.* *0.5 kHz*	~~**26 100.5**~~ ~~to~~ ~~**26 120.5**~~ *~~41 f.~~* *~~0.5 kHz~~*
Limits (kHz)	4 21~~9~~5.~~2~~75	6 3~~30~~19.75	8 4~~36~~23.~~2~~75	12 6~~56~~24.75	16 ~~902~~821.75	19 ~~703~~690.~~2~~75	22 ~~443~~389.~~7~~25	26 120.75

Band (MHz)	**4**	**6**	**8**	**12**	**16**	**18/19**	**22**	**25/26**
Limits (kHz)	4 215.75	6 319.75	8 423.75	12 624.75	16 821.75	19 690.75	22 389.25	26 120.75
Frequencies assignable to coast stations for data transmission *d) p) aa) bb) cc)*	**4 217.5** *1 f.* *3 kHz*	**6 322** to **6 328** *3 f.* *3 kHz*	**8 425.5** to **8 434.5** *4 f.* *3 kHz*	**12 627** to **12 654** *10 f.* *3 kHz*	**16 823.25** to **16 901.25** *27 f.* *3 kHz*			
Limits (kHz)	4 219.25	6 330.75	8 436.25	12 656.75	16 902.75	19 690.75	22 389.25	26 120.75
Frequencies assignable to coast stations for data transmission *n) o) p) aa) bb) cc)*						**19 692.5** to **19 701.5** *4 f.* *3 kHz*	**22 391** to **22 442** *18 f.* *3 kHz*	
Limits (kHz)	4 219.25	6 330.75	8 436.25	12 656.75	16 902.75	19 703.25	22 443.75	26 120.75
Frequencies assignable to coast stations for digital selective calling *l)*	**4 219.5** to **4 220.5** *3 f.* *0.5 kHz*	**6 331** to **6 332** *3 f.* *0.5 kHz*	**8 436.5** to **8 437.5** *3 f.* *0.5 kHz*	**12 657** to **12 658** *3 f.* *0.5 kHz*	**16 903** to **16 904** *3 f.* *0.5 kHz*	**19 703.5** to **19 704.5** *3 f.* *0.5 kHz*	**22 444** to **22 445** *3 f.* *0.5 kHz*	**26 121** to **26 122** *3 f.* *0.5 kHz*
Limits (kHz)	4 221	6 332.5	8 438	12 658.5	16 904.5	19 705	22 445.5	26 122.5
Frequencies assignable to coast stations for data transmission *d) p) aa) bb) cc)*	**4 222.5** to **4 258.5** *13 f.* *3 kHz*	**6 334** to **6 379** *16 f.* *3 kHz*	**8 439.5** to **8 508.5** *24 f.* *3 kHz*	**12 660** to **12 771** *38 f.* *3 kHz*	**16 906** to **17 038** *45 f.* *3 kHz*			
Limits (kHz)	4 260	6 380.5	8 510	12 772.5	17 039.5	19 705	22 445.5	26 122.5
Frequencies assignable to coast stations for data transmission *n) o) p) aa) bb) cc)*						**19 706.5** to **19 721.5** *6 f.* *3 kHz*	**22 447** to **22 546** *34 f.* *3 kHz*	
Limits (kHz)	4 260	6 380.5	8 510	12 772.5	17 039.5	19 723	22 447.5	26 122.5
Frequencies assignable to coast stations for wide-band~~ and A1A or A1B Morse telegraphy~~, facsimile, special and data transmission systems and direct-printing telegraphy systems *m) p) ee) ff)*								
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*end*)

Band (MHz)	4	6	8	12	16	18/19	22	25/26
Limits (kHz)	4 351	6 501	8 707	13 077	17 242	19 755	22 696	26 145
Frequencies assignable to coast stations for telephony, duplex operation *a)* ~~*gg)*~~	**4 352.4** to **4 436.4** *29 f. 3 kHz*	**6 502.4** to **6 523.4** *8 f. 3 kHz*	**8 708.4** to **8 813.4** *36 f. 3 kHz*	**13 078.4** to **13 198.4** *41 f. 3 kHz*	**17 243.4** to **17 408.4** *56 f. 3 kHz*	**19 756.4** to **19 798.4** *15 f. 3 kHz*	**22 697.4** to **22 853.4** *53 f. 3 kHz*	**26 146.4** to **26 173.4** *10 f. 3 kHz*
Limits (kHz)	4 438	6 525	8 815	13 200	17 410	19 800	22 855	26 175

NOC

a)

MOD

b) Until 1 January 2017, ~~S~~see Part B, Section III. After this date, Section III will no longer apply and has to be deleted by a future competent WRC.

NOC

c) to *d)*

SUP

e)

SUP

f)

SUP

g)

NOC

h) to *l)*

MOD

m) Frequencies from these frequency bands may also be used for A1A or A1B Morse telegraphy ~~(working) (see Part B, Section II)~~subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

NOC

n) and *o)*

MOD

p) These sub-bands, except the frequencies referred to in Notes *i),* *j)*, *n)* and *o)*, may be used ~~for the initial testing and the possible future introduction within the maritime mobile service of new digital technologies. Stations using these sub-bands for this purpose shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article **5**~~digitally modulated emissions for maritime mobile service (e.g. as described in Recommendation ITU-R M.1798). The provisions of No. **15.8** apply.

ADD

aa) Until 1 January 2017, these bands may be used by narrow-band direct-printing applications. Before 1 January 2017, administrations who introduce digitally modulated emissions for radiocommunications are urged to take all practicable steps to prevent interference to the narrow-band direct-printing applications in the band.

ADD

bb) From 1 January 2017 these bands, except the frequencies referred to in Notes *n)* and *o)*, may be used by narrow-band direct-printing applications by administrations, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

cc) From 1 January 2017, administrations who will make assignments to stations using digitally modulated emissions are encouraged to effect coordination with potentially affected administrations.

ADD

dd) These bands may be used by narrow-band direct-printing applications by the administrations, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

ee) Frequencies from these bands may be used for wideband telegraphy, facsimile, A1A/A1B Morse telegraphy and special data transmission on the condition that interference is not caused to and protection is not claimed from stations in the maritime mobile service using digitally modulated emissions.

ADD

ff) The bands 4 345-4 351 kHz, 6 495-6 501 kHz, 8 701-8 707 kHz may be used for simplex (single-sideband) telephone operation (regularly spaced by 3 kHz), in accordance with provision No. **52.177**, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions.

ADD

gg) The bands 4 066.4-4 150.4 kHz, 4 352.4-4 436.4 kHz, 6 201.4-6 231.4 kHz, 6 502.4-6 523.4 kHz, 8 196.4-8 298.4 kHz, 8 708.4-8 813.4 kHz, 12 231.4-12 366.4 kHz, 13 078.4-13 198.4 kHz, 16 361.4-16 574.4 kHz, 17 243.4-17 408.4 kHz, 18 781.4-18 844.4 kHz, 19 756.4-19 798.4 kHz, 22 001.4-22 178.4 kHz, 22 697.4-22 853.4 kHz, 25 071.4-25 119.4 kHz, 26 146.4-26 173.4 kHz may be used, in accordance with the Appendix **25** allotment Plan, for digitally modulated emissions as described in Recommendation ITU-R M.1798 on condition that it shall not cause harmful interference to, or claim protection from other stations in the maritime mobile service using radiotelephony operations. The digitally modulated emissions may be used provided that their occupied bandwidth does not exceed 2 800 Hz, it is situated wholly within one frequency channel and the peak envelope power of coast stations does not exceed 10 kW and the peak envelope power of ship stations does not exceed 1.5 kW per channel.

MOD

PART B – Channelling arrangements (WRC-~~07~~12)

NOC

Section I – Radiotelephony

MOD

Section II – Narrow-band direct-printing telegraphy (paired frequencies)

1 Each coast station which uses paired frequencies is assigned one or more frequency pairs from the following series; each pair consists of a transmitting and a receiving frequency.

2 The speed of the narrow-band direct-printing telegraphy and data systems shall not exceed 100 Bd for FSK and 200 Bd for PSK.

Table of frequencies for two-frequency operation by coast stations (kHz)
to be used until 1 January 2017

NOC

The table itself is unchanged.

MOD

Table of frequencies for two-frequency operation by coast stations (kHz)
to be used after 1 January 2017

Channel No.	4 MHz band[1]		6 MHz band[3]		8 MHz band[4]	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
1	4 210.5	4 172.5	6 314.5	6 263	8 376.5[2]	8 376.5[2]
2	4 211	4 173	6 315	6 263.5	8 417	8 377
3	4 211.5	4 173.5	6 315.5	6 264	8 417.5	8 377.5
4	4 212	4 174	6 316	6 264.5	8 418	8 378
5	4 212.5	4 174.5	6 316.5	6 265	8 418.5	8 378.5
6	4 213	4 175	6 317	6 265.5	8 419	8 379
7	4 213.5	4 175.5	6 317.5	6 266	8 419.5	8 379.5
8	4 214	4 176	6 318	6 266.5	8 420	8 380
9	4 214.5	4 176.5	6 318.5	6 267	8 420.5	8 380.5
10	4 215	4 177	6 319	6 267.5	8 421	8 381
11	4 177.5[2]	4 177.5[2]	6 268[2]	6 268[2]	8 421.5	8 381.5
12	4 215.5	4 178	6 319.5	6 268.5	8 422	8 382
13	~~4 216~~	~~4 178.5~~	~~6 320~~	~~6 269~~	8 422.5	8 382.5
14	~~4 216.5~~	~~4 179~~	~~6 320.5~~	~~6 269.5~~	8 423	8 383
15	~~4 217~~	~~4 179.5~~	~~6 321~~	~~6 270~~	8 423.5	8 383.5
~~16~~	~~4 217.5~~	~~4 180~~	~~6 321.5~~	~~6 270.5~~	~~8 424~~	~~8 384~~
~~17~~	~~4 218~~	~~4 180.5~~	~~6 322~~	~~6 271~~	~~8 424.5~~	~~8 384.5~~
~~18~~	~~4 218.5~~	~~4 181~~	~~6 322.5~~	~~6 271.5~~	~~8 425~~	~~8 385~~
~~19~~	~~4 219~~	~~4 181.5~~	~~6 323~~	~~6 272~~	~~8 425.5~~	~~8 385.5~~
~~20~~			~~6 323.5~~	~~6 272.5~~	~~8 426~~	~~8 386~~
~~21~~			~~6 324~~	~~6 273~~	~~8 426.5~~	~~8 386.5~~
~~22~~			~~6 324.5~~	~~6 273.5~~	~~8 427~~	~~8 387~~
~~23~~			~~6 325~~	~~6 274~~	~~8 427.5~~	~~8 387.5~~
~~24~~			~~6 325.5~~	~~6 274.5~~	~~8 428~~	~~8 388~~
~~25~~			~~6 326~~	~~6 275~~	~~8 428.5~~	~~8 388.5~~
~~26~~			~~6 326.5~~	~~6 275.5~~	~~8 429~~	~~8 389~~
~~27~~			~~6 327~~	~~6 281~~	~~8 429.5~~	~~8 389.5~~
~~28~~			~~6 327.5~~	~~6 281.5~~	~~8 430~~	~~8 390~~
~~29~~			~~6 328~~	~~6 282~~	~~8 430.5~~	~~8 390.5~~
~~30~~			~~6 328.5~~	~~6 282.5~~	~~8 431~~	~~8 391~~
~~31~~			~~6 329~~	~~6 283~~	~~8 431.5~~	~~8 391.5~~
~~32~~			~~6 329.5~~	~~6 283.5~~	~~8 432~~	~~8 392~~
~~33~~			~~6 330~~	~~6 284~~	~~8 432.5~~	~~8 392.5~~
~~34~~			~~6 330.5~~	~~6 284.5~~	~~8 433~~	~~8 393~~
~~35~~					~~8 433.5~~	~~8 393.5~~
~~36~~					~~8 434~~	~~8 394~~
~~37~~					~~8 434.5~~	~~8 394.5~~
~~38~~					~~8 435~~	~~8 395~~
~~39~~					~~8 435.5~~	~~8 395.5~~
~~40~~					~~8 436~~	~~8 396~~

1 Ship stations may use the coast station receiving frequencies for transmitting A1A or A1B Morse telegraphy (working), with the exception of channel No. 11 (see Appendix 15).

2 For the conditions of use of this frequency, see Article **31**.

~~3 Ship stations may use the coast station receiving frequencies of channel Nos. 25 up to and including 34 for transmitting A1A or A1B Morse telegraphy (working).~~

~~4 Ship stations may use the coast station receiving frequencies of channel Nos. 29 up to and including 40 for transmitting A1A or A1B Morse telegraphy (working).~~

Table of frequencies for two-frequency operation by coast stations (kHz)

Channel No.	12 MHz band [5]		16 MHz band [6]		18/19 MHz band	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
1	12 579.5	12 477	16 807	16 683.5	~~19 681~~	~~18 870.5~~
2	12 580	12 477.5	16 807.5	16 684	~~19 681.5~~	~~18 871~~
3	12 580.5	12 478	16 808	16 684.5	~~19 682~~	~~18 871.5~~
4	12 581	12 478.5	16 808.5	16 685	~~19 682.5~~	~~18 872~~
5	12 581.5	12 479	16 809	16 685.5	~~19 683~~	~~18 872.5~~
6	12 582	12 479.5	16 809.5	16 686	~~19 683.5~~	~~18 873~~
7	12 582.5	12 480	16 810	16 686.5	19 684	18 873.5
8	12 583	12 480.5	16 810.5	16 687	19 684.5	18 874
9	12 583.5	12 481	16 811	16 687.5	19 685	18 874.5
10	12 584	12 481.5	16 811.5	16 688	19 685.5	18 875
11	12 584.5	12 482	16 812	16 688.5	19 686	18 875.5
12	12 585	12 482.5	16 812.5	16 689	19 686.5	18 876
13	12 585.5	12 483	16 813	16 689.5	19 687	18 876.5
14	12 586	12 483.5	16 813.5	16 690	19 687.5	18 877
15	12 586.5	12 484	16 814	16 690.5	19 688	18 877.5
16	12 587	12 484.5	16 814.5	16 691	19 688.5	18 878
17	12 587.5	12 485	16 815	16 691.5	19 689	18 878.5
18	12 588	12 485.5	16 815.5	16 692	19 689.5	18 879
19	12 588.5	12 486	16 816	16 692.5	19 690	18 879.5
20	12 589	12 486.5	16 816.5	16 693	19 690.5	18 880
21	12 589.5	12 487	16 817	16 693.5	~~19 691~~	~~18 880.5~~
22	12 590	12 487.5	16 817.5	16 694	~~19 691.5~~	~~18 881~~
23	12 590.5	12 488	16 818	16 694.5	~~19 692~~	~~18 881.5~~
24	12 591	12 488.5	16 695 [2]	16 695 [2]	~~19 692.5~~	~~18 882~~
25	12 591.5	12 489	16 818.5	16 695.5	~~19 693~~	~~18 882.5~~
26	12 592	12 489.5	16 819	16 696	~~19 693.5~~	~~18 883~~
27	12 592.5	12 490	16 819.5	16 696.5	~~19 694~~	~~18 883.5~~
28	12 593	12 490.5	16 820	16 697	~~19 694.5~~	~~18 884~~
29	12 593.5	12 491	16 820.5	16 697.5	~~19 695~~	~~18 884.5~~
30	12 594	12 491.5	16 821	16 698	~~19 695.5~~	~~18 885~~
31	12 594.5	12 492	16 821.5	16 698.5	~~19 696~~	~~18 885.5~~
32	12 595	12 492.5	~~16 822~~	~~16 699~~	~~19 696.5~~	~~18 886~~
33	12 595.5	12 493	~~16 822.5~~	~~16 699.5~~	~~19 697~~	~~18 886.5~~
34	12 596	12 493.5	~~16 823~~	~~16 700~~	~~19 697.5~~	~~18 887~~
35	12 596.5	12 494	~~16 823.5~~	~~16 700.5~~	~~19 698~~	~~18 887.5~~
36	12 597	12 494.5	~~16 824~~	~~16 701~~	~~19 698.5~~	~~18 888~~
37	12 597.5	12 495	~~16 824.5~~	~~16 701.5~~	~~19 699~~	~~18 888.5~~
38	12 598	12 495.5	~~16 825~~	~~16 702~~	~~19 699.5~~	~~18 889~~
39	12 598.5	12 496	~~16 825.5~~	~~16 702.5~~	~~19 700~~	~~18 889.5~~
40	12 599	12 496.5	~~16 826~~	~~16 703~~	~~19 700.5~~	~~18 890~~
41	12 599.5	12 497	~~16 826.5~~	~~16 703.5~~	~~19 701~~	~~18 890.5~~
42	12 600	12 497.5	~~16 827~~	~~16 704~~	~~19 701.5~~	~~18 891~~
43	12 600.5	12 498	~~16 827.5~~	~~16 704.5~~	~~19 702~~	~~18 891.5~~
44	12 601	12 498.5	~~16 828~~	~~16 705~~	~~19 702.5~~	~~18 892~~
45	12 601.5	12 499	~~16 828.5~~	~~16 705.5~~	~~19 703~~	~~18 892.5~~

~~[5] Ship stations may use the coast station receiving frequencies of channel Nos. 58 up to and including 156 for transmitting A1A or A1B Morse telegraphy (working), with the exception of channel No. 87 (see Appendix 15).~~

~~[6] Ship stations may use the coast station receiving frequencies of channel Nos. 71 up to and including 193 for transmitting A1A or A1B Morse telegraphy (working).~~

Table of frequencies for two-frequency operation by coast stations (kHz)

Channel No.	12 MHz band[5] (cont.)		16 MHz band[6] (cont.)	
	Transmit	Receive	Transmit	Receive
46	12 602	12 499.5	~~16 829~~	~~16 706~~
47	12 602.5	12 500	~~16 829.5~~	~~16 706.5~~
48	12 603	12 500.5	~~16 830~~	~~16 707~~
49	12 603.5	12 501	~~16 830.5~~	~~16 707.5~~
50	12 604	12 501.5	~~16 831~~	~~16 708~~
51	12 604.5	12 502	~~16 831.5~~	~~16 708.5~~
52	12 605	12 502.5	~~16 832~~	~~16 709~~
53	12 605.5	12 503	~~16 832.5~~	~~16 709.5~~
54	12 606	12 503.5	~~16 833~~	~~16 710~~
55	12 606.5	12 504	~~16 833.5~~	~~16 710.5~~
56	12 607	12 504.5	~~16 834~~	~~16 711~~
57	12 607.5	12 505	~~16 834.5~~	~~16 711.5~~
58	12 608	12 505.5	~~16 835~~	~~16 712~~
59	12 608.5	12 506	~~16 835.5~~	~~16 712.5~~
60	12 609	12 506.5	~~16 836~~	~~16 713~~
61	12 609.5	12 507	~~16 836.5~~	~~16 713.5~~
62	12 610	12 507.5	~~16 837~~	~~16 714~~
63	12 610.5	12 508	~~16 837.5~~	~~16 714.5~~
64	12 611	12 508.5	~~16 838~~	~~16 715~~
65	12 611.5	12 509	~~16 838.5~~	~~16 715.5~~
66	12 612	12 509.5	~~16 839~~	~~16 716~~
67	12 612.5	12 510	~~16 839.5~~	~~16 716.5~~
68	12 613	12 510.5	~~16 840~~	~~16 717~~
69	12 613.5	12 511	~~16 840.5~~	~~16 717.5~~
70	12 614	12 511.5	~~16 841~~	~~16 718~~
71	12 614.5	12 512	~~16 841.5~~	~~16 718.5~~
72	12 615	12 512.5	~~16 842~~	~~16 719~~
73	12 615.5	12 513	~~16 842.5~~	~~16 719.5~~
74	12 616	12 513.5	~~16 843~~	~~16 720~~
75	12 616.5	12 514	~~16 843.5~~	~~16 720.5~~
76	12 617	12 514.5	~~16 844~~	~~16 721~~
77	12 617.5	12 515	~~16 844.5~~	~~16 721.5~~
78	12 618	12 515.5	~~16 845~~	~~16 722~~
79	12 618.5	12 516	~~16 845.5~~	~~16 722.5~~
80	12 619	12 516.5	~~16 846~~	~~16 723~~
81	12 619.5	12 517	~~16 846.5~~	~~16 723.5~~
82	12 620	12 517.5	~~16 847~~	~~16 724~~
83	12 620.5	12 518	~~16 847.5~~	~~16 724.5~~
84	12 621	12 518.5	~~16 848~~	~~16 725~~
85	12 621.5	12 519	~~16 848.5~~	~~16 725.5~~
86	12 622	12 519.5	~~16 849~~	~~16 726~~
87	12 520 [2]	12 520 [2]	~~16 849.5~~	~~16 726.5~~
88	12 622.5	12 520.5	~~16 850~~	~~16 727~~
89	12 623	12 521	~~16 850.5~~	~~16 727.5~~
90	12 623.5	12 521.5	~~16 851~~	~~16 728~~
91	12 624	12 522	~~16 851.5~~	~~16 728.5~~
92	12 624.5	12 522.5	~~16 852~~	~~16 729~~
~~93~~	~~12 625~~	~~12 523~~	~~16 852.5~~	~~16 729.5~~
~~94~~	~~12 625.5~~	~~12 523.5~~	~~16 853~~	~~16 730~~
~~95~~	~~12 626~~	~~12 524~~	~~16 853.5~~	~~16 730.5~~

~~Table of frequencies for two-frequency operation by coast stations (kHz)~~

~~Channel No.~~	~~12 MHz band~~ [5] ~~(cont.)~~		~~16 MHz band~~ [6] ~~(cont.)~~	
	~~Transmit~~	~~Receive~~	~~Transmit~~	~~Receive~~
~~96~~	~~12 626.5~~	~~12 524.5~~	~~16 854~~	~~16 731~~
~~to~~	~~…~~	~~…~~	~~….~~	~~…..~~
~~193~~			~~16 902.5~~	~~16 784.5~~

Table of frequencies for two-frequency operation by coast stations (kHz)

Channel No.	22 MHz band ~~[7]~~		~~25/26 MHz band~~	
	Transmit	Receive	Transmit	~~Receive~~
~~1~~	~~22 376.5~~	~~22 284.5~~	~~26 101~~	~~25 173~~
~~2~~	~~22 377~~	~~22 285~~	~~26 101.5~~	~~25 173.5~~
~~3~~	~~22 377.5~~	~~22 285.5~~	~~26 102~~	~~25 174~~
~~4~~	~~22 378~~	~~22 286~~	~~26 102.5~~	~~25 174.5~~
~~5~~	~~22 378.5~~	~~22 286.5~~	~~26 103~~	~~25 175~~
~~6~~	~~22 379~~	~~22 287~~	~~26 103.5~~	~~25 175.5~~
~~7~~	~~22 379.5~~	~~22 287.5~~	~~26 104~~	~~25 176~~
~~8~~	~~22 380~~	~~22 288~~	~~26 104.5~~	~~25 176.5~~
~~9~~	~~22 380.5~~	~~22 288.5~~	~~26 105~~	~~25 177~~
~~10~~	~~22 381~~	~~22 289~~	~~26 105.5~~	~~25 177.5~~
~~11~~	~~22 381.5~~	~~22 289.5~~	~~26 106~~	~~25 178~~
~~12~~	~~22 382~~	~~22 290~~	~~26 106.5~~	~~25 178.5~~
~~13~~	~~22 382.5~~	~~22 290.5~~	~~26 107~~	~~25 179~~
14	22 383	22 291	~~26 107.5~~	~~25 179.5~~
15	22 383.5	22 291.5	~~26 108~~	~~25 180~~
16	22 384	22 292	~~26 108.5~~	~~25 180.5~~
17	22 384.5	22 292.5	~~26 109~~	~~25 181~~
18	22 385	22 293	~~26 109.5~~	~~25 181.5~~
19	22 385.5	22 293.5	~~26 110~~	~~25 182~~
20	22 386	22 294	~~26 110.5~~	~~25 182.5~~
21	22 386.5	22 294.5	~~26 111~~	~~25 183~~
22	22 387	22 295	~~26 111.5~~	~~25 183.5~~
23	22 387.5	22 295.5	~~26 112~~	~~25 184~~
24	22 388	22 296	~~26 112.5~~	~~25 184.5~~
25	22 388.5	22 296.5	~~26 113~~	~~25 185~~
26	22 389	22 297	~~26 113.5~~	~~25 185.5~~
~~27~~	~~22 389.5~~	~~22 297.5~~	~~26 114~~	~~25 186~~
~~28~~	~~22 390~~	~~22 298~~	~~26 114.5~~	~~25 186.5~~
~~29~~	~~22 390.5~~	~~22 298.5~~	~~26 115~~	~~25 187~~
~~30~~	~~22 391~~	~~22 299~~	~~26 115.5~~	~~25 187.5~~
~~31~~	~~22 391.5~~	~~22 299.5~~	~~26 116~~	~~25 188~~
~~32~~	~~22 392~~	~~22 300~~	~~26 116.5~~	~~25 188.5~~
~~33~~	~~22 392.5~~	~~22 300.5~~	~~26 117~~	~~25 189~~
~~34~~	~~22 393~~	~~22 301~~	~~26 117.5~~	~~25 189.5~~
~~35~~	~~22 393.5~~	~~22 301.5~~	~~26 118~~	~~25 190~~
~~36~~	~~22 394~~	~~22 302~~	~~26 118.5~~	~~25 190.5~~
~~37~~	~~22 394.5~~	~~22 302.5~~	~~26 119~~	~~25 191~~
~~38~~	~~22 395~~	~~22 303~~	~~26 119.5~~	~~25 191.5~~
~~39~~	~~22 395.5~~	~~22 303.5~~	~~26 120~~	~~25 192~~
~~40~~	~~22 396~~	~~22 304~~	~~26 120.5~~	~~25 192.5~~
~~41~~	~~22 396.5~~	~~22 304.5~~		
~~42~~	~~22 397~~	~~22 305~~		
~~43~~	~~22 397.5~~	~~22 305.5~~		
~~44~~	~~22 398~~	~~22 306~~		
~~45~~	~~22 398.5~~	~~22 306.5~~		
~~46~~	~~22 399~~	~~22 307~~		
~~47~~	~~22 399.5~~	~~22 307.5~~		
~~48~~	~~22 400~~	~~22 308~~		
~~49~~	~~22 400.5~~	~~22 308.5~~		
~~50~~	~~22 401~~	~~22 309~~		

~~[7] Ship stations may use the coast station receiving frequencies of channels No. 68 up to and including 135 for transmitting A1A or A1B Morse telegraphy (working).~~

~~**Table of frequencies for two-frequency operation by coast stations (kHz)**~~

~~Channel No.~~	~~22 MHz band[7] (cont.)~~	
	~~Transmit~~	~~Receive~~
~~51~~	~~22 401.5~~	~~22 309.5~~
~~52~~	~~22 402~~	~~22 310~~
~~53~~	~~22 402.5~~	~~22 310.5~~
~~54~~	~~22 403~~	~~22 311~~
~~55~~	~~22 403.5~~	~~22 311.5~~
~~56~~	~~22 404~~	~~22 312~~
~~57~~	~~22 404.5~~	~~22 312.5~~
~~58~~	~~22 405~~	~~22 313~~
~~59~~	~~22 405.5~~	~~22 313.5~~
~~60~~	~~22 406~~	~~22 314~~
~~61~~	~~22 406.5~~	~~22 314.5~~
~~62~~	~~22 407~~	~~22 315~~
~~63~~	~~22 407.5~~	~~22 315.5~~
~~64~~	~~22 408~~	~~22 316~~
~~65~~	~~22 408.5~~	~~22 316.5~~
~~66~~	~~22 409~~	~~22 317~~
~~67~~	~~22 409.5~~	~~22 317.5~~
~~68~~	~~22 410~~	~~22 318~~
~~69~~	~~22 410.5~~	~~22 318.5~~
~~70~~	~~22 411~~	~~22 319~~
~~71~~	~~22 411.5~~	~~22 319.5~~
~~72~~	~~22 412~~	~~22 320~~
~~73~~	~~22 412.5~~	~~22 320.5~~
~~74~~	~~22 413~~	~~22 321~~
~~75~~	~~22 413.5~~	~~22 321.5~~
~~76~~	~~22 414~~	~~22 322~~
~~77~~	~~22 414.5~~	~~22 322.5~~
~~78~~	~~22 415~~	~~22 323~~
~~79~~	~~22 415.5~~	~~22 323.5~~
~~80~~	~~22 416~~	~~22 324~~
~~81~~	~~22 416.5~~	~~22 324.5~~
~~82~~	~~22 417~~	~~22 325~~
~~83~~	~~22 417.5~~	~~22 325.5~~
~~84~~	~~22 418~~	~~22 326~~
~~85~~	~~22 418.5~~	~~22 326.5~~
~~86~~	~~22 419~~	~~22 327~~
~~87~~	~~22 419.5~~	~~22 327.5~~
~~88~~	~~22 420~~	~~22 328~~
~~89~~	~~22 420.5~~	~~22 328.5~~
~~90~~	~~22 421~~	~~22 329~~
~~91~~	~~22 421.5~~	~~22 329.5~~
~~92~~	~~22 422~~	~~22 330~~
~~93~~	~~22 422.5~~	~~22 330.5~~
~~94~~	~~22 423~~	~~22 331~~
~~95~~	~~22 423.5~~	~~22 331.5~~
~~96~~	~~22 424~~	~~22 332~~
~~97~~	~~22 424.5~~	~~22 332.5~~
~~98~~	~~22 425~~	~~22 333~~
~~99~~	~~22 425.5~~	~~22 333.5~~
~~100~~	~~22 426~~	~~22 334~~
~~101~~	~~22 426.5~~	~~22 334.5~~
~~102~~	~~22 427~~	~~22 335~~
~~103~~	~~22 427.5~~	~~22 335.5~~
~~104~~	~~22 428~~	~~22 336~~
~~105~~	~~22 428.5~~	~~22 336.5~~

~~Table of frequencies for two-frequency operation by coast stations (kHz)~~

~~Channel No.~~	~~22 MHz band 7 (end)~~	
	~~Transmit~~	~~Receive~~
~~106~~	~~22 429~~	~~22 337~~
~~107~~	~~22 429.5~~	~~22 337.5~~
~~108~~	~~22 430~~	~~22 338~~
~~109~~	~~22 430.5~~	~~22 338.5~~
~~110~~	~~22 431~~	~~22 339~~
~~111~~	~~22 431.5~~	~~22 339.5~~
~~112~~	~~22 432~~	~~22 340~~
~~113~~	~~22 432.5~~	~~22 340.5~~
~~114~~	~~22 433~~	~~22 341~~
~~115~~	~~22 433.5~~	~~22 341.5~~
~~116~~	~~22 434~~	~~22 342~~
~~117~~	~~22 434.5~~	~~22 342.5~~
~~118~~	~~22 435~~	~~22 343~~
~~119~~	~~22 435.5~~	~~22 343.5~~
~~120~~	~~22 436~~	~~22 344~~
~~121~~	~~22 436.5~~	~~22 344.5~~
~~122~~	~~22 437~~	~~22 345~~
~~123~~	~~22 437.5~~	~~22 345.5~~
~~124~~	~~22 438~~	~~22 346~~
~~125~~	~~22 438.5~~	~~22 346.5~~
~~126~~	~~22 439~~	~~22 347~~
~~127~~	~~22 439.5~~	~~22 347.5~~
~~128~~	~~22 440~~	~~22 348~~
~~129~~	~~22 440.5~~	~~22 348.5~~
~~130~~	~~22 441~~	~~22 349~~
~~131~~	~~22 441.5~~	~~22 349.5~~
~~132~~	~~22 442~~	~~22 350~~
~~133~~	~~22 442.5~~	~~22 350.5~~
~~134~~	~~22 443~~	~~22 351~~
~~135~~	~~22 443.5~~	~~22 351.5~~

MOD

Section III – Narrow-band direct-printing telegraphy (non-paired frequencies)
until 1 January 2017 (after this date the entire section will no longer apply and has to be deleted by a future competent WRC)

SUP

Section IV – Morse telegraphy (calling)

SUP

Section V – Morse telegraphy (working)

ADD

Section VI – Data transmission

Table of frequencies (kHz) assignable to ship and coast stations for data transmission (kHz)[1] to be used from 1 January 2017

Channel No.	4 MHz band		6 MHz band		8 MHz band	
	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)
1	4 205 [2]	4 205 [2]	6 300.5 [2]	6 300.5 [2]	8 397.75 [2]	8 397.75 [2]
2	4 217.5	4 154.5	6 303.5 [2]	6 303.5 [2]	8 400.75 [2]	8 400.75 [2]
3	4 222.5 [3]	4 157.5 [3]	6 306.5 [2]	6 306.5 [2]	8 403.75 [2]	8 403.75 [2]
4	4 225.5 [3]	4 160.5 [3]	6 309.5 [2]	6 309.5 [2]	8 406.75 [2]	8 406.75 [2]
5	4 228.5 [3]	4 163.5 [3]	6 322 [3]	6 235 [3]	8 409.75 [2]	8 409.75 [2]
6	4 231.5 [3]	4 166.5 [3]	6 325 [3]	6 238 [3]	8 412.75 [2]	8 412.75 [2]
7	4 234.5 [3]	4 169.5 [3]	6 328 [3]	6 241 [3]	8 425.5 [3]	8 302 [3]
8	4 237.5	4 180	6 334	6 244	8 428.5 [3]	8 305 [3]
9	4 240.5	4 183.25	6 337	6 247	8 431.5 [3]	8 308 [3]
10	4 243.5 [3]	4 186.25 [3]	6 340	6 250	8 434.5 [3]	8 311 [3]
11	4 246.5 [3]	4 189.25 [3]	6 343	6 253	8 439.5	8 314
12	4 249.5 [3]	4 192.25 [3]	6 346	6 256	8 442.5	8 317
13	4 252.5 [3]	4 195.25 [3]	6 349	6 259	8 445.5	8 320
14	4 255.5 [3]	4 198.25 [3]	6 352	6 270.5	8 448.5	8 323
15	4 258.5 [3]	4 201.25 [3]	6 355	6 273.5	8 451.5	8 326
16			6 358	6 276.5	8 454.5	8 329
17			6 361	6 279.5	8 457.5	8 332
18			6 364	6 282.5	8 460.5	8 335
19			6 367 [3]	6 285.5 [3]	8 463.5	8 338
20			6 370 [3]	6 288.5 [3]	8 466.5 [3]	8 343.25 [3]
21			6 373 [3]	6 291.5 [3]	8 469.5 [3]	8 346.25 [3]
22			6 376 [3]	6 294.5 [3]	8 472.5 [3]	8 349.25 [3]
23			6 379 [3]	6 297.5 [3]	8 475.5 [3]	8 352.25 [3]
24					8 478.5 [3]	8 355.25 [3]
25					8 481.5 [3]	8 358.25 [3]
26					8 484.5 [3]	8 361.25 [3]
27					8 487.5 [3]	8 364.25 [3]
28					8 490.5	8 368
29					8 493.5	8 371
30					8 496.5	8 374
31					8 499.5 [3]	8 385.5 [3]
32					8 502.5 [3]	8 388.5 [3]
33					8 505.5 [3]	8 391.5 [3]
34					8 508.5 [3]	8 394.5 [3]

1 The data transmission shall be in accordance with the latest version of Recommendation ITU-R M.1798.

2 Non-paired (simplex) operations only.

3 Assignable for wideband operation using multiple of 3 kHz bandwidth.

Table of frequencies (kHz) assignable to ship and coast stations for data transmission (kHz)[1] to be used from 1 January 2017

Channel No.	12 MHz		16 MHz		18/19 MHz	
	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)
1	12 563.25 [2]	12 563.25 [2]	16 787.5 [2]	16 787.5 [2]	18 890.5 [2]	18 890.5 [2]
2	12 566.25 [2]	12 566.25 [2]	16 790.5 [2]	16 790.5 [2]	18 893.5 [2]	18 893.5 [2]
3	12 569.25 [2]	12 569.25 [2]	16 793.5 [2]	16 793.5 [2]	18 896.5 [2]	18 896.5 [2]
4	12 572.25 [2]	12 572.25 [2]	16 796.5 [2]	16 796.5 [2]	19 682.25	18 847.5
5	12 575.25 [2]	12 575.25 [2]	16 799.5 [2]	16 799.5 [2]	19 692.5 [3]	18 850.5 [3]
6	12 ,627 [3]	12 370 [3]	16 802.5 [2]	16 802.5 [2]	19 695.5 [3]	18 853.5 [3]
7	12 630 [3]	12 373 [3]	16 823.25 [3]	16 551.5 [3]	19 698.5 [3]	18 856.5 [3]
8	12 633 [3]	12 376 [3]	16 826.25 [3]	16 554.5 [3]	19 701.5 [3]	18 859.5 [3]
9	12 636 [3]	12 379 [3]	16 829.25 [3]	16 557.5 [3]	19 706.5	18 862.5
10	12 639 [3]	12 382 [3]	16 832.25 [3]	16 560.5 [3]	19 709.5	18 865.5
11	12 642 [3]	12 385 [3]	16 835.25 [3]	16 563.5 [3]	19 712.5	18 868.5
12	12 645 [3]	12 388 [3]	16 838.25 [3]	16 566.5 [3]	19 715.5	18 871.5
13	12 648 [3]	12 391 [3]	16 841.25 [3]	16 569.5 [3]	19 718.5	18 883.5
14	12 651 [3]	12 394 [3]	16 844.25 [3]	16 572.5 [3]	19 721.5	18 886.5
15	12 654 [3]	12 397 [3]	16 847.25 [3]	16 575.5 [3]		
16	12 660	12 400	16 850.25 [3]	16 578.5 [3]		
17	12 663	12 403	16 853.25 [3]	16 581.5 [3]		
18	12 666	12 406	16 856.25 [3]	16 584.5 [3]		
19	12 669	12 409	16 859.25 [3]	16 587.5 [3]		
20	12 672	12 412	16 862.25 [3]	16 590.5 [3]		
21	12 675	12 415	16 865.25 [3]	16 593.5 [3]		
22	12 678	12 418	16 868.25 [3]	16 596.5 [3]		
23	12 681 [3]	12 423.75 [3]	16 871.25 [3]	16 599.5 [3]		
24	12 684 [3]	12 426.75 [3]	16 874.25 [3]	16 602.5 [3]		
25	12 687 [3]	12 429.75 [3]	16 877.25 [3]	16 605.5 [3]		
26	12 690 [3]	12 432.75 [3]	16 880.25 [3]	16 608.5 [3]		
27	12 693 [3]	12 435.75 [3]	16 883.25 [3]	16 611.5 [3]		
28	12 696 [3]	12 438.75 [3]	16 886.25 [3]	16 614.5 [3]		
29	12 699	12 441.75	16 889.25	16 621		
30	12 702	12 444.75	16 892.25 [3]	16 624 [3]		
31	12 705	12 447.75	16 895.25 [3]	16 627 [3]		
32	12 708	12 450.75	16 898.25 [3]	16 630 [3]		
33	12 711 [3]	12 453.75 [3]	16 901.25 [3]	16 633 [3]		
34	12 714 [3]	12 456.75 [3]	16 906	16 636		
35	12 717 [3]	12 459.75 [3]	16 909	16 639		
36	12 720 [3]	12 462.75 [3]	16 912	16 642		
37	12 723 [3]	12 465.75 [3]	16 915	16 645		
38	12 726 [3]	12 468.75 [3]	16 918	16 648		
39	12 729 [3]	12 471.75 [3]	16 921	16 651		
40	12 732 [3]	12 474.75 [3]	16 924	16 654		
41	12 735	12 524.25	16 927	16 657		
42	12 738 [3]	12 527.25 [3]	16 930	16 660		
43	12 741 [3]	12 530.25 [3]	16 933	16 663		
44	12 744 [3]	12 533.25 [3]	16 936	16 666		
45	12 747 [3]	12 536.25 [3]	16 939	16 669		
46	12 750 [3]	12 539.25 [3]	16 942	16 672		
47	12 753 [3]	12 542.25 [3]	16 945	16 675		
48	12 756 [3]	12 545.25 [3]	16 948	16 678		
49	12 759 [3]	12 548.25 [3]	16 951	16 681		
50	12 762	12 551.25	16 954 [3]	16 700.5 [3]		

Channel No.	12 MHz		16 MHz		18/19 MHz	
	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)
51	12 765	12 554.25	16 957 [3]	16 703.5 [3]		
52	12 768	12 557.25	16 960 [3]	16 706.5 [3]		
53	12 771	12 560.25	16 963 [3]	16 709.5 [3]		
54			16 966 [3]	16 712.5 [3]		
55			16 969 [3]	16 715.5 [3]		
56			16 972 [3]	16 718.5 [3]		
57			16 975 [3]	16 721.5 [3]		
58			16 978 [3]	16 724.5 [3]		
59			16 981 [3]	16 727.5 [3]		
60			16 984 [3]	16 730.5 [3]		
61			16 987 [3]	16 733.5 [3]		
62			16 990	16 736.5		
63			16 993	16 739.5		
64			16 996 [3]	16 742.5 [3]		
65			16 999 [3]	16 745.5 [3]		
66			17 002 [3]	16 748.5 [3]		
67			17 005 [3]	16 751.5 [3]		
68			17 008 [3]	16 754.5 [3]		
69			17 011 [3]	16 757.5 [3]		
70			17 014 [3]	16 760.5 [3]		
71			17 017 [3]	16 763.5 [3]		
72			17 020 [3]	16 766.5 [3]		
73			17 023 [3]	16 769.5 [3]		
74			17 026 [3]	16 772.5 [3]		
75			17 029 [3]	16 775.5 [3]		
76			17 032 [3]	16 778.5 [3]		
77			17 035 [3]	16 781.5 [3]		
78			17 038 [3]	16 784.5 [3]		

Table of frequencies (kHz) assignable to ship and coast stations for data transmission (kHz) [1] to be used from 1 January 2017

Channel No.	22 MHz		25/26 MHz	
	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)
1	22 354 [2]	22 354 [2]	25 142 [2]	25 142 [2]
2	22 357 [2]	22 357 [2]	25 145 [2]	25 145 [2]
3	22 360 [2]	22 360 [2]	25 148 [2]	25 148 [2]
4	22 363 [2]	22 363 [2]	25 151 [2]	25 151 [2]
5	22 366 [2]	22 366 [2]	25 154 [2]	25 154 [2]
6	22 369 [2]	22 369 [2]	25 157 [2]	25 157 [2]
7	22 372 [2]	22 372 [2]	25 160 [2]	25 160 [2]
8	22 378	22 181.5	25 163 [2]	25 163 [2]
9	22 381	22 184.5	25 166 [2]	25 166 [2]
10	22 391 [3]	22 187.5 [3]	25 169 [2]	25 169 [2]
11	22 394 [3]	22 190.5 [3]	25 172 [2]	25 172 [2]
12	22 397 [3]	22 193.5 [3]	25 175 [2]	25 175 [2]
13	22 400 [3]	22 196.5 [3]	25 178 [2]	25 178 [2]
14	22 403 [3]	22 199.5 [3]	25 181 [2]	25 181 [2]
15	22 406 [3]	22 202.5 [3]	25 184 [2]	25 184 [2]
16	22 409 [3]	22 205.5 [3]	25 187 [2]	25 187 [2]
17	22 412 [3]	22 208.5 [3]	25 190 [2]	25 190 [2]
18	22 415 [3]	22 211.5 [3]	25 193 [2]	25 193 [2]
19	22 418 [3]	22 214.5 [3]	25 196 [2]	25 196 [2]
20	22 421 [3]	22 217.5 [3]	25 199 [2]	25 199 [2]
21	22 424 [3]	22 220.5 [3]	25 202 [2]	25 202 [2]
22	22 427 [3]	22 223.5 [3]	25 205 [2]	25 205 [2]
23	22 430 [3]	22 226.5 [3]	26 103.5 [3]	25 123 [3]
24	22 433 [3]	22 229.5 [3]	26 106.5 [3]	25 126 [3]
25	22 436 [3]	22 232.5 [3]	26 109.5 [3]	25 129 [3]
26	22 439 [3]	22 235.5 [3]	26 112.5 [3]	25 132 [3]
27	22 442 [3]	22 238.5 [3]	26 115.5 [3]	25 135 [3]
28	22 447	22 243.5	26 118.5 [3]	25 138 [3]
29	22 450	22 246.5		
30	22 453 [3]	22 249.5 [3]		
31	22 456 [3]	22 252.5 [3]		
32	22 459 [3]	22 255.5 [3]		
33	22 462 [3]	22 258.5 [3]		
34	22 465 [3]	22 261.5 [3]		
35	22 468 [3]	22 264.5 [3]		
36	22 471 [3]	22 267.5 [3]		
37	22 474 [3]	22 270.5 [3]		
38	22 477 [3]	22 273.5 [3]		
39	22 480 [3]	22 276.5 [3]		
40	22 483	22 279.5		
41	22 486	22 282.5		
42	22 489	22 286		
43	22 492	22 289		
44	22 495	22 299.5		
45	22 498	22 302.5		
46	22 501	22 305.5		
47	22 504	22 308.5		
48	22 507	22 311.5		
49	22 510	22 314.5		
50	22 513 [3]	22 317.5 [3]		

Channel No.	22 MHz		25/26 MHz	
	Coast TX (Ship RX)	Coast RX (Ship TX)	Coast TX (Ship RX)	Coast RX (Ship TX)
51	22 516 [3]	22 320.5 [3]		
52	22 519 [3]	22 323.5 [3]		
53	22 522 [3]	22 326.5 [3]		
54	22 525 [3]	22 329.5 [3]		
55	22 528 [3]	22 332.5 [3]		
56	22 531 [3]	22 335.5 [3]		
57	22 534 [3]	22 338.5 [3]		
58	22 537 [3]	22 341.5 [3]		
59	22 540 [3]	22 344.5 [3]		
60	22 543 [3]	22 347.5 [3]		
61	22 546 [3]	22 350.5 [3]		

ADD

RESOLUTION [A1.9_NBDP] (WRC-12)

Application and abrogation of certain provisions of the Radio Regulations as revised by WRC-12

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that this conference has adopted a revision to the Radio Regulations (RR) in accordance with its terms of reference which will enter into force on [1 January 2013];

b) that some of the provisions, as amended by this conference, need to apply as of a later date;

c) that as a general rule, new and revised Resolutions and Recommendations enter into force at the time of signing of the Final Acts of a conference;

d) that as a general rule, Resolutions and Recommendations which a WRC has decided to suppress are abrogated at the time of the signing of the Final Acts of the conference,

resolves

1 that, as of 1 January 2017, the following provisions of the RR, which are suppressed by this conference, shall be abrogated: "Table of frequencies for two-frequency operation by coast stations (kHz) to be used before 1 January 2017", Section II of Part B of Appendix **17**;

2 that, as of 1 January 2017, the following provisions, as established by this conference, shall enter into force: "Table of frequencies for two-frequency operation by coast stations (kHz) to be used from 1 January 2017", Section II of Part B of Appendix **17**.

MOD

ARTICLE 59

Entry into force and provisional application of the Radio Regulations (WRC-~~2000~~12)

ADD

59.A109 – the revised provisions for which other effective dates of application are stipulated in Resolution **[A1.9_NBDP] (WRC-12)**:

SUP

RESOLUTION 351 (Rev.WRC-07)

Review of the frequency and channel arrangements in the HF bands allocated to the maritime mobile service contained in Appendix 17 with a view to improving efficiency through the use of new digital technology by the maritime mobile service

AGENDA ITEM 1.10

1.10 to examine the frequency allocation requirements with regard to operation of safety systems for ships and ports and associated regulatory provisions, in accordance with Resolution ***357 (WRC-07)****;*

Resolution **357 (WRC-07)**: *Consideration of regulatory provisions and spectrum allocations for use by enhanced maritime safety systems for ships and ports*

1/1.10/1 Executive summary

The outcome of the agenda item provides a focused effort to improve three areas:

– Automatic identification system (AIS), including requirements for satellite detection of AIS;

– new abilities to communicate safety and security information for ships and ports;

– improvement of the communication environment for port operations and ship movement including VHF data transmission capability.

Several essential topics which were initially addressed under this agenda item, proved to be too complex for the studies to be completed in time to recommend action by WRC-12.

These areas included:

– the next generation of global maritime distress and safety system;

– implementation of E-Navigation which is the harmonized creation, collection, integration, exchange and presentation of maritime information on board and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment;

– mesh networking for improved safety communications in the maritime environment;

– container and cargo identification systems to support global commerce and enhanced port security.

These remaining decisive topics to the global maritime community call for continued study within the ITU-R toward resolution at a future WRC.

1/1.10/2 Background

The global maritime community has agreed on special measures to enhance maritime safety systems for ships and ports.

1/1.10/2.1 Regulatory status of AIS 1 and AIS 2

International Maritime Organization (IMO) Resolution MSC 74(69) stated that:

"The AIS should improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS), by satisfying the following functional requirements:

.1 in a ship-to-ship mode for collision avoidance;

.2 as a means for littoral States to obtain information about a ship and its cargo; and

.3 as a VTS tool, i.e. ship-to-shore (traffic management)."

The Radio Regulations only recognize the automatic identification system-search and rescue transponder (AIS-SART) operation as having a safety function on the two AIS frequencies as noted in RR Appendix **15** (Rev.WRC-07).

1/1.10/2.2 Satellite-AIS

Additional AIS channel or channels may be required to enhance and accommodate global ship-tracking capabilities.

1/1.10/2.3 Broadcasts of safety and security information for ships and ports[1]

The broadcast of safety and security information for ships and ports is vital for maritime safety. RR Article **33** describes the operational procedures for maritime urgency and safety communications, including the transmission of maritime safety information (MSI). However IMO and the International Hydrographic Organization (IHO) recognize that the existing MSI systems have limited capacity and will include only the promulgation of changes to the security levels in major ports and coastal waters. If additional security-related information needs to be promulgated, this will have to be transmitted via other systems. Therefore there may be a requirement for additional spectrum to be allocated for this purpose.

Communication systems in the bands 415-526.5 kHz includes transmissions in accordance with Recommendations ITU-R M.540-2 and ITU-R M.1677-1, and may include digital technology similar to that used in ITU-R M.1798. Additional studies for enhanced broadcast in a portion of the band 415-526.5 kHz are contained in Report ITU-R M.2201. The data access network is a simplex data exchange based on an automated carrier-sense (listen-before-talk) protocol.

1/1.10/2.4 RR Appendix 18

RR Appendix **18** is used globally, for both data and voice services. There is, also, an expanding demand for data services at both a regional, and ultimately, a global level. This issue is covered by Resolution **342 (Rev.WRC-2000)**.

Voice transmissions play a continuing role in port operations, ship movement and distress at sea.

This issue is addressed through *resolves* 1 of Resolution **357 (WRC-07)**.

1/1.10/2.4.1 Use of new technologies by MMS in RR Appendix 18 (Resolution 342 (Rev.WRC-2000))

Resolution **342 (Rev.WRC-2000)** which is referred to in Resolution **357 (WRC-07)** considers the use of new technologies for the MMS in the band 156-174 MHz and the consequential revision of RR Appendix 18.

In addition, data systems increasingly offer similar and complementary services to the traditional voice systems.

1/1.10/2.4.2 Port operations and ship movement (*resolves* 1 of Resolution 357 (WRC-07))

The matter to be considered is the global implementation of numbers of single-frequencies channels that are derived from two-frequency channels. These would be for port operation and ship movement use.

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[1] Communications and information related to IMO SOLAS Chapter V, XI-1 (Special measures to enhance maritime safety), and XI-2 (Special measures to enhance maritime security) - ISPS Code.

Many administrations have decommissioned public correspondence networks and transmission sites. Some administrations have also seen the demand for single-frequencies for port operations exceed the current supply. Most retain a voice port operations requirement and see vessels from all over the world.

1/1.10/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations and Reports: Recommendations ITU-R M.493-13, ITU-R M.540-2, ITU-R M.1084-4, ITU-R M.1371-4, ITU-R M.1677-1, ITU-R M.1797, ITU-R M.1842-1 and Reports ITU-R M.2084 and ITU-R M.2169.

New relevant ITU-R Report: ITU-R M.2201 and ITU-R M.[SNAP].

1/1.10/3.1 Regulatory status of AIS 1 and AIS 2

AIS frequencies are used for search and rescue, safety of navigation, ship movement and the tracking of vessels, as well as use by search and rescue aircraft authorized by RR Appendix **18** and the most recent version of Recommendation ITU-R M.1371-4.

1/1.10/3.2 Satellite-AIS

Recommendation ITU-R M.1371-4 has introduced new Message 27 for the AIS. This message has been designed for the purpose of the AIS satellite detection. Report ITU-R M.2169 has been developed giving a technical background for the utilization of channels 75 and 76 of RR Appendix **18** in order to improve the satellite detection of AIS messages.

1/1.10/3.3 Broadcasts of safety and security information for ships and ports

Report ITU-R M.2201 has been developed given the description of a system to be used to broadcast from shore to ships information related to safety and security. The system will utilize the band 495-505 kHz.

RR No. **5.82A** limits the use of MMS systems in the band 495-505 kHz to radio telegraphy. RR No. **5.82B** requires that administrations making frequency assignments to services other than the MMS in the 495-505 kHz band shall ensure that no harmful interference is caused to the MMS in this band and to other services in adjacent bands. These provisions already give priority to the MMS over other MS applications in the band 495-505 kHz.

1/1.10/3.4 RR Appendix 18

1/1.10/3.4.1 Use of new technologies by MMS in RR Appendix 18 (Resolution 342 (Rev.WRC-2000))

Since WRC-2000 a certain number of channels have been identified within RR Appendix **18** which could possibly be used for a new digital technology. The identification of these channels was the first step in the introduction of the new technology. The most recent version of Recommendation ITU-R M.1842 describes two narrow-band and three wideband systems that could address this requirement.

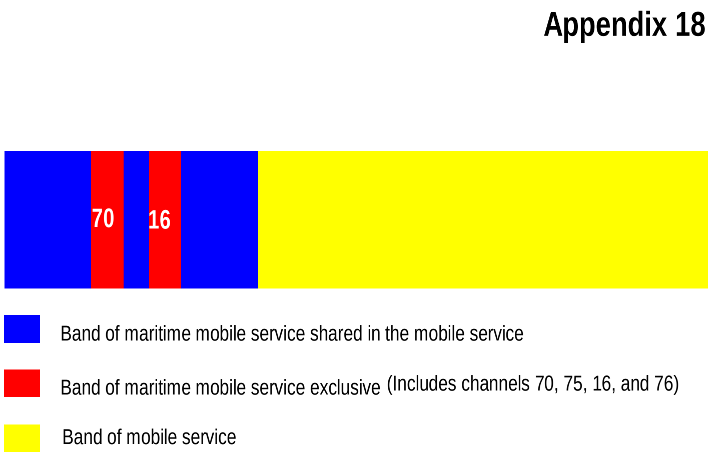
The problem is not finding a new data digital system but finding spectrum allocated to the VHF MMS within which it can be implemented. The identification of some channels inside RR Appendix **18** allows the usage of narrow-band systems, while the wideband systems will need the combination of two or more channels. If we want to mitigate the effect of the already existing congestion in the MMS it would be extremely useful if these channels were harmonized worldwide thus avoiding administrations having to decide unilaterally where it could implement such a technology.

Allocations to the MMS in the VHF band are, with the exception of distress channels and their associated guardbands, non-exclusive of a fact that is quite often forgotten by the maritime community.

RR Appendix **18** describes how some portions of the MS band could be used by the MMS.

For this reason it is important to look how RR Appendix **18** is built. The following scale graphic (Figure 1) gives some useful indications.

FIGURE 1



RR Appendix **18** is formed of 3 bands: 156-157.45 MHz, 160.6-160.975 MHz and 161.475-162.05 MHz.

The bands 157.45-160.6 MHz and 160.975-161.475 MHz shown in Figure 1 are also used by the MMS. These bands are within the frequency range covered by RR Appendix **18.** Current maritime equipment is fully tuneable over these two bands. The two bands are widely forgotten and overlooked as potential spectrum solutions for emerging maritime technologies.

Recent studies indicate these two bands would be preferential candidates for new VHF applications to support the maritime community.

However existing usage is a hindrance, especially in Europe where ECC Recommendation T/R 25-08 and ECC Report 25, frame the utilization for the LMS.

Similar situations exist throughout the world. Notwithstanding the desire of the maritime community to extend RR Appendix **18**, any maritime usage is encumbered by having to protect existing operators in the three identified bands.

Even inside the three bands of RR Appendix **18**, the MMS has difficulty in using identified spectrum shared with the LMS. For this reason the proposed regulatory considerations only identify and propose bands identified in RR Appendix **18**.

In order to mitigate this effect some administrations have tried to optimize the usage of the MS. Using RR No. **5.226**, they have given the priority to the MS for the frequencies of RR Appendix **18** in an inland coastal zone sufficiently wide to guarantee the geographical separation of MMS and LMS stations. Inland of this coastal zone the priority is given to the LMS.

Such a geographical separation approach could be utilized in order to extend the usage of RR Appendix **18**.

1/1.10/3.4.2 Port operations and ship movement (*resolves* 1 of Resolution 357 (WRC-07))

Some administrations have identified a shortage of globally recognized simplex frequency channels suitable for port operations. The effort to eliminate channel congestion, through footnote *m)* to RR Appendix **18**, allows administrations flexibility to reclassify more duplex channels for simplex operation.

However, by doing so, the ultimate goal of harmonization inside RR Appendix **18** remains unsatisfied due to the diversity of usage all over the world.

The compatibility of existing and future ship-borne equipment to operate in the new frequency plan allocated to coast stations needs to be taken into account.

1/1.10/4 Analysis of the results of studies

1/1.10/4.1 Regulatory status of AIS 1 and AIS 2

ITU Radio Regulations recognize the AIS-SART operation as having a safety function on the two AIS frequencies see RR Appendix **15 (Rev.WRC-07)**). Consideration should be given to the appropriate RR designation of the channels AIS 1 and AIS 2, including the AIS ship-to-ship collision avoidance function. Report ITU-R M.[SNAP] illustrates that, presently, the channels; AIS 1 and AIS 2 do not enjoy the same regulatory status in RR Appendix **18** as other RR Appendix **15** frequencies.

1/1.10/4.2 Satellite-AIS

Improvement of the satellite detection of AIS messages has been requested by many administrations.

Separate frequencies for satellite detection of AIS must be selected from within RR Appendix **18** because the tuning range of the ship-borne AIS Class A is limited to these frequencies. Also, with respect to possible additional AIS frequencies, Report ITU-R M.2084 indicated that the interference environment resulting from existing services in those bands must be taken into account in determining the feasibility of accommodating satellite AIS in any given band or channel. This is due to the large satellite antenna footprint that overlaps both land and sea. Separate operating frequencies in addition to AIS 1 and AIS 2 are therefore needed that are not subject to terrestrial use.

Channels 75 and 76 are exclusively dedicated to maritime use therefore these channels are proposed to be shared with the MSS. This proposal meets the intent of footnote *n)* to RR Appendix **18** for interference mitigation.

Report ITU-R M.2169 gives the technical justification for the utilization of channels 75 and 76 and demonstrates compatibility with channel 16.

Satellite detection of the ship-borne AIS utilizing channels 75 and 76 should be limited to the AIS Class A equipment.

Recommendation ITU-R M.1371-4 concerns the introduction of Message 27 along with its transmissions on the designated channels 75 and 76, and the AIS Class A equipment updates to add this message to facilitate improved satellite AIS detection.

MSS (Earth-to-space) allocation for satellite AIS is compatible with the existing navigation-related communication frequencies as designated in RR Appendix **18**, note *n).* ITU-R Report M.2169 and Recommendation ITU-R M.1371-4, confirm the compatibility and show that the transmission of new AIS Message 27 contains navigational information including position, speed over ground, course over ground, navigational status. The proposed MSS (Earth-to-space) frequencies (channels 75 and 76) are for navigation and serve as guardbands for channel 16, the safety and distress frequency. Precautions to avoid harmful interference to channel 16 are achievable by automatically inhibiting Message 27 transmissions within 40 nautical miles of coast stations.

1/1.10/4.3 Broadcasts of safety and security information for ships and ports

Due to further requirements for spectrum to accommodate existing and new maritime systems, which will require more capacity than the international automated system for distributing maritime safety information (NAVTEX), SafetyNET satellite-based system or a voice announcement can provide, it seems appropriate to make an exclusive primary allocation to the MMS in the band 495-505 kHz.

1/1.10/4.4 RR Appendix 18

1/1.10/4.4.1 Use of new technologies by MMS in RR Appendix 18 (Resolution 342 (Rev.WRC-2000))

Recommendation ITU-R M.1842-1 describes narrow-band systems which could operate in the envelope of one channel (25 kHz bandwidth) or wideband systems working with the combination of more than one channel (up to 100 kHz).

The optimum usage of RR Appendix **18** would be to use a harmonized band especially dedicated to the digital system. This will avoid the use of notes, such as *o)*, throughout RR Appendix **18** and would reinforce the worldwide harmonization for this kind of systems. For duplex operation a spacing of 4.6 MHz between the upper and lower frequencies is generally recognized as optimum. An illustration of these band arrangements is shown in Report ITU-R M.[SNAP].

A duplex band inside RR Appendix 18 will be needed to implement this technology. Bands of 100 kHz or wider are proposed.

1/1.10/4.4.2 Port operations and ship movement (*resolves* 1 of Resolution 357 (WRC-07))

From WRC-97 a number of two-frequency channels in RR Appendix **18** were identified, by note *m)*, for single-frequency use. The usage of note *m)* would allow participating administrations to use these single-frequency channels for applications such as port operations, where congestion was experienced. This was an initial recognition of the shortage of globally recognized single-frequency channels, in RR Appendix **18**. Although port operations on two-frequency channels do exist, port operations are predominantly undertaken on single-frequency channels.

The Radio Regulations Board approved a Rule of Procedure after WRC-07 regarding simplex use in RR Appendix **18** (Part A1/AP18 pages 1 and 2) effectively implementing this part of the proposal. WRC-07 revised RR Appendix **18** to allow simplex use of channels 01, 07, 19, 20, 21, 60, 66, 78, 79, 80, and 81 subject to coordination with affected administrations (Note *m)*). However, WRC-07 omitted placing an “x” in the “Single frequency” column against affected channels in RR Appendix **18**, thereby unintentionally omitting this from the Radio Regulations.

To allow expanded use of single-frequency channels modifications to the table of frequencies in RR Appendix **18** are required.

The ship-borne equipment should be capable of operating simplex and duplex channels using the same frequency plan.

Within RR Appendix **18**, there are essentially 26 single-frequency channels and 33 two-frequency channels making a total of 59 (single and two-frequency channels). Of the 26 single-frequency channels there are only 8 single-frequency channels available for general assignment for port operations and ship movement. This takes into account the general unavailability of certain "special use" single-frequency channels reserved for particular usage such as search and rescue operation etc. as follows:

– AIS 1, AIS 2, and channels 87 and 88 – the latter two are included here as it is not certain that older vessels are able to access the lower frequencies of the former, now split AIS channels;

– the four inter-ship channels 6, 8, 72 and 77;

– channels 10, 13, 16, 67, 70 and 73 as these are reserved for special usage;

– channels 15, 17, 75 and 76 due to restrictions on usage and limitation of power to 1 W.

The above "special use" channels are 18 out of a total of 26 single-frequency channels, thus leaving only 8 single-frequency channels for standard port operations and ship movement assignment purposes. This point is illustrated in Report ITU-R M.[SNAP].

Investigation all over the world shows that the number of the duplex channels (specifically those which are dedicated to the public correspondence) could be reduced with the view to make two single-frequencies available for port operations and ship movement. This point is also illustrated in Report ITU-R M.[SNAP].

Two objectives of this approach to VHF data, port operation and ship movement usage are simplification and harmonization. This can be achieved by redefining the channel usage within RR Appendix **18**, with the clear intention of maintaining the current GMDSS usage which is considered to be satisfactory.

1/1.10/5 Methods to satisfy the agenda item

1/1.10/5.1 Regulatory status of AIS 1 and AIS 2

1/1.10/5.1.1 Method A1

This method proposes:

– a primary allocation in the MMS, and a secondary allocation for aeronautical mobile service in the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz;

– a secondary allocation to the MSS (Earth-to-space) in the Table of Frequency Allocations (RR Article **5**). Consequentially, RR No. **5.227A** will be suppressed.

Advantages

– Additional protection for AIS frequencies which are used for search and rescue, safety of navigation, ship movement and tracking of vessels, as well as use by search and rescue aircraft authorized by RR Appendix **18** and the most recent version of Recommendation ITU-R M.1371.

Disadvantages

– The restriction to the MMS only will impact the existing mobile and fixed incumbents already operating in accordance with the current Table of Frequency Allocations. Provisions may need to be established to address this issue.

1/1.10/5.1.2 Method A2

This method proposes:

– retaining the current allocation to the FS and the MS in the bands 156.8375-161.9625 MHz and 161.9875-162.0125 MHz;

– a primary allocation to the MMS in the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz;

– adding RR No. **5.B110** in the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz to allow use of aircraft stations for search and rescue operation and other safety related communication **(see** RR Appendix **18**).

– retaining current allocation for FS and LMS in Region 1 and retaining current allocation for FS, LMS and AMS in Regions 2 and 3 in the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz through a new footnote No. **5.B110*bis***;

Advantages

– Protection of assignments of existing services operating in the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz.

Disadvantages

– May lead to harmful interference to AIS 1 and AIS 2 frequencies from systems operating in the FS and MS in this band.

1/1.10/5.2 Satellite-AIS

1/1.10/5.2.1 Method B1: Secondary allocation to mobile satellite service (Earth-to-space)

Taking into account the studies performed within ITU-R, especially Report ITU-R M.2169 and Recommendation ITU-R M.1371-4, it is proposed to identify the channels 75 and 76 of RR Appendix **18** in order to improve the satellite detection of AIS Message 27. To do so a secondary allocation to the MSS (Earth-to-space) is proposed in regards to the frequencies of channels 75 and 76 in RR Article **5**. This secondary allocation is done through a footnote like it has been done for AIS 1 and AIS 2 during the WRC-07.

Advantages

– Provides spectrum for the implementation of the most recent version of Recommendation ITU-R M.1371 for improved satellite detection.

– Uses frequencies already allocated to the MMS.

– Can coexist with the current function of channels 75 and 76 as the distress frequency channel 16 guardbands, and is therefore compliant with note *n)* of RR Appendix **18** in the protection of channel 16 from harmful interference.

1/1.10/5.2.2 Method B2: Primary allocation to mobile-satellite service (Earth-to-space)

Taking into account the studies performed within ITU-R, especially Report ITU-R M.2169 and Recommendation ITU-R M.1371, it is proposed to identify the channels 75 and 76 of RR Appendix **18** in order to improve the satellite detection of AIS Message 27. To do so a primary allocation to the MSS (Earth-to-space) is proposed via a footnote in regards to the frequencies of channels 75 and 76 in RR Article **5**.

Advantages

– Provides spectrum for the implementation of the most recent version of Recommendation ITU-R M.1371 for improved satellite detection.

– Satellite detection reliability increases and allows for greater probability of vessel tracking.
– Uses frequencies already allocated to the MMS.

1/1.10/5.3 Broadcasts of safety and security information for ships and ports

1/1.10/5.3.1 Method C: Exclusive primary allocation to the maritime mobile service

It is proposed to make an exclusive primary allocation to the MMS in the band 495-505 kHz in all three regions and a co-primary allocation in the band 510-525 kHz in Region 2.

Advantages

– Allocations reflect need for continued and enhanced transmission in support of maritime safety information (MSI) and security broadcasts.
– The allocation in the proposed frequency band to the MMS would provide a global harmonized frequency for this application.

1/1.10/5.4 RR Appendix 18

1/1.10/5.4.1 Method D1: Designation of: 2 × 400 kHz for digital band (800 kHz), 22 new single frequency channels and consideration of a man overboard channel

1/1.10/5.4.1.1 Use of technologies by MMS in RR Appendix 18 (Resolution 342 (Rev.WRC-2000))

Identification of the bands 156.925-157.325 MHz and 161.525-161.925 MHz in order to provide a 2 × 400 kHz band for the use of digital technologies described in Recommendation ITU-R M.1842-1.

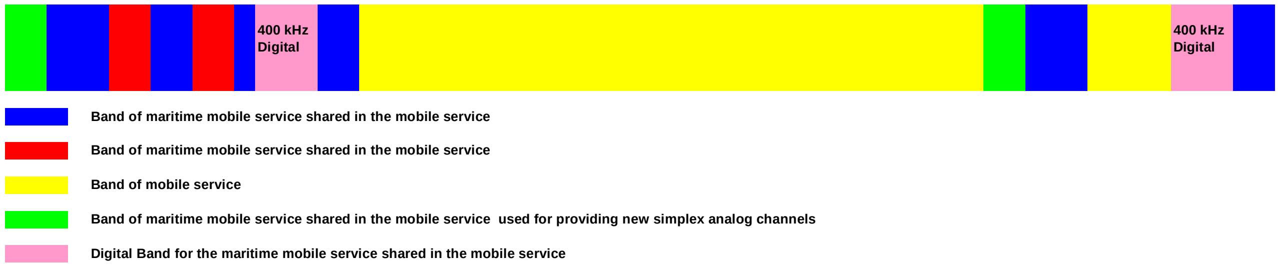
These bands are formed by the use of the public correspondence duplex channels 19 to 26 and channels 78 to 86.

The usage of new digital technologies is non-mandatory for this reason a new note *CCC)* is proposed for the identified new digital band in order to authorize analogue modulation in respect of Recommendation ITU-R M.1084 for the administration that wishes to do so subject to not claiming protection from other stations in the MMS using digital data transmissions.

The main idea is to give a clear indication to the industry in order to develop the appropriate standards for future equipment.

FIGURE 2

Graphical presentation of the future RR Appendix 18



1/1.10/5.4.1.2 Port operations and ship movement (*resolves* 1 of Resolution 357 (WRC-07))

The channels 01 to 05 and 60 to 65 which are public correspondence duplex channels are proposed to be split into simplex channels. This will create 22 new simplex channels instead of 11 duplex channels. These new channels could be used for port operation.

One objective will be to identify a simplex channel, outside the GMDSS channels, for man over board (MOB) equipment. It will be a great benefit for the maritime community to identify a dedicated worldwide harmonized channel for this usage thus avoiding the use of the GMDSS channels.

Advantages

– Method D1 will increase the number of available channels, in particular the simplex channels that are mostly wanted by seafarers. By providing in Appendix **18** the channel numbers to be used in the simplex mode it provides clarity that is needed to encourage the production of equipment capable of operating in simplex mode on all of the channels allowed for simplex mode.

1/1.10/5.4.1.3 Housekeeping of the notes in RR Appendix 18

It is proposed to suppress footnotes *m)* and *o)* throughout RR Appendix **18**.

Disadvantages

– By removing note *m)*, this method would cause the single-frequency transmissions by maritime mobile stations to be no longer subject to coordination with affected administrations, thus opening up the opportunity for interference between MMS and LMS stations operating in coastal regions of administrations which allocate certain frequencies in RR Appendix **18** for LMS usage.

1/1.10/5.4.1.4 Date of implementation for this method

The most important in this method is that the GMDSS channels, as well as the AIS channels will remain unchanged. It means that after any date of implementation the equipment will still be valid for distress and safety purposes.

For this reason it is not necessary to delay implementation unduly.

The implementation date for digital is proposed to be 1 January 2017 which gives 5 years for the industry to react and the users to migrate, if they wish so, seems reasonable.

1/1.10/5.4.2 Method D2: Designation of: Two slots of 2 × 200 digital band (800 kHz), 18 single-frequency channels and man overboard channel

1/1.10/5.4.2.1 Port operations and ship movement (*resolves* 1 of Resolution 357 (WRC-07))

To satisfy the requirements of administrations resulting from congestion in the RR Appendix **18** bands, it is proposed to divide duplex channels 18-22 and 78-81, removing note *m)* for those channels. This will create 18 new simplex channels instead of 9 duplex channels. These channels may be used for port operations. The shortening of the channels seems unreasonable since in this case the channels kept for two-frequency usage will become the channels which are between the channels becoming the candidates for single-frequency operation, and it is illogical. Add a new note *BBB)* for these channels indicating that until the date of implementation these channels may continue to be assigned as two-frequency channels, but as from that date they shall be available only as single-frequency. This provision will allow for harmonization of spectrum use and ensure compatibility of ship and coast stations. Indicate the channel numbers of the single-frequency channels, in RR Appendix **18**, by use of the channel designation given in Recommendations ITU-R M.493 and ITU-R M.1084.

1/1.10/5.4.2.2 Introduction of RR Appendix 18 technologies in the maritime mobile service (Resolution 342 (Rev.WRC-2000))

Under the current provisions of RR Appendix **18** (Note *o)*), channels 23-26 and 82-86 (frequency bands 157.125-157.325 MHz and 161.725-161.925 MHz), i.e. 2 × 200 kHz, are already identified for new technologies, subject to coordination with affected administrations. It would appear appropriate to use these identified channels for new digital technologies. It is therefore proposed to add the relevant regulatory provisions in Method D2 (Note *DDD)*).

At the same time, it is proposed to retain the current channelling arrangements, using a 25 kHz bandwidth, in order to allow administrations to use a combination of the required channels.

The use of new digital technologies will not be mandatory, as per Note *DDD).* In the bands in question, administrations wishing to do so may use analogue modulation in accordance with Recommendation ITU-R M.1084, subject to not causing interference to or claiming protection from stations employing digital technologies.

At the same time, in order to increase the capacity for introducing digital technologies, it is proposed to identify an additional frequency band. In some countries, duplex channels 01-05 and 60-65 are extensively used by VHF coast stations to support GMDSS functional requirement on general communications between ships at sea and terrestrial subscribers, including those who might be involved in SAR operations (i.e. port authorities, medical services, etc.). Thus, these channels need to be maintained as duplex channels. However, in view of the need to meet the spectrum requirements for the introduction of new digital systems, it is proposed to allow for digital technologies in the frequency bands corresponding to channels 02-05 and 61-65. Accordingly, it is proposed to include relevant regulatory provisions for channels 02-05 and 61-65 (frequency bands 156.075-156.275 MHz and 160.675-160.875 MHz) for duplex use and digital technologies, subject to agreement with affected administrations (Note *AAA)*).

1/1.10/5.4.2.3 Date of implementation

The implementation date should allow sufficient time to develop new standards, procedures, and provide modifications to shore-based and ship-borne equipment. Therefore, an implementation date of no earlier than 1 January 2017 is proposed.

Advantages

– Where congestion exists, single-frequency use of existing two-frequency channels would be facilitated as vessels would have access to these additional single frequency channels.

– Two-frequency use, whether for regional data systems or port operations, can continue to operate.

– Allows the implementation of digital technologies on a primary basis in the frequency bands already earmarked for such usage, without claiming protection from analogue stations.

Disadvantages

– For some administrations which allocate certain frequencies in RR Appendix **18** for LMS usage, removal of note *m)* would cause the single-frequency transmissions by maritime mobile stations to be no longer subject to coordination with affected administrations, thus opening up the opportunity for interference between MMS and LMS stations operating in coastal regions.

1/1.10/5.4.3 Method D3: Designation of: 2 × 150 kHz digital band (300 kHz) and 22 single-frequency channels

As previously discussed in § 1/1.10/4.4.2 (above), WRC-07 revised RR Appendix **18** to allow simplex use of channels 01, 07, 19, 20, 21, 60, 66, 78, 79, 80, and 81 subject to coordination with affected administrations (Note *m)*). However, WRC-07 omitted placing an “x” in the “Single frequency” column against affected channels in RR Appendix **18**, thereby unintentionally omitting this from the Radio Regulations.

The Radio Regulations Board approved a Rule of Procedure after WRC-07 regarding simplex use in RR Appendix **18** (Part A1/AP18 pages 1 and 2), effectively implementing this part of the proposal.

Therefore, the baseline for RR Appendix **18** should be the Rule of Procedure as approved by the Radio Regulations Board.

1/1.10/5.4.3.1 Simplex use of duplex channels

Expansion of optional simplex use of duplex channels (add more “x” designations to duplex channels) in RR Appendix **18** will provide further benefits to maritime radiocommunications by relieving current congestion in the VHF maritime mobile bands in accordance with Recommendation ITU-R M.1084-4.

Under this method, optional single-frequency use for port operations may also continue, subject to coordination with affected administrations. This method retains note *m)*, which allows simplex operations only “subject to coordination with affected administrations”, thereby limiting the possibility of co-channel interference between MMS and LMS communications in coastal regions in administrations where some RR Appendix **18** channels are allocated for LMS usage.

Report ITU-R M.2010-1, a study on efficiency in the VHF maritime mobile band, concluded that this spectrum efficiency option expands the number of usable communication channels with the minimum of compatibility issues. The analogue VHF radio on board vessels that travel internationally would have access to both the original two-frequency channels and their single-frequency derivatives, thus allowing port operations on two or single-frequency channels.

Advantages

– Allows the implementation of digital technologies on a primary basis in the frequency bands already earmarked for such usage, without claiming protection from analogue stations.

Disadvantages

– Single-frequency channels that are not identified by channel number in Appendix **18** but by a footnote are not likely to be fully implemented globally by vessels. This means that some ports may not have those channels available to communicate with international vessels that travel globally.

1/1.10/5.4.3.2 Channels for data exchange

Recommendation ITU-R M.1842-1 provides examples of potential VHF data exchange systems and recommends the use of RR Appendix **18** channels to support future digital technologies in the maritime mobile service.

Adding a new Note *s)* to the table of RR Appendix **18** and to the section "Notes referring to the Table" supports the identification of six channels (24, 25, 26, and 84, 85, 86) for potential data exchange systems.

1/1.10/5.4.3.3 Protection of channels AIS 1 and AIS 2

Protecting the Automatic Identification System channels (AIS 1 and AIS 2) from harmful interference would ensure the future safety of maritime mobile radiocommunications for these channels. Report ITU-R M.2122 "EMC assessment of shore-based electronic navigation (eNAV) infrastructure and new draft standards for data exchange in the VHF maritime mobile band (156-174 MHz)" describes the susceptibility of AIS 1 and AIS 2 to interference from the adjacent duplex channels. This Report also provides technical guidelines for the electromagnetic compatibility between AIS and systems that use channels 27 and 28.

Thus, modifying Note *c)* in the section "Notes referring to the Table" of RR Appendix **18** is necessary for protecting AIS.

1/1.10/5.4.3.4 Non-application of channel interleaving

Recommendation ITU-R M.1084-4 describes the advantages of increased spectrum efficiency by channel interleaving 12.5 kHz channels with 25 kHz channels.

The current RR Appendix **18** excludes maritime mobile service safety channels from 12.5 kHz channel interleaving (See Note *e)*). By modifying Note *e)* in the section "Notes referring to the Table" of RR Appendix **18**, the non-application of channel interleaving extends to the exclusion of AIS 1 and AIS 2, and the proposed channels for E-navigation discussed in the preceding section.

1/1.10/5.4.3.5 Long-range detection of AIS

Modifying the Radio Regulations to reflect the satellite monitoring of Automatic Identification System (AIS) equipped vessels is critical to search and rescue, safety of navigation, and the safe movement and tracking of vessels. This proposal specifically adds a mobile-satellite service (MSS) (Earth-to-space) allocation to 156.775 MHz and 156.825 MHz (RR Appendix **18,** channels 75 and 76) for improved AIS satellite detection using message 27.

This proposal satisfies the International Maritime Organization (IMO) Resolution MSC 74(69), which requires that AIS improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of Vessel Traffic Services (VTS). Improved satellite detection of AIS will satisfy IMO functional requirements for collision avoidance, obtaining information about a ship and its cargo, and providing ship-to-shore traffic management. The ITU-R completed studies to identify VHF channels in RR Appendix **18** for improved AIS satellite detection and recently approved Recommendation ITU-R M.1371-4, "Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band", to reflect specialized message 27 for long-range AIS broadcast messages of AIS Class A equipped vessels.

This proposed MSS (Earth-to-space) allocation for satellite AIS is compatible with the existing navigation-related communications of the frequencies as designated in RR Appendix **18**, Note *n).* Report ITU-R M.2169, "Improved satellite detection of AIS", and Recommendation ITU-R M.1371-4, confirm the compatibility and show that the transmission of new AIS message 27 contains navigational information including position, speed over ground, course over ground, navigational status. The proposed MSS (Earth-to-space) frequencies (channels 75 and 76) are for navigation and serve as guardbands for channel 16 - the safety and distress frequency. Precautions to avoid harmful interference to channel 16 are achievable by prohibiting message 27 transmissions within 40 nautical miles of coast stations.

Therefore, the new proposed footnote *r)* is fully compliant with footnote *n)* in RR Appendix **18**.

1/1.10/6 Regulatory and procedural considerations

1/1.10/6.1 For Method A: Regulatory status of AIS 1 and AIS 2

1/1.10/6.1.1 For Method A1

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. **2.1**)

MOD

~~**148-223 MHz**~~		
Allocation to services		
Region 1	**Region 2**	**Region 3**
…		
156.8375-161.9625~~174~~ FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A 5.229~~	**156.8375-161.9625~~174~~** FIXED MOBILE ~~5.226 5.227A 5.230 5.231 5.232~~	
161.9625-161.9875 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ MARITIME MOBILE Aeronautical mobile (OR) Mobile-satellite (Earth-to-space) 5.226 ~~5.227A 5.229~~ ADD 5.A110	**161.9625-161.9875** FIXED MOBILE MARITIME MOBILE Aeronautical mobile (OR) Mobile-satellite (Earth-to-space) 5.226 ~~5.227A 5.230 5.231 5.232~~ ADD 5.A110	
161.9875-162.0125 FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A~~ 5.229	**161.9875-162.0125** FIXED MOBILE ~~5.226 5.227A 5.230 5.231 5.232~~	
162.0125-162.0375 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ MARITIME MOBILE Aeronautical mobile (OR) Mobile-satellite (Earth-to-space) 5.226 ~~5.227A~~ 5.229 ADD 5.A110	**162.0125-162.0375** FIXED ~~MOBILE~~ ~~MARITIME MOBILE~~ Aeronautical mobile (OR) Mobile-satellite (Earth-to-space) 5.226 ~~5.227A 5.230 5.231 5.232~~ ADD 5.A110	
162.0375-174 FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A~~ 5.229	**162.0375-174** FIXED MOBILE 5.226 ~~5.227A~~ 5.230 5.231 5.232	
…	…	…

Editorial Note: In the Table above, if the proposed modifications for the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are accepted, then the frequency allocations in these bands become identical for all three Regions and the corresponding cells of the Table should be merged for Regions 1, 2 and 3. RR No. ***5.229*** *will also be part of the merged cells for the frequency band 162.0125-162.0375 MHz.*

ADD

5.A110 The use of the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz by the mobile-satellite service (Earth-to-space) and the aeronautical mobile (OR) service is limited to automatic identification system (AIS) emissions operating in accordance with Appendix **18**. (WRC-12)

SUP

5.227A

1/1.10/6.1.2 For Method A2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

148-223 MHz		
Allocation to services		
Region 1	**Region 2**	**Region 3**
… **156.8375-161.9625~~174~~** FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A~~ 5.229	**156.8375-161.9625~~174~~** FIXED MOBILE 5.226 ~~5.227A~~ 5.230 5.231 5.232	
161.9625-161.9875 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ MARITIME MOBILE 5.226 5.227A ~~5.229~~ ADD 5.B110 ADD 5.B110*bis*	**161.9625-161.9875** ~~FIXED~~ MOBILE MARITIME MOBILE 5.226 5.227A ~~5.230 5.231 5.232~~ ADD 5.B110 ADD 5.B110*bis*	
161.9875-162.0125 FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A~~ 5.229	**161.9875-162.0125** FIXED MOBILE 5.226 ~~5.227A~~ 5.230 5.231 5.232	
162.0125-162.0375 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ MARITIME MOBILE 5.226 5.227A 5.229 ADD 5.B110 ADD 5.B110*bis*	**162.0125-162.0375** ~~FIXED~~ MOBILE MARITIME MOBILE 5.226 5.227A ~~5.230 5.231 5.232~~ ADD 5.B110 ADD 5.B110*bis*	
162.0375-174 FIXED MOBILE except aeronautical mobile 5.226 ~~5.227A~~ 5.229 …	**162.0375-174** FIXED MOBILE 5.226 ~~5.227A~~ 5.230 5.231 5.232 …	…

Editorial Note: In the Table above, if the proposed modifications for the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are accepted, then the frequency allocations in these bands become identical for all three Regions and the corresponding cells of the Table should be merged for Regions 1, 2 and 3. RR No. ***5.229*** *will also be part of the merged cells for the frequency band 162.0125-162.0375 MHz.*

ADD

5.B110 The bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz may be used by aircraft stations for search and rescue purposes and other corresponding operations (see Appendix **18**). (WRC-12)

ADD

5.B110*bis* *Additional allocation:* In Region 1, the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are also allocated to the fixed and land mobile services on a primary basis. In Regions 2 and 3, the bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are also allocated to the fixed, land mobile and aeronautical mobile services. Stations in the fixed, land mobile and aeronautical mobile services shall not cause harmful interference to or claim protection from the maritime mobile service in the VHF band. (WRC-12)

1/1.10/6.2 Satellite-AIS

1/1.10/6.2.1 For Method B1

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. **2.1**)

MOD

148-223 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...	...	
156.7625-156.8375	MARITIME MOBILE (distress and calling) 5.111 5.226 <u>ADD 5.C110</u>	
...	...	

ADD

5.C110 *Additional allocation:* the bands 156.7625-156.7875 MHz and 156.8125-156.8375 MHz are also allocated to the mobile-satellite service (Earth-to-space) on a secondary basis for the reception of automatic identification system (AIS) emissions, broadcasting long-range AIS message (Message 27, see the most recent version of Recommendation ITU-R M.1371), from stations operating in the maritime mobile service (see Appendix **18**). (WRC-12)

1/1.10/6.2.2 For Method B2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

148-223 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...	...	
156.7625-156.8375	MARITIME MOBILE (distress and calling) 5.111 5.226 ADD 5.D110	
...	...	

ADD

5.D110 *Additional allocation:* the bands 156.7625-156.7875 MHz and 156.8125-156.8375 MHz are also allocated to the mobile-satellite service (Earth-to-space) on a primary basis for the reception of automatic identification system (AIS) emissions, broadcasting long-range AIS message (Message 27, see the most recent version of Recommendation ITU-R M.1371), from stations operating in the maritime mobile service (see Appendix **18**). (WRC-12)

1/1.10/6.2.3 For Both Method B1 and Method B2

MOD

APPENDIX 18 (Rev.WRC-~~07~~12)

Table of transmitting frequencies in the VHF maritime mobile band

(See Article **52**)

NOTE A – For assistance in understanding the Table, see Notes *a)* to ~~*q*~~*r)* below. (WRC-~~07~~12)

NOTE B – The Table below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several duplex channels, but also allows the use of 12.5 kHz channel spacing. The channel numbering for 12.5 kHz channels and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-4 Annex 4, Tables 1 and 3. (WRC-07)

MOD

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
15	*g)*	156.750	156.750	x	x		
75	*n) r)*	156.775	156.775		x		
16	*f)*	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n) r)*	156.825	156.825		x		

Notes referring to the Table

General notes

NOC

a) to *e)*

Specific notes

NOC

f) to *q)*

ADD

r) Additionally, these channels (75 and 76) may be used by the mobile-satellite service (Earth-to-space) for the reception of long-range AIS broadcast messages from ships (Message 27, see the most recent version of Recommendation ITU-R M.1371). (WRC-12)

1/1.10/6.3 Broadcasts of safety and security information for ships and ports

1/1.10/6.3.1 For Method C: Exclusive primary allocation to the maritime mobile service

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

495-1 800 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
495-505	MARITIME MOBILE ~~5.82A 5.82B~~	
505-526.5 MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION 5.72	**505-510** MARITIME MOBILE 5.79	**505-526.5** MARITIME MOBILE 5.79 5.79A 5.84 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Land mobile
	510-525 MARITIME MOBILE 5.79A 5.84 AERONAUTICAL RADIONAVIGATION	
...	...	...

SUP

5.82A

SUP

5.82B

1/1.10/6.4 RR Appendix 18

1/1.10/6.4.1 For Method D1: Designation of: 2 × 400 kHz for digital band (800 kHz), 22 new single-frequency channels and consideration of a man overboard channel

MOD

APPENDIX 18 (Rev.WRC-~~07~~12)

Table of transmitting frequencies in the VHF maritime mobile band

(See Article **52**)

NOTE A – For assistance in understanding the Table 1, see Notes *a)* to ~~*q*~~*FFF)* below. (WRC-~~07~~12)

NOTE B – ~~The~~ Table 1 below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several duplex channels~~, but also allows the use of 12.5 kHz channel spacing~~. The channel numbering ~~for 12.5 kHz channels~~ and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-4 Annex 4, Tables 1 and 3. Table 1 below describes also the harmonized band where the digital technologies defined in Recommendation ITU-R M.1842 could be deployed. (WRC-~~07~~12)

NOTE C – Table 2 defines the channel numbering based on 25 kHz channel spacing for the digital band or for analogue usage, see Note *CCC).*

TABLE 1

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
~~60~~	~~*m), o)*~~	~~156.025~~	~~160.625~~		~~x~~	~~x~~	~~x~~
1060	*AAA)*	156.025	156.025		x		
2060	*AAA)*	160.625	160.625		x		
~~01~~	~~*m), o)*~~	~~156.050~~	~~160.650~~		~~x~~	~~x~~	~~x~~
1001	*AAA)*	156.050	156.050		x		
2001	*AAA)*	160.650	160.650		x		
~~61~~	~~*m), o)*~~	~~156.075~~	~~160.675~~		~~x~~	~~x~~	~~x~~
1061	*AAA)*	156.075	156.075		x		
2061	*AAA)*	160.675	160.675		x		
~~02~~	~~*m), o)*~~	~~156.100~~	~~160.700~~		~~x~~	~~x~~	~~x~~
1002	*AAA)*	156.100	156.100		x		
2002	*AAA)*	160.700	160.700		x		
~~62~~	~~*m), o)*~~	~~156.125~~	~~160.725~~		~~x~~	~~x~~	~~x~~
1062	*AAA)*	156.125	156.125		x		
2062	*AAA)*	160.725	160.725		x		
~~03~~	~~*m), o)*~~	~~156.150~~	~~160.750~~		~~x~~	~~x~~	~~x~~
1003	*AAA)*	156.150	156.150		x		
2003	*AAA)*	160.750	160.750		x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
~~63~~	~~*m), o)*~~	~~156.175~~	~~160.775~~		~~x~~	~~x~~	~~x~~
1063	*AAA)*	156.175	156.175		x		
2063	*AAA)*	160.775	160.775		x		
~~04~~	~~*m), o)*~~	~~156.200~~	~~160.800~~		~~x~~	~~x~~	~~x~~
1004	*AAA)*	156.200	156.200		x		
2004	*AAA)*	160.800	160.800		x		
~~64~~	~~*m), o)*~~	~~156.225~~	~~160.825~~		~~x~~	~~x~~	~~x~~
1064	*AAA)*	156.225	156.225		x		
2064	*AAA)*	160.825	160.825		x		
~~05~~	~~*m), o)*~~	~~156.250~~	~~160.850~~		~~x~~	~~x~~	~~x~~
1005	*AAA)*	156.250	156.250		x		
2005	*AAA)*	160.850	160.850		x		
~~65~~	~~*m), o)*~~	~~156.275~~	~~160.875~~		~~x~~	~~x~~	~~x~~
1065	*AAA)*	156.275	156.275		x		
2065	*AAA)*	160.875	160.875		x		
06	*f)*	156.300		x			
66	~~*m), o)*~~	156.325	160.925		~~x~~	x	x
07	~~*m), o)*~~	156.350	160.950		~~x~~	x	x
67	*h)*	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	*i)*	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	*h), q)*	156.500	156.500	x	x		
70	*f), j)*	156.525	156.525	Digital selective calling for distress, safety and calling			
11	*q)*	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	*i)*	156.625		x			
13	*k)*	156.650	156.650	x	x		
73	*h), i)*	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	*g)*	156.750	156.750	x	x		
75	*n)*	156.775	156.775		x		
16	*f)*	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n)*	156.825	156.825		x		
17	*g)*	156.850	156.850	x	x		
77		156.875		x			
18	~~*m)*~~	156.900	161.500		~~x~~	x	x
~~78~~	~~*m)*~~	~~156.925~~	~~161.525~~		~~x~~	~~x~~	~~x~~
~~19~~	~~*m)*~~	~~156.950~~	~~161.550~~		~~x~~	~~x~~	~~x~~

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
~~79~~	~~*m)*~~	~~156.975~~	~~161.575~~		~~x~~	~~x~~	~~x~~
~~20~~	~~*m)*~~	~~157.000~~	~~161.600~~		~~x~~	~~x~~	~~x~~
~~80~~	~~*m)*~~	~~157.025~~	~~161.625~~		~~x~~	~~x~~	~~x~~
~~21~~	~~*m)*~~	~~157.050~~	~~161.650~~		~~x~~	~~x~~	~~x~~
~~81~~	~~*m)*~~	~~157.075~~	~~161.675~~		~~x~~	~~x~~	~~x~~
~~22~~	~~*m)*~~	~~157.100~~	~~161.700~~		~~x~~	~~x~~	~~x~~
~~82~~	~~*m), o)*~~	~~157.125~~	~~161.725~~		~~x~~	~~x~~	~~x~~
~~23~~	~~*m), o)*~~	~~157.150~~	~~161.750~~		~~x~~	~~x~~	~~x~~
~~83~~	~~*m), o)*~~	~~157.175~~	~~161.775~~		~~x~~	~~x~~	~~x~~
~~24~~	~~*m), o)*~~	~~157.200~~	~~161.800~~		~~x~~	~~x~~	~~x~~
~~84~~	~~*m), o)*~~	~~157.225~~	~~161.825~~		~~x~~	~~x~~	~~x~~
~~25~~	~~*m), o)*~~	~~157.250~~	~~161.850~~		~~x~~	~~x~~	~~x~~
~~85~~	~~*m), o)*~~	~~157.275~~	~~161.875~~		~~x~~	~~x~~	~~x~~
~~26~~	~~*m), o)*~~	~~157.300~~	~~161.900~~		~~x~~	~~x~~	~~x~~
~~86~~	~~*m), o)*~~	~~157.325~~	~~161.925~~		x	x	x
Digital band	*BBB), CCC), DDD), FFF)*	156.925 to 157.325	161.525 to 161.925			x	
27		157.350	161.950			x	x
87		157.375	157.375		x		
28		157.400	162.000			x	x
88		157.425	157.425		x		
AIS 1	*f), l), p)*	161.975	161.975				
AIS 2	*f), l), p)*	162.025	162.025				

Editorial note: The Rules of Procedure on RR Appendix ***18*** *was included in the table above.*

Notes referring to ~~the~~ Tables 1 and 2

General notes

NOC

a) to *e)*

Specific notes

NOC

f) to *l)*

SUP

m)

NOC

n)

SUP

o)

NOC

p) to *q)*

ADD

AAA) Until 1 January 2017 the existing duplex channels can continue to be assigned. From that date no new coast station assignments for duplex mode are permitted. However existing duplex mode assignments may be preserved for coastal stations and retained for vessels, as shown in the Table below:

Channel designator	Transmitting frequencies (MHz)	
	From ship station	From coast station
60	156.025	160.625
01	156.050	160.650
61	156.075	160.675
02	156.100	160.700
62	156.125	160.725
03	156.150	160.750
63	156.175	160.775
04	156.200	160.800
64	156.225	160.825
05	156.250	160.850
65	156.275	160.875

ADD

BBB) Until 1 January 2017, this duplex band is used for analogue communications using the channelling arrangement described in Table 2.

ADD

CCC) From 1 January 2017, the duplex band (156.925 to 157.325 MHz and 161.525 to 161.925 MHz) is identified for the utilization of the digital systems described in the most recent version of Recommendation ITU-R M.1842.
This band could also be used for analogue modulation described in the most recent version of Recommendation ITU-R M.1084 for the administration that wishes to do so, subject to not claiming protection from other stations in the maritime mobile service using digitally modulated emissions. See Table 2 for the channel numbering based on 25 kHz channel spacing for the digital or for analogue usage.

ADD

DDD) In the United States and Canada, only the bands 157. 200-157.325 and 161.800-161.925 MHz (corresponding to the channels: 24, 84, 25, 85, 26 and 86; see Table 2) are authorized for digitally modulated emissions.

ADD

EEE) These channels may be operated as single-frequency channels, subject to coordination with affected administrations.

ADD

FFF) In China, only the bands 157.150-157.325 and 161.750-161.925 MHz (corresponding to the channels: 23, 83, 24, 84, 25, 85, 26 and 86; see Table 2) are authorized for digitally modulated emissions.

ADD

TABLE 2

Channel numbering based on 25 kHz channel spacing for the digital band (narrow-band usage) or for analogue usage

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
78	*EEE)*	156.925	161.525		x	x	
19	*EEE)*	156.950	161.550		x	x	
79	*EEE)*	156.975	161.575		x	x	
20	*EEE)*	157.000	161.600		x	x	
80	*EEE)*	157.025	161.625		x	x	
21	*EEE)*	157.050	161.650		x	x	
81	*EEE)*	157.075	161.675		x	x	
22	*EEE)*	157.100	161.700		x	x	
82	*EEE)*	157.125	161.725		x	x	
23	*EEE), FFF)*	157.150	161.750		x	x	
83	*EEE), FFF)*	157.175	161.775		x	x	
24	*EEE), FFF), DDD)*	157.200	161.800		x	x	
84	*EEE), FFF), DDD)*	157.225	161.825		x	x	
25	*EEE), FFF), DDD)*	157.250	161.850		x	x	
85	*EEE), FFF), DDD)*	157.275	161.875		x	x	
26	*EEE), FFF), DDD)*	157.300	161.900		x	x	
86	*EEE), FFF), DDD)*	157.325	161.925		x	x	

1/1.10/6.4.2 For Method D2: Designation of: Two slots of 2 × 200 digital band (800 kHz), 18 single-frequency channels and man overboard channel

MOD

APPENDIX 18 (Rev.WRC-~~07~~12)

Table of transmitting frequencies in the VHF maritime mobile band

(See Article **52**)

NOTE A – For assistance in understanding ~~the~~ Table 1, see Notes a) to ~~q~~FFF) below. (WRC-~~07~~12)

NOTE B – ~~The~~ Table 1 below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several duplex channels~~, but also allows the use of 12.5 kHz channel spacing~~. The channel numbering ~~for 12.5 kHz channels~~ and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-4 Annex 4, Tables 1 and 3. (WRC-~~07~~12)

TABLE 1

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
60	*~~m), o)~~*	156.025	160.625		x	x	x
01	*~~m), o)~~*	156.050	160.650		x	x	x
61	*~~m), o~~AAA)*	156.075	160.675		x	x	x
02	*~~m), o~~AAA)*	156.100	160.700		x	x	x
62	*~~m), o~~AAA)*	156.125	160.725		x	x	x
03	*~~m), o~~AAA)*	156.150	160.750		x	x	x
63	*~~m), o~~AAA)*	156.175	160.775		x	x	x
04	*~~m), o~~AAA)*	156.200	160.800		x	x	x
64	*~~m), o~~AAA)*	156.225	160.825		x	x	x
05	*~~m), o~~AAA)*	156.250	160.850		x	x	x
65	*~~m), o~~AAA)*	156.275	160.875		x	x	x
06	*f)*	156.300		x			
MOB*	*EEE)*	160.900	160.900				
66	*~~m), o)~~*	156.325	160.925	x	x	x	x
07	*~~m), o)~~*	156.350	160.950	x	x	x	x
67	*h)*	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	*i)*	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	*h), q)*	156.500	156.500	x	x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
70	*f), j)*	156.525	156.525	Digital selective calling for distress, safety and calling			
11	*q)*	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	*i)*	156.625		x			
13	*k)*	156.650	156.650	x	x		
73	*h), i)*	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	*g)*	156.750	156.750	x	x		
75	*n), FFF)*	156.775	156.775		x		
16	*f)*	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n), FFF)*	156.825	156.825		x		
17	*g)*	156.850	156.850	x	x		
77		156.875		x			
18	*~~m)~~BBB)*	156.900	161.500		x	x	x
1018	*BBB)*	156.900	156.900		x		x
2018	*BBB)*	161.500	161.500		x		x
78	*~~m)~~BBB)*	156.925	161.525		x	x	x
1078	*BBB)*	156.925	156.925		x		x
2078	*BBB)*	161.525	161.525		x		x
19	*~~m)~~BBB)*	156.950	161.550		x	x	x
1019	*BBB)*	156.950	156.950		x		x
2019	*BBB)*	161.550	161.550		x		x
79	*~~m)~~BBB)*	156.975	161.575		x	x	x
1079	*BBB)*	156.975	156.975		x		x
2079	*BBB)*	161.575	161.575		x		x
20	*~~m)~~BBB)*	157.000	161.600		x	x	x
1020	*BBB)*	157.000	157.000		x		x
2020	*BBB)*	161.600	161.600		x		x
80	*~~m)~~BBB)*	157.025	161.625		x	x	x
1080	*BBB)*	157.025	157.025		x		x
2080	*BBB)*	161.625	161.625		x		x
21	*~~m)~~BBB)*	157.050	161.650		x	x	x
1021	*BBB)*	157.050	157.050		x		x
2021	*BBB)*	161.650	161.650		x		x
81	*~~m)~~BBB)*	157.075	161.675		x	x	x
1081	*BBB)*	157.075	157.075		x		x
2081	*BBB)*	161.675	161.675		x		x

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
22	~~m)~~BBB)	157.100	161.700		x	x	x
1022	BBB)	157.100	157.100		x		x
2022	BBB)	161.700	161.700		x		x
82	~~m), o~~DDD), CCC)	157.125	161.725		x	x	x
23	~~m), o~~DDD), CCC)	157.150	161.750		x	x	x
83	~~m), o~~DDD), CCC)	157.175	161.775		x	x	x
24	~~m), o~~DDD), CCC)	157.200	161.800		x	x	x
84	~~m), o~~DDD), CCC)	157.225	161.825		x	x	x
25	~~m), o~~DDD), CCC)	157.250	161.850		x	x	x
85	~~m), o~~DDD), CCC)	157.275	161.875		x	x	x
26	~~m), o~~DDD), CCC)	157.300	161.900		x	x	x
86	~~m), o~~DDD), CCC)	157.325	161.925		x	x	x
27		157.350	161.950			x	x
87		157.375	157.375		x		
28		157.400	162.000			x	x
88		157.425	157.425		x		
AIS 1	*f), l), p)*	161.975	161.975				
AIS 2	*f), l), p)*	162.025	162.025				

* MOB – man overboard

*Editorial note: The Rules of Procedure on RR Appendix **18** was included in the table above.*

Notes referring to ~~the~~ Tables 1 and 2

General notes

NOC

a) to *e)*

Specific notes

NOC

f) to *l)*

SUP

m)

NOC

n)

SUP

o)

NOC

p) to *q)*

ADD

AAA) From 1 January 2017, in the frequency bands 156.075-156.275 MHz and 160.675-160.875 MHz, corresponding to channels 02-05 and 61-65, digital systems described in the most recent version of Recommendation ITU-R M.1842 may be used, subject to coordination with affected administrations. See Table 2 for the channel numbering based on a 25 kHz channel spacing for digital or analogue use.

ADD

BBB) Until 1 January 2017, the existing duplex channels 18-22 and 78-81 can continue to be assigned. From that date, no new coast station assignments for duplex mode are permitted, and the frequencies associated with channels 18-22 and 78-81 shall only be available as single-frequency channels. Single-frequency channels shall be identified by the channel number designation in accordance with Recommendation ITU-R M.1084. (WRC-12)

ADD

CCC) Until 1 January 2017, these frequencies shall be used for analogue communications.

ADD

DDD) From 1 January 2017, the bands 157.125-157.325 MHz and 161.725-161.925 MHz, corresponding to duplex channels 23-26 and 82-86, are identified for use by digital systems described in the most recent version of Recommendation ITU-R M.1842. Administrations that so wish may also use these bands for analogue modulation described in the most recent version of Recommendation ITU-R M.1084, subject to not causing interference or claiming protection from stations in the maritime mobile service using digitally modulated emissions. See Table 2 for the channel numbering based on a 25 kHz channel spacing for digital or analogue usage.

ADD

EEE) The frequency 160.900 MHz is designated for “man overboard” systems. (WRC-12)

ADD

FFF) Additionally, these channels (75 and 76) may be used by the mobile-satellite service (Earth-to-space) for the reception of automatic identification system (AIS) emissions and the long-range transmission of AIS messages (message 27: see the most recent version of Recommendation ITU-R M.1371). (WRC-12)

ADD

TABLE 2

Channel numbering based on 25 kHz channel spacing for the digital band (narrow-band usage) or for analogue usage

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
61	*AAA)*	156.075	160.675		x	x	x
02	*AAA)*	156.100	160.700		x	x	x
62	*AAA)*	156.125	160.725		x	x	x
03	*AAA)*	156.150	160.750		x	x	x
63	*AAA)*	156.175	160.775		x	x	x
04	*AAA)*	156.200	160.800		x	x	x
64	*AAA)*	156.225	160.825		x	x	x
05	*AAA)*	156.250	160.850		x	x	x
65	*AAA)*	156.275	160.875		x	x	x
82	*DDD), CCC)*	157.125	161.725		x	x	x
23	*DDD), CCC)*	157.150	161.750		x	x	x
83	*DDD), CCC)*	157.175	161.775		x	x	x
24	*DDD), CCC)*	157.200	161.800		x	x	x
84	*DDD), CCC)*	157.225	161.825		x	x	x
25	*DDD), CCC)*	157.250	161.850		x	x	x
85	*DDD), CCC)*	157.275	161.875		x	x	x
26	*DDD), CCC)*	157.300	161.900		x	x	x
86	*DDD), CCC)*	157.325	161.925		x	x	x

1/1.10/6.4.3 For Method D3: Designation of: 2 × 150 kHz digital band (300 kHz) and 22 single-frequency channels

MOD

APPENDIX 18 (Rev.WRC-~~07~~12)

Table of transmitting frequencies in the VHF maritime mobile band

(See Article **52**)

MOD

NOTE A – For assistance in understanding the Table, see Notes *a)* to ~~*q)*~~ *s)* below. (WRC-~~07~~12)

NOTE B – The Table below defines the channel numbering for maritime VHF communications based on 25 kHz channel spacing and use of several simplex and duplex channels, but also allows the use of 12.5 kHz channel spacing. The channel numbering for 12.5 kHz channels and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-4 Annex 4, Tables 1 and 3. (WRC-~~07~~12)

Channel designator	**Notes**	**Transmitting frequencies (MHz)**		**Inter-ship**	**Port operations and ship movement**		**Public corres-pondence**
		From ship stations	**From coast stations**		**Single frequency**	**Two frequency**	
60	*m), o)*	156.025	160.625		x	x	x
01	*m), o)*	156.050	160.650		x	x	x
61	*m), o)*	156.075	160.675		x	x	x
02	*m), o)*	156.100	160.700		x	x	x
62	*m), o)*	156.125	160.725		x	x	x
03	*m), o)*	156.150	160.750		x	x	x
63	*m), o)*	156.175	160.775		x	x	x
04	*m), o)*	156.200	160.800		x	x	x
64	*m), o)*	156.225	160.825		x	x	x
05	*m), o)*	156.250	160.850		x	x	x
65	*m), o)*	156.275	160.875		x	x	x
06	*f)*	156.300		x			
66	*m), o)*	156.325	160.925		x	x	x
07	*m), o)*	156.350	160.950		x	x	x
67	*h)*	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	*i)*	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	*h), q)*	156.500	156.500	x	x		
70	*f), j)*	156.525	156.525	Digital selective calling for distress, safety and calling			
11	*q)*	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ship stations	From coast stations		Single frequency	Two frequency	
72	*i)*	156.625		x			
13	*k)*	156.650	156.650	x	x		
73	*h), i)*	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	*g)*	156.750	156.750	x	x		
75	*n), r)*	156.775	156.775		x		
16	*f)*	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n), r)*	156.825	156.825		x		
17	*g)*	156.850	156.850	x	x		
77		156.875		x			
18	*m)*	156.900	161.500		x	x	x
78	*m)*	156.925	161.525		x	x	x
19	*m)*	156.950	161.550		x	x	x
79	*m)*	156.975	161.575		x	x	x
20	*m)*	157.000	161.600		x	x	x
80	*m)*	157.025	161.625		x	x	x
21	*m)*	157.050	161.650		x	x	x
81	*m)*	157.075	161.675		x	x	x
22	*m)*	157.100	161.700		x	x	x
82	*m), o)*	157.125	161.725		x	x	x
23	*m), o)*	157.150	161.750		x	x	x
83	*m), o)*	157.175	161.775		x	x	x
24	*m), ~~o)~~s)*	157.200	161.800		x	x	x
84	*m), ~~o)~~s)*	157.225	161.825		x	x	x
25	*m), ~~o)~~s)*	157.250	161.850		x	x	x
85	*m), ~~o)~~s)*	157.275	161.875		x	x	x
26	*m), ~~o)~~s)*	157.300	161.900		x	x	x
86	*m), ~~o)~~s)*	157.325	161.925		x	x	x
27		157.350	161.950			x	x
87		157.375	157.375		x		
28		157.400	162.000			x	x
88		157.425	157.425		x		
AIS 1	*f), l), p)*	161.975	161.975				
AIS 2	*f), l), p)*	162.025	162.025				

Editorial Note: The Rules of Procedure on RR Appendix 18 was included in the table above.

Notes referring to the Table

General notes

MOD

c) The channels of the present Appendix, ~~but preferably channel 28 and~~ with the exception of channels 06, 13, 15, 16, 17, 70, 75 and 76, may be used for direct-printing telegraphy and data transmission, subject to special arrangement between interested and affected administrations.

MOD

e) Administrations may apply 12.5 kHz channel interleaving on a non-interference basis to 25 kHz channels, in accordance with the most recent version of Recommendation ITU-R M.1084, provided:

– it shall not affect the 25 kHz channels of the present Appendix maritime mobile distress and safety, AIS, and data-exchange frequencies, especially the channels 06, 13, 15, 16, 17, ~~and~~ 70, AIS 1 and AIS 2, nor the technical characteristics set forth in Recommendation ITU-R M.489-2 for those channels;

– implementation of 12.5 kHz channel interleaving and consequential national requirements shall be subject to coordination with affected administrations. (WRC-07)

Specific notes

ADD

r) Channels 75 and 76 are allocated to the mobile-satellite service (Earth-to-space) for the transmission of AIS message 27 from ships as defined in the most recent version of Recommendation ITU-R M.1371.

ADD

s) These channels may be used for data exchange in accordance with Recommendation ITU-R M.1842. (WRC-12)

CHAPTER 2

Radiolocation and amateur issues

(Agenda items 1.14, 1.15, 1.21, 1.23)

CONTENTS

AGENDA ITEM 1.14

1.14 to consider requirements for new applications in the radiolocation service and review allocations or regulatory provisions for implementation of the radiolocation service in the range 30-300 MHz, in accordance with Resolution ***611 (WRC-07)****;*

Resolution **611 (WRC-07)**: *Use of portion of the VHF band by the radiolocation service*

2/1.14/1 Executive summary

New applications in the RLS for aerospace surveillance, tracking and manoeuvring spacecraft have been identified in the VHF frequency range. VHF radiowaves propagate well through the ionosphere making this band effective and economical for space surveillance operations.

Sharing studies between the RLS and the FS/MS show the services can coexist with separation distances in the order of several hundred kilometres. The separation distances are dependent on antenna heights, additional mitigation techniques and the radar signal characteristics.

During the study period the revision of Recommendation ITU-R M.1802 and the new Report ITU-R M.2172 were developed.

Four methods have been proposed to satisfy this agenda item. Methods A, B and C propose a primary allocation to the RLS in the band 154-156 MHz with different conditions establishing protection of currently allocated services. These methods would satisfy the need for a radiolocation allocation. Method D with the proposal of no change to the Radio Regulations was also included.

2/1.14/2 Background

During the 2003-2007 study period, studies on protection criteria and technical characteristics of radiolocation systems, operating in VHF frequency range were conducted in accordance with Question ITU-R 237/8. The studies resulted in revision of Recommendation ITU-R M.1802 that contains the typical characteristics of radars, operating in the VHF band. There are other space object detection and monitoring systems used by some administrations in existing UHF radiolocation allocations, including the range 420-450 MHz.

Development of new applications in the RLS are closely related to significant growth in the number of space objects including artificial debris. These applications are planned for aerospace surveillance and tracking the launch and manoeuvring of spacecraft. They are based on the design of effective and economical radars that can be implemented in the VHF range as compared to higher frequency ranges.

VHF radio waves propagate well through the ionosphere, thus enabling various space object detection applications including remote space sensing and asteroid detection, as well as for defining the position of natural and artificial Earth satellites, from terrestrial-based radiolocation systems.

Current requirements for radiolocation systems for space-object detection from terrestrial locations in portion of the band 30-300 MHz are based on system bandwidth of up to 2 MHz. To this effect Resolution **611 (WRC-07)** was adopted at WRC-07 to consider at the next Conference a primary allocation to the RLS in the portion of the band 30-300 MHz for the implementation of new applications in the RLS, with bandwidth no larger than 2 MHz.

2/1.14/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Report: Recommendations ITU-R M.1802-1, ITU-R M.1808 and ITU-R F.758-4 and Report ITU-R M.2172.

Sharing studies between the RLS and FS/MS have been conducted in the 154-156 MHz frequency band. The studies also dealt with estimating the out-of-band emissions of RLS operating in the 154-156 MHz frequency band to assess feasibility of sharing with stations in the MMS in the frequency band above 156 MHz and stations of the RAS below 153 MHz. In spite of the fact that Resolution **611 (WRC-07)** does not invite ITU-R to conduct compatibility studies between stations of the radiolocation service and stations of other services having allocations in the adjacent frequency bands, estimation of out-of-band compatibility for stations in the RLS and the determination of appropriate sharing conditions may facilitate sharing for a new potential allocation.

The conducted studies were oriented on deriving the required protection (separation) distances between radiolocation radars and stations in the existing services.

2/1.14/4 Analysis of the results of studies

Report ITU-R M.2172 contains the studies of compatibility calculations between stations in the RLS and stations in the FS and MS in the band 154-156 MHz and a study of the impact on the MMS in the adjacent band 156-174 MHz.

2/1.14/4.1 Sharing studies with the fixed and mobile services

The sharing studies between space surveillance radars and stations operating in the FS/MS in the 154-156 MHz frequency band were conducted using two approaches.

The first approach was based on protection criteria and technical characteristics of mobile stations as specified in Recommendation ITU R M.1808 (I/N of −6 or −10 dB). The studies based on this approach show that the protection distances for the wideband signal with the I/N equal to −10 dB do not exceed 590 km assuming no polarization decoupling and 400 km assuming polarization decoupling. Narrow-band operation using an I/N of −10 dB results in a significant increase in the protection distances which could be up to 760 km assuming no polarization decoupling and up to 570 km assuming polarization decoupling. Further considering the statistical nature of interference from the RLS the protection distance would be 510 km assuming no polarization decoupling and 310 km assuming polarization decoupling for the worst-case narrow-band radiolocation signal.

The second approach used as the protection criterion for fixed/mobile stations a permitted interference field-strength level of 12 dB(μV/m) in 25 kHz. The studies based on this criteria showed that protection distances required to ensure compatibility with base stations in the MS and with stations in the FS would not exceed 314 km for no more than 0.1% of time depending on the effective radiated power of the radiolocation systems, effective antenna height of the FS and MS stations, mobile station service areas, urban and rural radio-wave propagation conditions, additional polarization decoupling, etc.

The results above are based on assumed base station antenna heights of 30 m for fixed/mobile systems. Typical base station antenna height values used for frequency sharing are 60 m to 65 m, which would lead to an additional 50 km of required separation. Furthermore, mobile base stations at high elevations are likely to receive greater interfering signals.

Applying additional mitigation techniques such as an increase in elevation angle of the radiolocation station antenna main lobe during scanning of the selected azimuths, the required protection distance can be reduced to 230 km for the narrow-band signal and to 105 km for wideband signal.

Usage of screening facilities around radars could also result in a reduction of interference caused by space surveillance radars in the direction of fixed and mobile stations.

The performed studies showed that the separation distances required for protection of radiolocation systems appear to be less than the separation distances required for protection of the mobile systems from interference produced by radiolocation systems.

2/1.14/4.2 Out-of-band compatibility studies

Though Resolution **611 (WRC-07)** does not require ITU-R to carry out compatibility studies in the adjacent frequency bands these studies were performed to support the possible allocation of the frequency band 154-156 MHz to the RLS. The feasibility of sharing between space surveillance radars operating in the frequency band 154-156 MHz and systems in the MMS operating in the frequency band 156-174 MHz and also radio astronomy systems operating in the frequency band 150.05-153 MHz were analysed.

2/1.14/4.2.1 Compatibility studies with the maritime mobile service operating in the frequency band 156-174 MHz

For the MMS safety channels aircraft search and rescue (SAR) operating on channels 16 (156.800 MHz ± 37.5 kHz) and 70 (156.525 MHz ± 12.5 kHz) and the aircraft SAR and satellites operating on automatic identification system (AIS) channels AIS 1 (161.975 MHz ± 12.5 kHz) and AIS 2 (162.025 MHz ± 12.5 kHz) a maximum interference level at the input of antenna of victim receivers of −16 dBW in these channels produced by space surveillance radar out-of-band emissions shall be maintained. The space surveillance radars considered in the studies meet this protection requirement either through the application of distance separation and/or out-of-band emissions attenuation using band pass filters.

Protection distances required to ensure in-band compatibility of stations in the RLS with mobile systems would be quite sufficient for sharing with ship and coastal maritime mobile stations in the 156-174 MHz frequency band. The usage of band pass filters at the radar transmitter output to attenuate out-of-band emissions by 30 dB allows the protection distance to be reduced to 16 km for narrow-band signals and 4 km for wide-band signals. The protection distance would be 0 km if appropriate antenna polarization discrimination is employed.

The conducted studies show that the space surveillance radars operating in the frequency band 154-156 MHz will not cause unacceptable interference to MMS receivers operating in the frequency band 156-174 MHz in the same geographical area.

2/1.14/4.2.2 Compatibility studies with RAS systems operating in the frequency band 150.05-153 MHz

The conducted studies show that the space surveillance radars operating in the frequency band 154-156 MHz will not cause unacceptable interference to radio astronomy stations operating in the frequency band 150.05-153 MHz with separation distances between 15 and 50 km depending on mitigation techniques employed.

2/1.14/5 Methods to satisfy the agenda item

2/1.14/5.1 Method A

To allocate the frequency band 154-156 MHz to the RLS on a primary basis limited to applications for space-object detection in accordance with the revised Resolution **611 (WRC-12)** as well as establishing adequate protection for systems operating in the MS and FS systems.

Advantages

– The existing lack of spectrum available for the RLS in the VHF range required for space surveillance will be solved. The use of space surveillance radar may avoid collision of spacecraft and space debris in the near-Earth orbit. It will also permit the identification of the orbits of potentially dangerous asteroids and other celestial bodies.

– Limitation of allocation (see proposed modifications to Resolution **611 (WRC-07)**) to space object detection applications will make it possible to significantly limit the number of radiolocation stations worldwide (units) and in conjunction with technical compatibility methods will provide compatibility with stations of the existing services.

– Provides compatibility with the systems in the services operating in the bands below 154 MHz and above 156 MHz.

Disadvantages

– Region 2 has a primary allocation to the RLS in the VHF range and a further allocation in Region 2 is unnecessary.

– Region 3 currently does not intend to operate space-object detection radars in the VHF band except in a band allocated to the RLS on a secondary basis. Thus additional allocation to RLS in the VHF band is not necessary in Region 3.

– There is a potential that future development of systems of other services to which the band 154-156 MHz is allocated on a primary basis will be constrained in places where space surveillance RLS stations are located.

2/1.14/5.2 Method B

Same as Method A with additional agreement seeking procedure under RR No. **9.21**.

Advantages

See Advantages of Method A and additionally:

– Additional regulatory protection of services is achieved through agreement-seeking procedure.

– Simple procedure for the Bureau to identify potentially affected administrations based on trigger field strength using propagation model of Recommendation ITU-R P.1546-4.

Disadvantages

– Region 2 has a primary allocation to the RLS in the VHF range and a further allocation in Region 2 is unnecessary.

– Region 3 currently does not intend to operate space-object detection radars in the VHF band except in a band allocated to the RLS on a secondary basis. Thus additional allocation to RLS in the VHF band is not necessary in Region 3.

– Application of the agreement-seeking procedure based on RR No. **9.21** will increase the Bureau's and administrations' workload.

– If there are some other systems in FS and MS which require higher protection than established in agreement seeking procedure there is a potential that these systems may not be protected in places where space surveillance RLS stations are located.

2/1.14/5.3 Method C

Adding a primary allocation to the RLS in [list of countries] in the frequency band 154-156 MHz in RR Article **5** by a footnote and suppression of Resolution **611 (WRC-07)**.

Advantages

– The existing lack of spectrum available for the RLS in the VHF range required for space surveillance in concerned countries will be solved. The possibility of collision avoidance of spacecraft and space debris will be provided at the near-Earth orbit.

– Simplification of the Radio Regulations by suppressing Resolution **611 (WRC-07)**. Protection of systems belonging to other services is achieved through agreement-seeking procedure in the proposed footnote.

– Some regions have already allocations to the RLS in the VHF range and an allocation by country footnote may be more appropriate.

Disadvantages

– If there are some other systems in the FS and MS which require higher protection than established in the agreement-seeking procedure then there is a potential that these systems may not be protected.

– There is the potential for harmful interference to MMS safety channels (channel 16 (156.800 MHz ± 37.5 kHz) and channel 70 (156.525 MHz ± 12.5 kHz) and the AIS channels (AIS 1 (161.975 MHz ± 12.5 kHz) and AIS 2 (162.025 MHz ± 12.5 kHz)).

– For the countries which are not in the footnote and which are wishing to implement such applications of RLS a decision of future competent WRC is required in order to add a country name into the country footnote.

2/1.14/5.4 Method D

No change to RR Article **5** and suppression of Resolution **611 (WRC-07)**.

Advantages

Potential interference from stations of the RLS to stations of the numerous incumbent services, including MMS safety channels in the 30-300 MHz range would be avoided.

Disadvantages

– The current requirements for radiolocation systems for space-object detection from terrestrial locations in portion of the band 30-300 MHz are not met.

– The operation of RLS in this case is only possible in accordance with RR No. **4.4**. This may preclude the feasibility of establishing space surveillance RLS systems due to the high risks involved - high cost of such stations and potentially low effectiveness on account of the need to protect any future stations in existing services.

– A lack of space surveillance RLS systems, or their low operating effectiveness (when operating under RR No. **4.4**), could have catastrophic consequences in terms of collision of space stations and space debris on near-Earth orbits.

2/1.14/6 Regulatory and procedural considerations

In the methods below it is proposed that the modifications to the provisions of RR Article **5** and Resolution **611 (Rev.WRC-12)** would apply from the date of the end of WRC-12.

2/1.14/6.1 Method A

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

148-223 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
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RADIO ASTRONOMY
5.149</td><td colspan="2" rowspan="2">150.05-154~~6.4875~~
FIXED
MOBILE

5.225 ~~5.226~~</td></tr>
<tr><td>153-154
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MOBILE except aeronautical mobile (R)
Meteorological Aids</td></tr>
<tr><td>154-156~~.4875~~
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RADIOLOCATION ADD 5.A114
~~5.226~~</td><td colspan="2">154-156
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MOBILE
RADIOLOCATION ADD 5.A114

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</table>

ADD

5.A114 For the use of the frequency band 154-156 MHz by the radiolocation service Resolution **611 (Rev.WRC-12**) shall apply.

2/1.14/6.2 Method B

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. **2.1**)

MOD

148-223 MHz

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ADD

5.B114 For the use of the frequency band 154-156 MHz by the radiolocation service Resolution **611 (Rev.WRC-12**) shall apply. This service shall be subject to agreement obtained under No. **9.21**.

2/1.14/6.3 Methods A and B

Modification of Resolution 611 (WRC-07) as proposed in Methods A and B

MOD

RESOLUTION 611 (Rev.WRC-~~07~~12)

Use of ~~portion of the VHF~~the 154-156 MHz band by the radiolocation service

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that the band below 300 MHz is ~~primarily~~ generally allocated to terrestrial services;

~~*b)* that the radiolocation service has no global primary allocations in the band 30-300 MHz;~~

~~c~~b) that the frequency band 138-144 MHz is allocated to the radiolocation service on a primary basis in Region 2 and additionally in China under No. **5.213** of the Radio Regulations, the frequency band 216-225 MHz is allocated to radiolocation service on a secondary basis in Region 2, and the frequency band 223-230 MHz is also allocated to radiolocation service on a secondary basis in Region 3;

c) that the frequency band 154-156 MHz is allocated to the radiolocation service on a primary basis by the World Radiocommunication Conference 2012;

d) the current regional allocations in the band 30-300 MHz to radiolocation service are used on the shared basis with other services, specifically with fixed and mobile services;

NOC

considering e) to *i)*

j) that current requirements for radiolocation systems are based on~~for~~ space-object detection applications operating from terrestrial locations in a portion of the band 30-300 MHz ~~are based on 2 MHz bandwidth systems, however allocation with a wider frequency range may provide flexibility and facilitate sharing with existing services~~;

~~*k)* that, to provide adequate spectrum for new radar systems, there is a need to allocate on a primary basis worldwide additional spectrum in the 30-300 MHz frequency range,~~

k) that the results of sharing studies between the radiolocation service and existing services are summarized in Report ITU-R M.2172,

recognizing

a) that it is important to ensure radiolocation radars can be operated compatibly with the existing primary services having allocations in the portions of the VHF band;

~~*b)* that ITU-R initiated studies in response to Question ITU-R 237/8 on characteristics and protection criteria for radars operating in the radiolocation service in the frequency band 30-300 MHz,~~

b) that in the frequency band 138 to 144 MHz, the radiolocation service is allocated on a primary basis in Region 2 and China (RR No. **5.213**) without additional constraints on the radiolocation service in the Radio Regulations,

resolves

1 that the usage of the frequency band 154-156 MHz by the radiolocation service shall be limited to space-object detection systems operating from terrestrial locations;

(Relevant to Method A)

2 that administrations planning to operate radiolocation service shall minimize the possibility of interference caused to terrestrial services and should take into account results of studies mentioned in *considering k)* when applying mitigation techniques and other measures specified in order to reduce interference;

(End of relevance to Method A)

(Relevant to Method B)

2 that administrations should take into account the need to protect the existing and future systems in fixed and mobile services;

2*bis* that for the identification of potentially affected administrations under No. **9.21** as specified in No. **5.B114** the field-strength value of 12 dB(μV/m) for 10% of time produced at 10 m above ground level in the 25 kHz reference frequency band at the border of the territory of any other administration shall be used;

(End of relevance to Method B)

3 that for the maritime mobile service safety channels aircraft SAR operating on channels 16 (156.800 MHz ± 37.5 kHz) and 70 (156.525 MHz ± 12.5 kHz) and the aircraft SAR and satellites operating on AIS channels (AIS 1 (161.975 MHz ± 12.5 kHz) and AIS 2 (162.025 MHz ± 12.5 kHz)) a maximum interference level at the input of antenna of victim receivers of −16 dBW in these channels produced by space surveillance radar out-of-band emissions shall be maintained.

~~1 to consider at WRC-11 a primary allocation to the radiolocation service in the portion of the band 30-300 MHz for the implementation of new applications in the radiolocation service, with bandwidth no larger than 2 MHz, taking into account the results of ITU-R studies;~~

~~2 that the introduction of new systems in the radiolocation service shall be avoided in the frequency bands 156.4875-156.8375 MHz and 161.9625-162.0375 MHz, which are used by distress and safety applications in the maritime mobile service,~~

~~*invites ITU-R*~~

~~1 to continue to study, as a matter of urgency, the technical characteristics, protection criteria, and other factors to ensure that radiolocation systems can operate compatibly with systems operating in accordance with the Table in service in the 30-300 MHz frequency range band;~~

~~2 to include the results of the above studies in one or more new or existing ITU-R Recommendations, if appropriate;~~

~~3 to complete these studies in time for WRC-11.~~

2/1.14/6.4 Method C

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. **2.1**)

MOD

148-223 MHz

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</table>

Option 1 for ADD 5.C114

ADD

5.C114 *Additional allocation:* in [list of countries], the band 154-156 MHz is also allocated to the radiolocation service on a primary basis. The usage of the frequency band 154-156 MHz by the radiolocation service shall be limited by systems based on space-object detection applications operating from terrestrial locations. The operation of stations in the radiolocation service in the band 154-156 MHz shall be subject to agreement obtained under No. **9.21** with administrations whose services, operating in accordance with the Table of Frequency Allocations, may be affected. For the identification of potentially affected administrations the field-strength value of 12 dB(μV/m) for 10% of time produced at 10 m above ground level in the 25 kHz reference frequency band at the border of the territory of any other administration shall be used.

Option 2 for ADD 5.C114

ADD

5.C114 *Additional allocation:* in [list of countries], the band 154-156 MHz is also allocated to the radiolocation service on a primary basis. The usage of the frequency band 154-156 MHz by the radiolocation service shall be limited by systems based on space-object detection applications operating from terrestrial locations. The operation of stations in the radiolocation service in the band 154-156 MHz shall be subject to agreement obtained under No. **9.21** with administrations whose services, operating in accordance with the Table of Frequency Allocations, may be affected. For the identification of potentially affected administrations except those in Region 3, the field-strength value of 12 dB(μV/m) for 10% of time produced at 10 m above ground level in the 25 kHz reference frequency band at the border of the territory of any other administration shall be used. For the identification of potentially affected administrations in Region 3, the I/N value of −6 dB (N = −161 dBW/4 kHz) or −10 dB for applications with greater protection requirements, such as Public Protection and Disaster Relief (PPDR (N = −161 dBW/4 kHz)) for 1% of time produced at 60 m above ground level at the border of the territory of any other administration shall be used.

SUP

RESOLUTION 611 (WRC-07)

Use of a portion of the VHF band by the radiolocation service

2/1.14/6.5 Method D

NOC

ARTICLE 5

SUP

RESOLUTION 611 (WRC-07)

Use of a portion of the VHF band by the radiolocation service

AGENDA ITEM 1.15

1.15 to consider possible allocations in the range 3-50 MHz to the radiolocation service for oceanographic radar applications, taking into account the results of ITU-R studies, in accordance with Resolution ***612 (WRC-07)****;*

Resolution **612 (WRC-07)**: *Use of the radiolocation service between 3 and 50 MHz to support high-frequency oceanographic radar operations*

2/1.15/1 Executive summary

A significant increase of interest and use of oceanographic radar has been ongoing since the 1970s on a global basis. Work under this agenda item has identified potential spectrum allocations in terms of both compatibility with other users and effectiveness for ocean measurements.

The ITU-R has conducted theoretical interference analyses between generic oceanographic radars and fixed and mobile systems. The analyses showed that, under certain propagation modes, interference to a fixed or mobile station could occur as a result of either ground-wave or sky-wave propagation, when the fixed or mobile service transmission falls within the sweep bandwidth of the oceanographic radar. Ground-wave interference path component studies have demonstrated compatibility with existing services based on separation distance. Sky-wave path component studies demonstrate compatibility is largely dependent on ionospheric conditions, whether interference occurs through the main or back lobe directions, and that the interference manifests as high repetition rate impulsive interference.

The ITU also investigated several interference mitigation techniques that could be used to reduce the interference from oceanographic radars to fixed and mobile systems. These include 1) reducing ground-wave interference by adhering to the separation distances that have been outlined in Table 6 and Table 8, 2) implementing time synchronization of multiple radar transmissions within the same swept bandwidth to reuse the frequency, 3) limiting the EIRP to 25 dBW or less, and 4) implementing back lobe attenuation on the transmitting antenna.

Three methods have been proposed to satisfy this agenda item. Method A proposes a primary allocation to the RLS in portions of the frequency band 3 to 50 MHz with a Resolution to restrict the application to oceanographic radar and the operational characteristics. Method B suggests a secondary allocation to the RLS in portions of the frequency band 3 to 50 MHz. Method C puts forward a combination of primary and secondary allocations to the RLS in portions of the frequency band 3 to 50 MHz.

2/1.15/2 Background

The possible radiolocation allocations in the range 3-50 MHz could be used for the operation of oceanographic radars that monitor the sea surface for wave heights, currents and tracking of large objects. These radars will have an operational range which will not be greater than 300 km.

Oceanographic radars have been successfully operating in the 3 to 50 MHz range since the 1970s under RR No. **4.4** in some countries (United States, Germany, France, Australia, Republic of Korea, India, Japan, China, and the United Kingdom). Experimental use has allowed the development of radar technology and the identification of suitable spectrum in terms of both compatibility with other users and effectiveness for ocean measurements The need for additional data to mitigate the effects of disasters, including tsunamis, to understand climate change, and to ensure safe maritime travel has led to the consideration of operational use of oceanographic radar networks on a global basis. Increased reliance on the data from these systems for maritime safety, disaster response as well as oceanographic, climatological, and meteorological operations have driven the need to improve the regulatory status of the spectrum used by oceanographic radars while taking into account the protection of existing allocated services.

WRC-12 Agenda item 1.15 was established with the understanding that spectrum would be allocated on a shared basis. Reallocation of spectrum from an existing allocated radio service to the RLS is not the intent.

2/1.15/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R P.368, ITU-R P.372, ITU-R P.533, ITU-R M.1874.

New relevant ITU-R Report: ITU-R M.[RLS 3-50 MHz SHARING].

Multiple sub-bands are required within the range of 3 to 50 MHz to provide long-range data as well as high resolution data. Lower frequencies support long-range operation whereas higher frequency ranges support higher resolution data collection. High resolution data collection at long ranges is typically not achievable since the 150 kHz bandwidth required for high resolution data is not available at frequencies around 4.5 MHz. Manufacturers and researchers have settled on frequencies near 4.5 MHz ± 1 MHz, 9 MHz ± 1 MHz, 13 MHz ± 1 MHz, 16 MHz ± 1 MHz, 26 MHz ± 4 MHz and 43 MHz ± 4 MHz to meet the various scientific and operational requirements. This does not imply that 2 to 6 MHz are required in each range for operation of a network of oceanographic ocean observing radars. The actual spectrum requirements are much lower:

– For long-range operation (low frequencies around 4.5 MHz, 9 MHz, 13 MHz and 16 MHz) 2 separate operational bandwidths of 25 to 100 kHz would satisfy system requirements in each frequency range of operation for oceanographic radar.
– For short-range operation (around 26 MHz), 2 separate operational bandwidths of 100 to 150 kHz would satisfy system requirements for oceanographic radar.
– For short-range operations around 43 MHz, 2 separate operational bandwidths of 150 to 500 kHz would satisfy system requirements for oceanographic radar.

Sharing studies have focused on in-band compatibility in the bands used by FS and/or LMS only for the following reasons:

– Sharing with amateur, broadcasting, and radio astronomy services seems to be difficult due to their protection requirements.
– Sharing with maritime mobile, aeronautical mobile (R) and standard time and frequency services should be avoided due to the safety aspects of their operations.

The bands, considered most suitable, are listed in Table 1 below.

TABLE 1

The most suitable frequency bands for oceanographic radar operations

Band	Operational needs for oceanographic radars (resolution)	Most suitable bands	Services having allocations in the specified bands	RR Nos. (additional or alternative allocations) and/or Comments
4.5 ± 1 MHz	2 × 50 kHz (3 km)	3 155-3 200 kHz	FIXED, MOBILE except AM(R)	**5.117**, (5)
		4 438-4 650 kHz	FIXED, MOBILE except AM(R) – Regions 1 & 2 except AM – Region 3	(3), (5) (5)
		5 060-5 450 kHz	5 060-5 250 kHz FIXED, Mobile except AM 5 250-5 450 kHz FIXED, MOBILE except AM	**5.133**, (5) (3), (5)
9 ± 2 MHz	2 × 100 kHz (1.5 km)	7 450-8 100 kHz 9 040-9 400 kHz 9 900-9 995 kHz	FIXED, MOBILE except AM(R) FIXED FIXED	(3), (5) - -
13 ± 1 MHz	2 × 100 kHz (1.5 km)	12 100-12 230 kHz 13 410-13 570 kHz 13 870-14 000 kHz	FIXED FIXED, Mobile except AM(R) FIXED, Mobile except AM(R)	- **5.150**, (1), (3) -
16 ± 2 MHz	2 × 100 kHz (1.5 km)	14 350-14 990 kHz 15 800-16 360 kHz	FIXED, Mobile except AM(R) FIXED	(2), (3), (5) **5.153**
26 ± 4 MHz	2 × 150 kHz (1 km)	22 855-23 200 kHz 24 000-24 890 kHz 25 010-25 070 kHz 25 210-25 550 kHz 26 175-27 500 kHz 29 700-30 005 kHz	FIXED FIXED, LAND MOBILE FIXED, MOBILE except AM FIXED, MOBILE except AM FIXED, MOBILE except AM FIXED, MOBILE	**5.156** - (5) (1), (5) **5.150**, (4), (5) **5.150**, (2), (5)
43 ± 4 MHz	2 × 500 kHz (250 m)	39-39.986 MHz 40.02-40.98 MHz 41.015-44 MHz 44-47 MHz	FIXED, MOBILE FIXED, MOBILE FIXED, MOBILE FIXED, MOBILE	(2), (5) **5.150**, (4), (5) **5.160**, **5.161**, (4), (5) **5.162**, **5.162A**, (4), (5)

Comments:

1) The frequency bands 13 360-13 410 kHz and 25 550-25 670 kHz are allocated to the RAS.

2) The frequency bands 14 815-14 825 kHz and 29 700-39 500 kHz, which are allocated to the MS, are used by MMS in China. The band 14 815-14 825 kHz is used by some safety systems in the MMS in China.

3) The frequency bands 4 438-4 538, 5 250-5 350, 7 900-8 100, 13 410-13 510 and 14 350-14 450 kHz which are allocated to the mobile service are used by maritime mobile service in Viet Nam.

4) The frequencies 26 574 kHz, 40.68, 42.89 and 44.87 MHz are assigned to land mobile stations for the purpose of broadcasting auxiliary service (radio microphones) in Japan.

5) Maritime systems are in use in bands allocated to the MS.

An oceanographic radar installation may use one or more of the frequency bands listed in Table 1, and it is possible to share the same bandwidth by several oceanographic radar systems.

Radars do not hop between frequency bands. Multiple frequency bands ranging from 4.5 MHz to 47 MHz are required to meet a variety of applications.

For potential RLS allocations in the bands in Table 1 it is imperative to protect the existing frequency assignments in comments 1) to 5) from harmful interference of oceanographic radars.

2/1.15/4 Analysis of the results of studies

Report ITU-R M.[RLS 3-50 MHz SHARING] contains sharing studies between oceanographic radiolocation systems and the FS and the LMS in the bands 4.5 MHz ± 1 MHz, 9 MHz ± 1 MHz, 13 MHz ± 1 MHz, 16 MHz ± 1 MHz, 26 MHz ± 4 MHz and 43 MHz ± 4 MHz are summarized below.

2/1.15/4.1 Ground-wave interference path

Report ITU-R M.[RLS 3-50 MHz SHARING] shows that separation distances between 80 km and 170 km are required in order to protect systems operating under allocations to the FS and MS from oceanographic radar interference across land paths. These values represent worst-case conditions. In reality these protection distances are likely to be shorter because oceanographic radars are located at sea level and any topographic relief behind the radar will mask the emissions towards the land.

TABLE 2

Summary of protection distances relative to oceanographic system ground-wave propagation through land path

Band (MHz)	Separation distances for rural (km)			Separation distances for quiet rural (km)		
	19** (dBW)	16 (dBW)	10 (dBW)	19** (dBW)	16 (dBW)	10 (dBW)
5	120	110	80	170	150	120
9	100	80	70	130	110	90
13	100	80	60	110	100	80
16*	80	70	60	100	100	80
25*	80	70	60	100	90	80
42*	80	70	60	100	90	80

* Values at these frequencies are often similar due to the fact that the calculations round up to the next multiple of 10 km.

** The 19 dBW e.i.r.p. corresponds with a 2 dBi transmit antenna gain in the horizontal direction for ground-wave propagation in comparison to the higher gain of 8 dBi and a maximum e.i.r.p of 25 dBW that apply at higher elevation angles and to the sky-wave analysis.

Report ITU-R M.[RLS 3-50 MHz SHARING] shows that separation distances between 200 km and 920 km are required in order to protect FS and MS systems from interference from oceanographic radars across sea paths. These values represent worst-case conditions.

TABLE 3

Summary of protection distances relative to oceanographic system ground-wave propagation through sea path

Band (MHz)	Separation distances for rural (km)			Separation distances for quiet rural (km)		
	19* (dBW)	16 (dBW)	10 (dBW)	19* (dBW)	16 (dBW)	10 (dBW)
5	790	750	670	920	880	800
9	590	560	500	670	640	580
13	480	440	400	520	490	450
16	390	370	340	450	430	390
25	280	270	240	320	300	280
42	200	190	180	230	220	200

* The 19 dBW e.i.r.p. corresponds with a 2 dBi transmit antenna gain in the horizontal direction for ground-wave propagation in comparison to the higher gain of 8 dBi and a maximum e.i.r.p of 25 dBW that apply at higher elevation angles and to the sky-wave analysis.

2/1.15/4.2 Sky-wave interference path

ITU-R has studied three cases. Interference via the sky-wave path is highly variable, depending on sunspot activity, season, the time of day, and frequency. Results and analysis of the studies are contained in Report ITU-R M.[RLS 3-50 MHz Sharing].

Two studies evaluated interference impact based on the percentage of time that the interference to noise ratio exceeded −6 dB. These studies considered the generic oceanographic radar systems and used ITU recommended propagation and noise models. The first study examined back-lobe interference within the European region. It was found that $I/N = -6$ dB was not exceeded for more than 18.4% of the time, for any of the oceanographic radar systems. The second study examined worldwide interference caused by a directional antenna. The short-term interference time ratio was used to average the signal level. The results show that $I/N = -6$ dB was not exceeded for more than 1.6% of the time and globe.

A third study showed that the S/N of viable wanted links is degraded below minimum performance thresholds for no more than 12.7% of the wanted links, distributed over varying locations and time.

In the case of sky-wave propagation, the sharing situation with oceanographic radars with an equivalent isotropically radiated power 25 dBW is not significantly different than the sharing situation between presently co-allocated systems of the FS and MS. An oceanographic radar operates at a transmit power similar to many lower power mobile stations (in the order of 50 W). However the oceanographic radar utilizes a bandwidth wider than typical fixed and mobile stations. This causes the oceanographic radar signal to manifest itself as a repetitive interference to the fixed and mobile service systems.

The ITU-R studies evaluating compatibility between a representative oceanographic radar (RLS) and representative systems in the FS and MS show that periodic interference will occur between oceanographic radars and these systems. The level of interference is largely dependent upon ionospheric conditions, which affect the reliability and link margins of the wanted fixed and mobile links. Propagation conditions between an oceanographic radar and a victim receiver operating in the FS or MS are also important factors determining the interference level.

2/1.15/4.3 Spectrum observation

ITU-R also analysed the possibility of sharing between systems operating in the RLS and systems of other existing services in the 3-50 MHz band. Even though the study was conducted within a limited geographical area and during a small part of the sunspot cycle, the results of the study may be useful for the consideration of feasibility of sharing between oceanographic radars and systems of incumbent services in the band 3-50 MHz.

The results showed that there appeared to be sufficient spectral capacity within existing allocations above 20 MHz that could accommodate allocations to the RLS to meet the needs of oceanographic radars. However below 20 MHz it was observed that there was extensive use of the frequency bands by other services.

2/1.15/5 Methods to satisfy the agenda item

2/1.15/5.1 Method A

Add new primary allocations to RLS in RR Article **5** in some, or portions of the frequency bands 3 155-3 200 kHz, 4 438-4 650 kHz, 5 060-5 450 kHz, 7 450-8 100 kHz, 9 040-9 400 kHz, 9 900-9 995 kHz, 12 100-12 230 kHz, 13 410-13 570 kHz, 13 870-14 000 kHz, 14 350-14 990 kHz, 15 800-16 350 kHz, 22 855-23 200 kHz, 24 000-24 890 kHz, 25 010-25 070 kHz, 25 210-25 550 kHz, 26 175-27 500 kHz, 39-39.986 MHz, 40.02-40.98 MHz and 41.015-47 MHz. Each allocation would be subject to Resolution **612 (Rev.WRC-12)** referred to in a new RR No. **5.A115** which would apply to each new allocation.

Advantages:

– Primary allocations in sub-bands answer the operational need of safety systems (e.g. pollution and tsunami alert system) partially based on oceanographic radars.

– Provides spectrum for operation of oceanographic radar for measurement of coastal surface conditions to support environmental, oceanographic, meteorological, climatological, maritime and disaster relief operations.

– Identifies areas of the spectrum in the range 3 to 50 MHz where oceanographic radars may operate on a shared basis with existing allocated services.

– The level of compatibility with incumbent services is improved through a Resolution and a footnote, which include technical and operational constraints.

Disadvantages:

– Increases congestion in the bands due to the need for existing allocated services in sharing the spectrum with oceanographic radar locations**.**

– Some frequency bands are extensively used by terrestrial radiocommunication services in some geographical areas for land and sea applications. Sufficient protection of existing services or stable operation of oceanographic radar in these bands may be difficult.

– May not fully satisfy the oceanographic potential functions for long range observation of sea conditions by limiting the output power of the oceanographic radar in the Resolution.

2/1.15/5.2 Method B

Allocate some, or portions of the frequency bands 3 155-3 200 kHz, 4 438-4 650 kHz, 5 060-5 450 kHz, 7 450-8 100 kHz, 9 040-9 400 kHz, 9 900-9 995 kHz, 12 100-12 230 kHz, 13 410-13 570 kHz, 13 870-14 000 kHz, 14 350-14 990 kHz, 15 800-16 350 kHz, 22 855-23 200 kHz, 24 000-

24 890 kHz, 25 010-25 070 kHz, 25 210-25 550 kHz, 26 175-27 500 kHz, 39-39.986 MHz, 40.02-40.98 MHz and 41.015-47 MHz on a secondary basis to the RLS. Also suppress Resolution **612 (WRC-07)**.

Advantages:

– A secondary allocation to the RLS in candidate bands would increase the oceanographic radar potential for use on environmental protection, disaster preparedness, public health protection, meteorological operations, coastal and maritime safety and enhancement of national economies.

– Priority of existing services is maintained and future development of systems in these services is not constrained.

Disadvantages:

– Some interference mitigation techniques may need to be applied so that the interfering powers would not exceed the protection criteria of primary allocated services.

– A secondary allocation may limit the operational sustainability and suppresses the potential and availability of oceanographic radar data acquisition, in particular for use on disaster preparedness, and coastal and maritime safety.

– Secondary allocations in all bands put some uncertainty on the long-term use of radar systems which require time and money in their design and tests.

2/1.15/5.3 Method C

Allocate some, or portions of the frequency bands 3 155-3 200 kHz, 4 438-4 650 kHz, 5 060-5 450 kHz, 7 450-8 100 kHz, 9 040-9 400 kHz, 9 900-9 995 kHz, 12 100-12 230 kHz, 13 410-13 570 kHz, 13 870-14 000 kHz, 14 350-14 990 kHz, 15 800-16 350 kHz, 22 855-23 200 kHz, 24 000-24 890 kHz, 25 010-25 070 kHz, 25 210-25 550 kHz, 26 175-27 500 kHz, 39-39.986 MHz, 40.02-40.98 MHz and 41.015-47 MHz on primary and/or secondary basis to the RLS. Each new primary allocation could be subject to Resolution **612 (Rev.WRC-12)** referred to in a new RR No. **5.A115** which would apply to each new primary allocation.

Advantages:

– Advantages as found in Method A (2/1.15/5.1) would be appropriate for primary allocations.

– Advantages as found in Method B (2/1.15/5.2) would be appropriate for secondary allocations.

Disadvantages:

– Disadvantages as found in Method A (2/1.15/5.1) would be appropriate for primary allocations.

– Disadvantages as found in Method B (2/1.15/5.2) would be appropriate for secondary allocations.

2/1.15/6 Regulatory and procedural considerations

In the methods below it is proposed that the modifications to the provisions of RR Article **5** and Resolution **612 (Rev.WRC-12)** would apply from the date of the end of WRC-12.

2/1.15/6.1 Method A

Modification to the provisions of RR Article **5** for each frequency band allocated to the RLS at WRC-12.

ADD

5.A115 For the use of the bands aa-bb kHz, cc-dd kHz, … by the radiolocation service, Resolution **612 (Rev.WRC-12)** applies. (WRC-12)

MOD

APPENDIX 4 (Rev.WRC-~~07~~12)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

TABLE 1

Characteristics for terrestrial services

		Notice related to **Description of data items and requirements**								
…										
3		**CALL SIGN AND STATION IDENTIFICATION**								
3.1	**3A1**	the call sign used in accordance with Article **19** In the case of a transmitting station, for the fixed service below 28 MHz mobile service, meteorological aids service, radiolocation service between 3 and 50 MHz (operating in accordance with Resolution **612 (Rev.WRC-12))**, or standard frequency and time signal service, in the application of Article **11**, required if the station identification (3A2) is not provided	**O**	**O**	+				**O**	**3A1**
3.2	**3A2**	the station identification used in accordance with Article **19** In the case of a transmitting station, for the fixed service below 28 MHz mobile service, meteorological aids service, radiolocation service between 3 and 50 MHz (operating in accordance with Resolution **612 (Rev.WRC-12))**, or standard frequency and time signal service, in the application of Article **11**, required if the call sign (3A1) is not provided	**O**	**O**	+				**O**	**3A2**
…										

ARTICLE 19

Identification of stations

Section I – General provisions

MOD

19.1.1 In the present state of the technique, it is recognized nevertheless that the transmission of identifying signals for certain radio systems (e.g. radiodetermination, radio relay systems and space systems) is not always possible. However, for stations in the radiolocation service, notified to the Bureau or brought into use after 15 February 2012, in bands between 3 and 50 MHz (operating in accordance with Resolution **612 (WRC-12)**), the provisions of No. **19.51** shall be applied.

*Editorial Note: The frequency range and date in the proposed new text in **19.1.1** may change depending on the results of WRC-12.*

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RESOLUTION 612 (Rev.WRC-~~07~~12)

Use of the radiolocation service between 3 and 50 MHz to support ~~high frequency~~ oceanographic radar operations

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that there is increasing interest, on a global basis, in the operation of ~~high-frequency~~ oceanographic radars for measurement of coastal sea surface conditions to support environmental, oceanographic, meteorological, climatological, maritime and disaster mitigation operations;

b) that ~~high-frequency~~ oceanographic radars are also known in parts of the world as HF ocean radars, HF wave height sensing radars or HF surface wave radars;

c) that ~~high-frequency~~ oceanographic radars operate through the use of ground-wave propagation;

d) that ~~high-frequency~~ oceanographic radar technology has applications in global maritime domain awareness by allowing the long-range sensing of surface vessels, which provides a benefit to the global safety and security of shipping and ports;

e) that operation of ~~high-frequency~~ oceanographic radars provides benefits to society through environmental protection, disaster preparedness, public health protection, improved meteorological operations, increased coastal and maritime safety and enhancement of national economies;

f) that ~~high-frequency~~ oceanographic radars have been operated on an experimental basis around the world, providing an understanding of spectrum needs and spectrum sharing considerations, as well as an understanding of the benefits these systems provide;

~~*g)* that between 3 and 50 MHz, no radiolocation allocations exist;~~

~~h~~*g)* that performance and data requirements dictate the regions of spectrum that can be used by ~~high-frequency~~ oceanographic radar systems for ocean observations,

recognizing

a) that ~~high-frequency~~ oceanographic radars have been operated ~~on an experimental basis for more than 30 years~~ under provision No. **4.4** since the 1970s by several administrations;

b) that developers of the experimental systems have implemented techniques to make the most efficient use of the spectrum and mitigate interference to other radio services;

~~*c)* that the objective of Question ITU-R 240/8 is to study the most appropriate frequency bands for the operation of high-frequency oceanographic radars considering both radar system requirements and the protection of existing services;~~

c) that for the purpose of protecting existing services from harmful interference, received interference by those services from oceanographic radars shall not exceed a power flux-density with an I/N ratio of −6 dB in an area where its radio noise is categorized to the rural and the quiet rural defined in Recommendation ITU-R P.372-10;

d) ~~that high-frequency oceanographic radars operate with peak power levels on the order of 50 W~~that for the purpose of protecting existing services from harmful interference, oceanographic radars' impact via ground-wave propagation can be checked by Report ITU-R M.[RLS 3-50 MHz SHARING] based on Recommendation ITU-R P.368-9,

resolves

~~1 to invite ITU-R to identify high-frequency oceanographic radar system applications between 3 and 50 MHz, including bandwidth requirements, appropriate portions of this band for these applications, and other characteristics necessary to conduct sharing studies;~~

1 that, when oceanographic radars are notified to the Bureau, the notification shall be in accordance with No. **11.2** of the RR and shall contain the station identification (call sign) (Appendix **4** and Article **19**);~~2 to invite ITU-R to conduct sharing analyses between the radiolocation service applications identified under *resolves* 1 and incumbent services in the bands identified to be suitable for the operation of high-frequency oceanographic radar systems;~~

2 that the peak e.i.r.p. of an oceanographic radar shall not exceed 25 dBW;

~~3 that, if compatibility with existing services is confirmed under *resolves* 2, to recommend that WRC-11 consider allocations to the radiolocation service in several suitable bands between 3 and 50 MHz, as determined in the ITU-R studies, each band not exceeding 600 kHz, for the operation of oceanographic radars,~~

3 that for transmission of the station identification machine readable code shall be used (No. **19.18**);

4 that the separation distance[1] between an oceanographic radar and the border of a neighbouring country should be higher than the distances specified in the following table unless prior coordination agreements between neighbouring countries are undertaken:

---

[1] Given the difficulty in predicting the harmful interference from the sky-wave propagation the separation distance must be understood to be the minimum required separation distance beyond which an oceanographic radar will not cause harmful interference into co-primary service receivers via ground-wave propagation. The rural or quiet rural environment applies to the location of the fixed or mobile service receiver, not the radiolocation system location.

Frequency (MHz)	Land path		Sea or mixed path	
	Rural	Quiet rural	Rural	Quiet rural
5 (± 1 MHz)	120	170	790	920
9 (± 1 MHz)	100	130	590	670
13 (± 1 MHz)	100	110	480	520
16 (± 1 MHz)	80	100	390	450
25 (± 3 MHz)	80	100	280	320
42 (± 3 MHz)	80	100	200	230

Editorial Note: Frequency ranges in the above table may change depending on the results of WRC-12.

~~*invites administrations*~~

~~to contribute to the sharing studies between the radiolocation service and incumbent services in portions of the 3 to 50 MHz band identified as suitable for high-frequency oceanographic radar operations,~~

~~*invites ITU-R*~~

~~to complete the necessary studies, as a matter of urgency, taking into account the present use of the allocated band, with a view to presenting, at the appropriate time, the technical information likely to be required as a basis for the work of WRC-11,~~

~~*instructs the Secretary-General*~~

~~to bring this Resolution to the attention of the International Maritime Organization (IMO), World Meteorological Organization (WMO) and other international and regional organizations concerned.~~

2/1.15/6.2 Method B

Modification to the provisions of RR Article **5** for each frequency band allocated to the RLS at WRC-12.

SUP

RESOLUTION 612 (WRC-07)

Use of the radiolocation service between 3 and 50 MHz to support high-frequency oceanographic radar operations

2/1.15/6.3 Method C

Same as regulatory text under Method A (RR No. **5.A115**) and Resolution **612 (Rev.WRC-12)** for those bands allocated to the RLS on a primary basis only.

AGENDA ITEM 1.21

*1.21 to consider a primary allocation to the radiolocation service in the band 15.4-15.7 GHz, taking into account the results of ITU-R studies, in accordance with Resolution **614 (WRC-07)**;*

Resolution **614 (WRC-07)**: *Use of the band 15.4-15.7 GHz by the radiolocation service*

2/1.21/1 Executive summary

Sharing studies were undertaken with representative systems of radiocommunication services that would be co-allocated with the RLS in all or portions of the 15.4-15.7 GHz band, and compatibility studies were carried out with the RAS, allocated in the adjacent passive band. In the case of the primary FSS allocation in portions of the 15.4-15.7 GHz band, the FSS system characteristics used for the sharing study were taken from a superseded revision of ITU-R S-Series Recommendation that contained characteristics for sharing studies. Currently there are no operational FSS systems operating in this band.

Furthermore, while there are ICAO and industry standards available, there are no published ITU-R M-Series Recommendations with ARNS system parameters for sharing studies. However, there are two published Recommendations ITU-R S.1340 and ITU-R S.1341 that provide information on some types of non-ICAO standard systems for sharing study between mobile satellite system feeder links and ARNS systems in portions of the 15.4−15.7 GHz band, which were used in the analyses for this agenda item.

The results of all the studies demonstrate that the operation of radiolocation systems in the 15.4-15.7 GHz band are compatible with adjacent-band and co-frequency allocations, provided that appropriate mitigation techniques are adopted.

All four methods proposed to satisfy this agenda item include suppression of Resolution **614 (WRC-07)**:

– Method A proposes a new primary allocation for the RLS in the 15.4-15.7 GHz frequency band and a possible resolution providing further clarification on the use of this band as well as taking practical steps to protect ARNS and RAS in the adjacent 15.35-15.4 GHz frequency band;

– Method B proposes a new primary allocation for the RLS in the 15.5-15.7 GHz frequency band and a possible resolution providing further clarification on the use of this band as well as taking practical steps to protect ARNS and RAS in the adjacent 15.35-15.4 GHz frequency band;

– Method C proposes a new primary allocation for the RLS in the 15.55-15.7 GHz frequency band and a possible resolution for protection of ARNS and RAS systems in the adjacent band.

– Method D proposes no changes to the Radio Regulations.

2/1.21/2 Background

Resolution **614 (WRC-07)** invites the ITU-R "to study the technical characteristics, protection criteria, and other factors to ensure that radiolocation systems can operate compatibly with systems in the aeronautical radionavigation and fixed-satellite services in the band 15.4-15.7 GHz, taking account of the safety nature of the aeronautical radionavigation service;" "to study, as a matter of urgency, the compatibility between the radiolocation service in the band 15.4-15.7 GHz and RAS in the adjacent band 15.35-15.40 GHz;" and "to include the results of the studies in one or more new or existing ITU-R Recommendations." *Invites* 4 of Resolution **614 (WRC-07)** states that the studies need to be completed in time for WRC-12.

The band 15.4-15.7 GHz is allocated on a primary basis to ARNS. There are no ICAO-standard ARNS systems currently operating in this band although ICAO standards exist for aircraft weather radar systems. A few administrations have used non-ICAO standard aircraft landing systems (ALS) in this band.

The 15.43-15.63 GHz portion of the band is also allocated on a primary basis to the FSS (Earth-to-space), subject to RR No. **5.511A**. RR No. **5.511A** limits the use of 15.43-15.63 GHz FSS allocations to feeder links for non-GSO MSS in both space-Earth and Earth-space directions. RR No. **5.511D** also governs the use of the 15.4-15.43 GHz and 15.63-15.7 GHz bands by fixed-satellite systems. Currently, there are no FSS systems operating in the 15.4-15.7 GHz band. However, per RR No. **5.511A**, use of FSS (space-to-Earth) links in the 15.43-15.63 GHz band is limited to systems for which advance publication information has been received by the Bureau prior to 2 June 2000. RR No. **5.511D** allows fixed-satellite systems for which complete information for advance publication information had been received by the Bureau by 21 November 1997 to operate in the bands 15.4-15.43 GHz and 15.63-15.7 GHz in the space-to-Earth direction and 15.63-15.65 GHz in the Earth-to-space direction. However, no systems were filed and subsequently brought into use in this time-frame under these footnotes. Therefore RR Nos. **5.511A** and **5.511D** can be revised to reflect the current situation.

2/1.21/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Report: Recommendations ITU-R P.528, ITU-R RA.769, ITU-R S.1328, ITU-R S.1340, ITU-R S.1341, ITU-R M.1730, Report ITU-R M.2170.

The studies undertaken in support of this agenda item addressed sharing with systems of three services that may be impacted by a radiolocation allocation in 15.4-15.7 GHz: the ARNS, the RAS operating in the 15.35-15.4 GHz band, and the FSS, whose allocation is described in § 2/1.21/2. The details of these studies are contained in Report ITU-R M.2170.

Recommendation ITU-R M.1730 contained technical characteristics and protection criteria for radiolocation radars in the band 15.7-17.3 GHz only, as the band 15.7-17.3 GHz is already allocated to the RLS on a primary basis. Recommendation ITU-R M.1730-1 includes the characteristics of the systems relevant to this agenda item; this system is System-6. System-6 radar antenna is typically nose-mounted on the aircraft. A typical operational height value of 8 500 metres was used in the sharing study. The studies were performed with 100% duty cycle. However, System-6 maximum duty cycle is 20%.

While specific mitigation techniques have not been included in the studies for this agenda item, those discussed in considering *k)*, *l)* and *m)* of Resolution **614 (WRC-07)** may be relevant to radars in this band and if so may be employed to help reduce or eliminate the required separation distances presented in section 1/1.2/4.

For the ALS analysis, the studies used worst-case main lobe-to-main lobe antenna coupling. Figures 6 (a) and (c) from Recommendation ITU-R P.528 were used to derive the transmission loss. Also worst-case half power ALS transmitter values were used. The characteristics of the ALS used in this analysis are found in Table 2 of Report ITU-R M.2170.

The RAS has primary status in the 15.35-15.4 GHz passive band with provisions of RR Nos. **5.340** and **5.511A** pertaining to this band. The 15.35-15.4 GHz passive band is also allocated to the EESS and SRS (passive) § 4.1 of Report ITU-R M.2170 details 30 radio astronomy systems that may use the 15.35-15.4 GHz band. The criteria given in Recommendation ITU-R RA.769 were used in this analysis. For the RAS analysis the worst-case scenario was used assuming that a RAS system does not implement any filtering to limit and shapes the received signal in the allocated band and System-6 main lobe to an assumed RAS system 0 dBi side-lobe coupling.

There is no ITU-R Recommendation or Report in force that specifies frequency-sharing characteristics of any FSS system in any portion of the 15.4-15.7 GHz band. A review of Recommendation ITU-R S.1328-4 revealed that currently there are no systems specified for this band. However, Recommendation ITU-R S.1328-3, the previous version of this Recommendation, included several FSS systems. Therefore FSS system characteristics from Recommendation ITU-R S.1328-3 were used for the compatibility studies contained in Report ITU-R M.2170.

There are no ITU-R Recommendations in force that describe frequency-sharing characteristics of ARNS systems in the 15.4-15.7 GHz band. However, Annex 1 of Recommendation ITU-R S.1340 specifies parameters of some types of aeronautical radionavigation systems that were used in a sharing study between mobile satellite system feeder links and ARNS systems in portions of the 15.4-15.7 GHz band. These ARNS system characteristics were used in the compatibility studies contained in Report ITU-R M.2170.

2/1.21/4 Analysis of the results of studies

ALS analysis: § 2.2 of Report ITU-R M.2170 details the coexistence analysis between non-ICAO ALS using the allocation to ARNS and the radiolocation system and gives an overview and characteristics of an ALS that operates in the 15.4-15.7 GHz band which is implemented by some administrations, since no characteristics of ALSs that operate in the 15.4-15.7 GHz band are not found in ITU Recommendations or Reports.

For cases of far antenna side lobe to far antenna side-lobe coupling analysis, no separation distances are required.

In the worst-case, co-frequency scenario where the distance between the wanted ALS transmitter and the wanted ALS aircraft is 25 km; a separation distance of 55 km is required between System-6 and the ALS aircraft to ensure electromagnetic compatibility between ALS locations and the radiolocation system. In those cases where a deployable ALS station location is not known, separation distances are still relevant but it may be difficult to put into practice; therefore alternative coordination methods for protecting those cases may need to be established between administrations, as necessary.

RAS system analysis: the worst-case scenario shows that the out of band signal received from System-6 can be as high as to 55 dB above the protection threshold of −202 dBW at a slant distance of approximately 12 km.

The results show that when System-6 is lined up in azimuth with the RAS system, the possibility of strong interference exists. The probability of System-6 intentionally pointing at RAS stations for a long duration is very low; given that the RAS system locations are known, System-6 can use this information to avoid pointing in known RAS locations. System-6 mitigation methods can be used to reduce the interference duration or completely avoid interfering with RAS stations. Some examples of mitigation methods would employ adjusting antenna beam elevation and azimuth pointing angles, increasing the aircraft speed to minimize the interference duration, changing the aircraft height to change the interference coupling geometry, adjusting waveform parameter or a combination of all of them. Typically System-6 would point its antenna beam at or below −20 degrees.

FSS system analysis: Recommendation ITU-R S.1328-3, a superseded version of this Recommendation, included several FSS systems that have been studied. The result from the sharing studies shows that in all cases threshold requirements are met by System-6. Therefore, System-6 radar and the FSS satellites and earth stations can both operate compatibly in the 15.4-15.7 GHz band.

ARNS system analysis: As indicated in § 2/1.21/3, the system characteristics found in Recommendation ITU-R S.1340 are used for this analysis. In general, the results indicate that separation distances are required for these systems to coexist. The results of Report ITU-R M.2170 show that all four aeronautical radionavigation systems described in Recommendation ITU-R S.1340 will require separation distances in order to share the same spectrum with System-6, see § 6.2. It should be noted that many ITU-R Recommendations such as those in the 9 GHz band (WRC-07 Agenda item 1.3), have demonstrated that radiolocation and radionavigation radars can share the same spectrum.

The surface-based radar (SBR) systems have known physical locations; they operate at a few airports around the globe. During its operation, System-6 must avoid pointing its antenna beam at these known locations to preclude interference. One separation distance was calculated to be 30 km using a theoretical square pulse. With proper spectrum management such restrictions on System-6 is manageable and potential interference with the SBR systems can be avoided.

The aircraft multipurpose radar is placed on aircraft. In a given aircraft operational volume, the probability of these systems being at the same exact height, lined up in azimuth and pointing directly at each other is very low. The results show that in rare cases, when everything is in the proper alignment, interference is possible for a short duration because both System-6 and the radar sensing and measurement system (RSMS) are mobile; it is highly unlikely both systems would be moving in formation. Since these radars may be used for aeronautical safety applications, even these rare instances interference must be precluded. One result, calculated the separation distances of 87 km assuming System-6 was using a theoretical square pulse, but for practical operations, System-6 will use a chirp pulse and the separation distance was calculated in excess of 10 km.

The RSMS is designed to measure height and ground clearance. These radars are placed on aircraft. While operating, these aircraft can be anywhere from sea level to 1.5 km in height above sea level. It is difficult to predict the relative position of these systems as compared with System-6. The probability of these two radars of being lined up in azimuth and pointing directly at each other is also very low. It is possible not to place limits to the operations of System-6. However, the results show that in rare cases when everything is in the proper alignment, interference is possible for short duration. For many practical operational scenarios, where System-6 points its beam −20 degrees below the horizontal, the separation distances must be less than 6 km or greater than 27 km to preclude interference.

The analysis for the ALS in Recommendation ITU-R S.1340 was carried out using the same procedure used for in § 3 of Report ITU-R M.2170. These ALSs have known locations, and the landing aircraft has a specific procedure it must follow in order to land. One result calculated distance separation of 50 km assuming System-6 was using a theoretical square pulse. For practical operations, System-6 will use a chirp pulse. The results of this analysis show that with the proper operational procedures, System-6, even in the worst case scenario, would not interfere with the ALS. This would be done by either restricting System-6 operation to ensure the proper separation distance or by, properly positioning the System-6 antenna beam to avoid interference.

2/1.21/5 Methods to satisfy the agenda item

2/1.21/5.1 Method A

Add a primary allocation to RLS in 15.4-15.7 GHz in the Table of Frequency Allocations along with any necessary regulatory provisions in RR Article **5**, including the possible addition of a WRC-12 Resolution, to protect the ARNS and RAS systems in the adjacent 15.35-15.4 GHz band. Studies have shown compatibility with FSS systems. Also suppress Resolution **614 (WRC-07)**.

Advantages:

– Provides a primary allocation to RLS, contiguous across 15.4-17.3 GHz, with sufficient bandwidth to meet emerging requirements for increased image resolution and range accuracy. The linear FM chirp radar range resolution will improve from 9.38 cm to the planned 7.89 cm.

– Assures long-term operating and development environment for radiolocation systems.

– Provides protection in the Radio Regulations for the ARNS systems specified by the maritime and aeronautical communities in the International Civil Aviation Organization and International Maritime Organization.

– Should the specified protection criteria in the Radio Regulations be met, the protection at radio astronomy sites is ensured.

Disadvantages:

– The RLS spectrum requirement for 300 MHz may not be fully justified.

– Interference exceeding permissible levels may occur at the input of an RAS station (see section 2/1.21/4 of the CPM11-2 Report). However, adjustments in the way System-6 operates are used to reduce the interference duration or completely avoid interfering with RAS (see Report ITU-R M.2170, section 4.3).

– For implementation of radars other than linear FM chirped radars contained in Recommendation ITU-R M.1730-1, further studies may be required for compatibility with FSS systems in the 15.43-15.63 GHz band.

2/1.21/5.2 Method B

Add a primary allocation to RLS in 15.5-15.7 GHz in the Table of Frequency Allocations along with any necessary regulatory provisions in RR Article **5**, including the possible addition of a WRC-12 Resolution, to protect ARNS and RAS systems in the 15.35-15.4 GHz band. Studies have shown compatibility with FSS systems. Also suppress Resolution **614 (WRC-07)**.

Advantages:

– Provides a primary allocation to RLS, contiguous across 15.5-17.3 GHz, to meet emerging requirements for increased image resolution and range accuracy. The linear FM chirp radar range resolution will improve from 9.38 cm to 8.33 cm.

– Assures long-term operating and development environment for radiolocation systems.

Disadvantages:

– Impacts RLS performance from the planned 7.89 cm to 8.33 cm by the loss of 100 MHz of spectrum.

– For implementation of radars other than linear FM chirped radars contained in Recommendation ITU-R M.1730-1, further studies may be required for compatibility with FSS systems in the 15.43-15.63 GHz band.

2/1.21/5.3 Method C

Add a primary allocation to RLS in 15.55-15.7 GHz band in the Table of Frequency Allocations along with any necessary regulatory provisions in RR Article **5**, including the possible addition of a WRC-12 Resolution, to protect ARNS and RAS systems in the 15.35-15.4 GHz band. Studies have shown compatibility with FSS systems. Also suppress Resolution **614 (WRC-07)**.

Advantages:

– Provides a primary allocation to RLS, contiguous across 15.55-17.3 GHz, to meet emerging requirements for increased image resolution and range accuracy. The linear FM chirp radar range resolution will improve from 9.38 cm to 8.58 cm.

– Assures long-term operating and development environment for radiolocation systems.

Disadvantages:

– Impacts the performance from the planned 7.89 cm to 8.58 cm by the loss of 150 MHz of spectrum.

– For implementation of radars other than linear FM chirped radars contained in Recommendation ITU-R M.1730-1, further studies may be required for compatibility with FSS systems in the 15.43-15.63 GHz band.

2/121/5.4 Method D

No change to the Radio Regulations and suppress Resolution **614 (WRC-07)**.

Advantages:

– No impact to ARNS systems as well as RAS in the adjacent frequency band.

Disadvantages:

– Requirements for the performance of RLS will not be met.

2/1.21/6 Regulatory and procedural considerations

Example(s) of regulatory text to satisfy the agenda item.

2/1.21/6.1 Method A

The addition of a primary allocation for the RLS in the 15.4-15.7 GHz band and examples of new footnotes protecting ARNS and RAS systems are given below. In addition, it is possible that a WRC-12 Resolution (yet to be developed) may also be needed to provide further clarification.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
15.4-15.43	AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.A121 ADD 5.B121 5.511D	
15.43-15.63	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.A121 ADD 5.B121 5.511C	
15.63-15.7	AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.A121 ADD 5.B121 5.511D	
...		

ADD

5.A121 In the band 15.4-15.7 GHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, stations operating in the aeronautical radionavigation service.

ADD

5.B121 In order to protect the radio astronomy service in the band 15.35-15.4 GHz, transmissions from radiolocation stations operating in the band 15.4-15.7 GHz shall not exceed the power flux-density level of −156 dB(W/m^2) in a 50 MHz bandwidth into the band 15.35-15.4 GHz, at any radio astronomy observatory site for more than 2% of the time.

SUP

RESOLUTION 614 (WRC-07)

Use of the band 15.4-15.7 GHz by the radiolocation service

2/1.21/6.2 Method B

The addition of a primary allocation for the RLS in the 15.5-15.7 GHz band and examples of new footnotes protecting ARNS and RAS systems are given below. In addition, it is possible that a WRC-12 Resolution (yet to be developed) may also be needed to provide further clarification.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
15.43-15.5	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION 5.511C	
15.5~~43~~-15.63	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.C121 ADD 5.D121 5.511C	
15.63-15.7	AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.C121 ADD 5.D121 5.511D	
...		

ADD

5.C121 In the band 15.5-15.7 GHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, stations operating in the aeronautical radionavigation service.

ADD

5.D121 In order to protect the radio astronomy service in the band 15.35-15.4 GHz, transmissions from radiolocation stations operating in the band 15.5-15.7 GHz shall not exceed the power flux-density level of −156 dB(W/m^2) in a 50 MHz bandwidth into the band 15.35-15.4 GHz, at any radio astronomy observatory site for more than 2% of the time.

SUP

RESOLUTION 614 (WRC-07)

Use of the band 15.4-15.7 GHz by the radiolocation service

2/1.21/6.3 Method C

The addition of a primary allocation for the RLS in the 15.55-15.7 GHz band and examples of new footnotes protecting ARNS and RAS systems are given below. In addition, it is possible that a WRC-12 Resolution (yet to be developed) may also be needed to provide further clarification.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
15.43-15.55	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION 5.511C	
15.55~~43~~-15.63	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.E121 ADD 5.F121 5.511C	
15.63-15.7	AERONAUTICAL RADIONAVIGATION RADIOLOCATION ADD 5.E121 ADD 5.F121 5.511D	
...		

ADD

5.E121 In the band 15.55-15.7 GHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, stations operating in the aeronautical radionavigation service.

ADD

5.F121 In order to protect the radio astronomy service in the band 15.35-15.4 GHz, transmissions from radiolocation stations operating in the band 15.55-15.7 GHz shall not exceed the power flux-density level of −156 dB(W/m^2) in a 50 MHz bandwidth into the band 15.35-15.4 GHz, at any radio astronomy observatory site for more than 2% of the time.

SUP

RESOLUTION 614 (WRC-07)

Use of the band 15.4-15.7 GHz by the radiolocation service

2/1.21/6.4 Method D

No change to the Radio Regulations.

SUP

RESOLUTION 614 (WRC-07)

Use of the band 15.4-15.7 GHz by the radiolocation service

AGENDA ITEM 1.23

1.23 to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services

NOTE – There is no corresponding WRC resolution for this agenda item.

2/1.23/1 Executive summary

The frequency band 415-526.5 kHz provides unique ground-wave propagation characteristics well suited for present and potential future systems in incumbent services, as well as a secondary allocation to the ARS.

After taking studies into account, the following methods to satisfy this agenda item have been proposed:

Method A

A secondary allocation of up to 15 kHz to the ARS on a worldwide basis between 472 kHz and 487 kHz.

Method B

Two non-contiguous worldwide secondary allocations to the ARS at 461-469 kHz and 471-478 kHz, totalling 15 kHz.

Method C

No change to the Radio Regulations.

2/1.23/2 Background

The frequency range 415-526.5 kHz is currently allocated to the BS, MMS, AMS, LMS and ARNS. Traditionally the band has been utilized extensively by these services due to its good ground-wave propagation characteristics. This frequency range would be well suited to reliable, relatively low-power ARS communications for the purposes of training, intercommunication, and technical investigation. A secondary allocation would also augment the overall capability of the ARS to provide assistance in disaster and emergency situations (see, e.g. Recommendation ITU-R M.1042-1 “Disaster communications in the amateur and amateur-satellite services”, Recommendation ITU-D 13 “Effective utilisation of the amateur services in disaster mitigation and relief operations”. ARS communications in the MF band would also allow for experimentation, thereby furthering knowledge relating to propagation and equipment design for new transmission modes.

Operations in this band are accomplished most frequently by point-to-point over-the-horizon transmissions. Ground-wave transmissions on the order of 200-400 km are common over sea with transmissions on the order of 150-300 km common over land. Recommendation ITU-R P.368 provides ground-wave propagation curves showing expected transmission range for a given transmission field strength. In the case of sky-wave propagation, the maximum propagation expected is 1 000 km from a station, depending on transmission parameters and specific propagation factors, such as sunspot number, power, antenna characteristics, and time of day, as shown in Recommendation ITU-R P.1147. Most MF links use the minimum e.i.r.p. required for a successful link for the reliability factor required. Co-frequency use is not possible inside the geographic range of such MF links without the potential for harmful interference.

2/1.23/3 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

Existing relevant ITU-R Recommendations: M.540-2, M.688, M.627-1, BS.560.

New relevant ITU-R Reports: M.2201, M.[AS EXP OP 415-526.5 kHz], M.2200, M.2203.

2/1.23/3.1 Introduction

Some administrations have given temporary authorization for stations of the ARS to operate, on a non-interference basis, within the frequency range 415-526.5 kHz. In addition to these experimental operations, studies have been undertaken in the ITU-R to provide additional information (Report ITU-R M.[AS EXP OP 415-526.5 kHz]) on the characteristics and compatibility of a possible secondary allocation to the ARS in this frequency range.

Details of amateur station characteristics and compatibility studies can be found respectively in Reports ITU-R M.2200 and ITU-R M.2203. The transmission modes and antenna simulations provided in this Report demonstrate that ARS operations in this range would be limited to relatively low e.i.r.p., in the range from several milliwatts to watts.

Implementation of the global maritime distress and safety system has rendered certain incumbent systems obsolete. However, new technologies as described in Report ITU-R M.2201 are being considered by incumbent users and should be taken into account as much as practicable when considering the possibility of coexistence with the ARS.

2/1.23/3.2 Compatibility of amateur service stations with systems of existing services

2/1.23/3.2.1 Maritime mobile service

The range 415-526.5 kHz is allocated to the MMS in all three Regions. Maritime safety information (MSI) is currently broadcast on 424 kHz, and mainly 490 kHz and 518 kHz via NAVTEX (Navigational text messages), standardized under International Standard IEC 61097-6, Global maritime distress and safety system (GMDSS) – Part 6: Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships.

Report ITU-R M.2201 provides technical details and examples of, the possible future MF maritime communication systems within the frequency range for ship and port security to enhance safety of navigation at sea.

A study was done to evaluate the required geographical separation as a function of frequency separation and power (e.m.r.p.) between stations in the ARS and NAVTEX stations. The minimum field strength used in this study was based on a minimum required field strength of 31.5 dBµV/m, which is a worst-case figure, as a level of 51.5 dBµV/m is required for near tropical areas. In addition, calculations were performed for two arbitrary additional protection levels of −14 dB and −20 dB. IMO Resolution A.801(19), Annex 4 requires a protection level of −8 dB.

As well, a ground conductivity figure for sea water of 5 S/m was used in the calculations. This is a conservative value as, typically, amateur stations would be located inland from the sea, where a lower level of ground conductivity would cause the ground-wave signal to be attenuated at a greater rate.

Calculations using a variety of protection criteria were generated. These calculations show protection distances as a function of frequency separation and transmitter output power of amateur stations. It should be noted that with a frequency separation of ≥ 3 kHz using much higher protection criteria than required by IMO Resolution A.801(19), Annex 4, the necessary geographical separation is only slightly increased. The study concludes that ARS operation within 3 kHz from the centre of the NAVTEX operation frequencies is neither practical nor desirable, because amateur transmitters could cause interference to NAVTEX signals. As well, given that maritime safety information is transmitted via NAVTEX, co-channel operation is not considered an option.

2/1.23/3.2.2 Land mobile service

Compatibility studies for the LMS were not undertaken as no usage was identified.

2/1.23/3.2.3 Aeronautical radionavigation service

Aeronautical non-directional beacons (NDB) operate in the band prescribed for study under this agenda item. While the long-term goal may be to remove NDBs from use, this is unlikely to be achieved in the near future. It is therefore essential to ensure whatever action is taken under this agenda item does not adversely affect NDB operations.

Two studies were undertaken to determine the compatibility between NDBs and amateur operations as described in Report ITU-R M.2203. Both studies were based on ICAO technical specifications.

The first study demonstrated that in a worst-case scenario of an aircraft in the immediate vicinity of an amateur station located at the edge of an NDB service area, a co-frequency amateur transmitter with an output power level exceeding a few milliwatts would result in unacceptable interfering field strength at the aircraft NDB receiving antenna. Therefore, co-frequency coexistence between amateur stations and NDB systems is unlikely.

In the second study, a table of protection distances was derived for different frequency offsets and amateur station radiated power using ground-wave and sky-wave propagation analyses. A worst-case ground conductivity value of 10 mS/m was used, which rendered propagation optimal. A lower value of 3 mS/m, for example, would reduce the radius of the protection zone by 50%. Protection of the RNS could be achieved by geographical separation, taking into account the technical and operational characteristics of the systems, which may result in distances in the range of 20 km in the best case to 800 km in the worst case. This protection can also be provided by sufficient frequency separation.

2/1.23/3.2.4 Aeronautical mobile service

The AMS operates on a secondary basis in parts of this frequency range and uses NDBs for audio broadcasts. Although no technical specifications were received on AM audio broadcasts using NDBs, it was assumed that the technical analyses undertaken for NDBs used in the ARNS would be applicable to this subset of NDBs.

2/1.23/3.2.5 Broadcasting service

There is no overlap in Regions 1 and 3 between the frequency range proposed for this allocation to the ARS and the 526.5 to 1 606.5 kHz allocation to the BS. In Region 2 the allocation to the BS (525 to 1 605 kHz) overlaps the spectrum range under study only between 525 and 526.5 kHz. Therefore, there is no possibility in Regions 1 and 3 of co-channel operation between the proposed ARS allocation and a station in the BS and a low probability of co-channel operation in Region 2, despite the frequency overlap.

However, a potential does exist for off-channel interference to reception of MF broadcast signals by ARS transmissions in a case of collocation of an amateur transmitter and a BS receiver. A study was undertaken that considered the potential interference to an MF broadcast receiver from an amateur station transmitter operated at a nearby frequency, as a function of the frequency separation and distance from the broadcast receiver. Two situations were examined: urban areas where amateur stations may be operated close to broadcast receivers, but where broadcast signal strength is high; and rural areas, where typical separation distances are greater, but broadcast signal strength may be closer to the minimum level recommended in Recommendation ITU-R BS.560. A table of calculations giving the minimum allowable distance between a broadcast receiver and an interfering transmitter as a function of frequency necessary to meet the required protection ratio was generated.

2/1.23/4 Analysis of the results of studies

2/1.23/4.1 Compatibility of amateur service stations with existing services

2/1.23/4.1.1 Maritime mobile service

Amateur radio operations cannot operate co-frequency or immediately adjacent to the existing NAVTEX frequencies, i.e., 424 kHz, 490 kHz and 518 kHz. Given the relatively narrow bandwidth of the NAVTEX receivers, studies indicate that a guardband of 3 kHz would be sufficient to minimize the potential for harmful interference from ARS transmissions.

2/1.23/4.1.2 Land mobile service

Compatibility studies for LMS were not undertaken as no usage was identified.

2/1.23/4.1.3 Aeronautical radionavigation service

The transmission modes and antenna simulations provided in Report ITU-R M.2200 demonstrate that ARS operations in this range would be limited to relatively low e.i.r.p., in the range from several milliwatts to watts.

One study demonstrated that co-frequency operation of an amateur station and an NDB is not feasible.

Another study showed that such operation could be feasible if protection distances, which would depend on frequency offsets and amateur station radiated power, were implemented. Such distances would be derived using sky-wave and ground-wave analyses as per Recommendations ITU-R P.1147 and ITU-R P.368, respectively, as shown in Report ITU-R M.2203. Mitigation measures such as avoidance of co-frequency operation, protection distances and power limitations may be implemented by administrations licensing ARS operations.

2/1.23/4.1.4 Aeronautical mobile service

It is assumed that the same mitigation measures as described in section 2/1.23/4.1.3 for the ARNS would apply to the AMS, which has a secondary allocation in Region 3 and which overlaps a potential secondary allocation to the ARS in the range 505-510 kHz.

2/1.23/4.1.5 Broadcasting service

The study demonstrated that provided the upper limit of an amateur allocation did not exceed 516 kHz, the potential for interference with broadcast reception at 525 kHz or higher would meet specified protection ratios. The methods below contemplate frequencies no higher than 510 kHz, therefore there would be no impact to the BS.

2/1.23/5 Methods to satisfy the agenda item

2/1.23/5.1 Method A

A secondary allocation of up to 15 kHz to the ARS on a worldwide basis between 472 kHz and 487 kHz.

Advantages

– Would provide the ARS with the opportunity to develop and experiment with new communication technologies using both sky-wave and ground-wave propagation in the MF spectrum.

– Would provide the ARS with additional coverage for reliable medium-range communication for potential use in the event of emergency and disaster situations.

Disadvantages

– Could increase the possibility of interference to incumbent services, including aeronautical radionavigation in certain parts of the world, and possible future maritime mobile systems.

– Administrations may have to take the necessary mitigation measures to protect incumbent services that would make part of the band unusable to the ARS.

2/1.23/5.2 Method B

Two non-contiguous worldwide secondary allocations to the ARS at 461-469 kHz and 471-478 kHz, totalling 15 kHz.

Advantages

– Would provide the ARS with the opportunity to develop and experiment with new communication technologies using both sky-wave and ground-wave propagation in the MF spectrum.

– Would provide the ARS with additional coverage for reliable medium-range communication.

Disadvantages

– Could increase the possibility of interference to incumbent services, including aeronautical radionavigation in certain parts of the world, and possible future maritime mobile systems.

– Administrations may have to take the necessary mitigation measures to protect incumbent services that would make part of the band unusable to the ARS.

2/1.23/5.3 Method C

No change to RR Article **5**.

Advantage

– Would not increase the possibility of interference to incumbent services.

Disadvantage

– Would not provide a secondary allocation to the ARS.

2/1.23/6 Regulatory and procedural considerations

2/1.23/6.1 Method A

A secondary allocation of up to 15 kHz to the ARS on a worldwide basis between 472 kHz and 487 kHz.

This method is reflected in the proposed changes to RR Article **5**.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

200-495 kHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td>...</td><td colspan="2"></td></tr>
<tr><td>415-435
MARITIME MOBILE 5.79
AERONAUTICAL RADIONAVIGATION
5.72</td><td colspan="2" rowspan="2">415-~~495~~472
MARITIME MOBILE 5.79 ~~5.79A~~
Aeronautical radionavigation 5.80

5.77 5.78 MOD 5.82</td></tr>
<tr><td>435-~~495~~472
MARITIME MOBILE 5.79 ~~5.79A~~
Aeronautical radionavigation
5.72 MOD 5.82</td></tr>
<tr><td>472-487</td><td colspan="2">MARITIME MOBILE 5.79 ~~5.79A~~
Aeronautical radionavigation 5.80
Amateur
5.72 5.77 ~~5.78~~ MOD 5.82</td></tr>
<tr><td>487-495</td><td colspan="2">MARITIME MOBILE 5.79 5.79A
Aeronautical radionavigation 5.80
5.72 5.77 ~~5.78~~ MOD 5.82</td></tr>
</table>

MOD

5.82 In the maritime mobile service, the frequency 490 kHz is to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles **31** and **52**. In using the band 415-495 kHz for the aeronautical radionavigation service or the band 472-487 kHz for the amateur service, administrations ~~are requested to~~ shall ensure that no harmful interference is caused to the frequency 490 kHz. (WRC-07)

2/1.23/6.2 Method B

Two non-contiguous worldwide secondary allocations to the ARS at 461-469 kHz and 471-478 kHz, totalling 15 kHz.

This method is reflected in the proposed changes to RR Article **5**.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

200-495 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
415-435 MARITIME MOBILE 5.79 AERONAUTICAL RADIONAVIGATION 5.72	**415-~~495~~461** MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.80 5.77 5.78 MOD 5.82	
435-~~495~~461 MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.72 MOD 5.82		
461-469 MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation Amateur 5.72 MOD 5.82	**461-469** MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.80 Amateur 5.77~~ 5.78~~ MOD 5.82	
469-471 MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.72 MOD 5.82	**469-471** MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.80 5.77~~ 5.78~~ MOD 5.82	
471-478 MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation Amateur 5.72 MOD 5.82	**471-478** MARITIME MOBILE 5.79~~ 5.79A~~ Aeronautical radionavigation 5.80 Amateur 5.77~~ 5.78~~ MOD 5.82	
478-495 MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.72 MOD 5.82	**478-495** MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.80 5.77~~ 5.78~~ MOD 5.82	

MOD

5.82 In the maritime mobile service, the frequency 490 kHz is to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles **31** and **52**. In using the band 415-495 kHz for the aeronautical radionavigation service or the bands 461-469 kHz and 471-478 kHz for the amateur service, administrations ~~are requested to~~ shall ensure that no harmful interference is caused to the frequency 490 kHz. (WRC-07)

Editorial note: In the table above, if the proposed modifications for the bands 461-469 kHz and 471-478 kHz are accepted, then the allocations to services in these bands, as well as in the bands 469-471 kHz and 478-495 kHz, become identical for all three Regions, and the corresponding cells of the Table should be merged for Regions 1, 2, and 3. RR Nos. **5.72**, **5.77**, **5.79**, **5.80** and **5.82** will also be part of the merged cells for the various bands listed above, as appropriate.

2/1.23/6.3 Method C

NOC

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

CHAPTER 3

Fixed, mobile and broadcasting issues

(Agenda items 1.5, 1.8, 1.17, 1.20, 1.22)

CONTENTS

AGENDA ITEM 1.5

1.5 to consider worldwide/regional harmonization of spectrum for electronic news gathering (ENG), taking into account the results of ITU-R studies, in accordance with Resolution ***954 (WRC-07)****;*

Resolution **954 (WRC-07)**: *Harmonization of spectrum for use by terrestrial electronic news gathering systems*

3/1.5/1 Executive summary

This agenda item is to consider worldwide/regional harmonization of spectrum for electronic news gathering (ENG), taking into account the results of ITU-R studies, in accordance with Resolution **954 (WRC-07)**.

Four methods have been identified to satisfy the agenda item and can be categorized into three groups:

– rationalization of the spectrum used by ENG. Method A targets this objective;

– harmonization of tuning ranges within frequency bands for ENG. Methods B and C target this goal. Although these methods pursue a similar objective, they differ in their regulatory implementation and their potential effect towards harmonization;

– a combination of both rationalization and harmonization. Method D attempts to achieve this objective.

3/1.5/2 Background

Administrations contributing to the studies within ITU-R have noted that for the purposes of the discussion on this topic, it is useful to define the terms "harmonization" and "rationalization" clearly with the following definitions:

- Rationalization: Using available technology to maximize efficient and flexible use of frequencies. This means using equipment standardization and advanced technologies to ensure the most efficient use of frequencies within administrative regulations when equipment is deployed.
- Harmonization: Global or regional agreement to employ a harmonized spectrum use in specific bands.

Electronic news gathering (ENG) operates terrestrially in appropriate bands allocated to the broadcasting[1], fixed and mobile services. In addition to audio and video applications, ENG includes services ancillary to broadcasting (SAB) and services ancillary to production (SAP).

The very nature of ENG in a competitive environment can involve several broadcasters/organizations/networks attempting to cover the same situation in a geographic area, requiring several radio-frequency channels to operate simultaneously often over the same radio path. Co-siting requirements of multiple ENG links, while covering an event, need to be met.

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[1] Within some administrations ENG applications are assigned within bands other than those allocated to the fixed and mobile services, for example wireless microphones can/may operate in bands allocated to the broadcasting services. Also, within some administrations, the use of such microphones is based on the condition that they shall not cause harmful interference to, nor claim protection from, other applications in neighbouring countries.

The specific spectrum bands used for ENG have a number of inherent technical attributes which are beneficial, however there may be offsetting conditions or spectrum management issues which may be harmful for ENG deployments. For example, ENG operating in radio-frequency spectrum bands below 3 GHz tend to provide better propagation characteristics over obstructed paths, thereby increasing the probability of a successful transmission from a particular event. In addition, new digital equipment can be used for higher velocity mobile applications at these lower frequency bands. These aspects need to be taken into account while considering regional harmonization. However, with the growth in the use of frequency bands between 500 MHz and 10 GHz by several radiocommunication services, there is the possibility of increased congestion and interference in the same geographic area from other services which may hinder ENG equipment use in these lower frequency bands. On the other hand, use of higher frequency bands could impose severe constraints in adverse weather conditions.

The term “tuning range” for ENG means a range of frequencies over which radio equipment is envisaged to be capable of operating; within this tuning range, the use in any one country of radio equipment from another country will be limited to the range of frequencies identified nationally in that one country for ENG, and will be operated in accordance with the related national conditions and requirements. Identification of a tuning range for ENG does not preclude the use of other applications in the same frequency range nor establish priority over any other use of these bands. Tuning ranges can then be used as a basis for the development of a WRC Resolution/Recommendation detailing harmonization of user requirements and spectrum usage for ENG on a worldwide/regional basis.

There are a number of constraints which prevent homogeneity in use of ENG equipment. Many national spectrum regulatory bodies have their own priorities for spectrum sharing for ENG applications. A worldwide frequency band/tuning range harmonization may not always translate into a frequency band/tuning range free of any sharing constraints.

Some existing ENG equipment has the capability of being deployed on operating frequencies outside of national regulations. Therefore, a limitation on the use of frequencies is contingent on operator knowledge of administration policies and regulations.

3/1.5/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Some administrations have made spectrum assignments for analogue and digital ENG within their national regulatory frameworks. Some of these assignments are reflected in the frequency ranges shown in Recommendations ITU-R F.1777 and ITU-R M.1824. It should be noted that these documents recommend characteristics of ENG systems operating in a number of bands for use in sharing studies and do not recommend the use of particular frequency bands. ENG global usage could benefit from harmonized band planning, thereby enhancing the viability of spectrum usage by ENG systems. However, this issue is further complicated by the differing system characteristics in use and their impact on spectrum usage within individual administrations. This issue may potentially be solved by the adoption of new technologies.

Some or all of the potential candidate tuning ranges considered for ENG may require sharing studies between the proposed ENG applications and incumbent services. The relevant ITU-R groups may complete the sharing studies that are required and administrations are encouraged to provide such sharing studies. The Reports and Recommendations listed below do not provide as yet all the relevant modelling and technical characteristics needed to accomplish the required studies.

Report ITU-R BT.2069 indicates that the current spectrum used for ENG will be insufficient to meet the anticipated demands.

Relevant ITU-R Recommendations and Reports

– Recommendations ITU-R F.1777, M.1808, M.1824, BT.1871, BT.1872, SA.609, SA.1018, SA.1019, SA.1154, SA.1155, SA.1275, SA.1414 and SA.1743.

– Reports ITU-R BT.2069, M.2116, F.[ENGTUNINGRANGES], F.[ENGSHARE], F.[ENGDEPLOYMENT].

3/1.5/4 Analysis of the results of studies

In order to assess the feasibility of harmonization of frequency bands, the ENG applications can be broadly divided into:

- video applications
- audio applications

In the absence of any meaningful frequency harmonization from one country to another, there is enormous diversity of ENG equipment available from manufacturers in a range of frequency bands. As a result, broadcasting organizations must possess diverse equipment in many of these frequency bands in order to travel from one country to another. This may potentially be alleviated through use of advanced technology which would reduce cost for broadcasting organizations, give economies of scale for equipment manufacturers and reduce interference possibilities.

Some administrations consider that spectrum rationalization, depending on the specific ENG application, may be more productive in allowing foreign broadcasters and/or ENG operators, as appropriate, knowledge of and access to the required spectrum in a given country/region. This information would assist broadcasters and/or ENG operators to seek licensing prior to planned news worthy events, allowing them access to spectrum when required. This information would also assist broadcasters and/or ENG operators to seek licensing for coverage of emergency news-worthy events. Both these measures would ensure that events can be covered. Studies have focused on the bands already used for ENG applications. The spectrum tuning ranges required to facilitate cross-border ENG requirements from other administration may be considerably less than the host administrations' national requirements.

Spectrum harmonization may provide many benefits such as reduced cost for broadcasting organizations, economies of scale for equipment manufacturers, and reduced interference possibilities. It does not imply ready access to spectrum within individual administrations. Spectrum access is only available through administration policies and regulations. The feasibility of such harmonization would have to take into account the disparate use of spectrum by the many countries involved and the differing ENG characteristics in use in administrations.

ENG is an activity that extends increasingly across national boundaries. Many administrations and regional organizations have developed radiocommunication protocols for frequency coordination to meet these requirements.

While studies on ENG user requirements were undertaken in ITU-R, some administrations are still awaiting the results of the studies of sharing and compatibility issues called for in Resolution **954 (WRC-07)** that document the usage by incumbent services and applications operating in the candidate tuning ranges for ENG harmonization and the impact of harmonization of ENG on other incumbent services and applications.

3/1.5/5 Methods to satisfy the agenda item

Four methods have been identified to satisfy the agenda items and can be categorized into three groups:

– rationalization of the spectrum used by ENG. Method A targets this objective;

– harmonization of tuning ranges within frequency bands for ENG. Methods B and C target this goal. Although these methods pursue a similar objective, they differ in their regulatory implementation and their potential effect towards harmonization;

– a combination of both rationalization and harmonization. Method D attempts to achieve this objective.

Given that there is an increasing need for ENG applications because international news-worthy events have achieved higher levels of worldwide interest, the demand for available spectrum has increased. This is due to the competitive environment, antenna siting issues, and the number of deployed ENG systems covering such events. It is important to ensure that the best solution for spectrum use by ENG systems can be realized. This can take the form of four distinct possibilities for the methods to satisfy the agenda item:

1) spectrum for ENG is harmonized on a worldwide basis;

2) spectrum for ENG is harmonized on a regional basis;

3) spectrum for ENG is rationalized on a worldwide basis;

4) spectrum for ENG is rationalized on a regional basis.

3/1.5/5.1 Method A

No change to the RR except addition of a WRC Resolution on Spectrum management guidelines for electronic news gathering

Method A has no change to the RR except the approval of a WRC Resolution encouraging the development of a database of the frequencies used in each country for ENG, and no change to RR Article **5** with suppression of Resolution **954 (WRC-07)**.

This method provides a mechanism to rationalize ENG spectrum usage by maintaining a single global database or individual regional databases of country-specific ENG bands with required technical and operational requirements for deployment. Rationalization is understood as establishing harmonized databases among participating administrations, which would become a crucial foundation before engaging into more complicated exercises by administrations for frequency harmonization/negotiation. Such database(s) can be used to conduct an analysis of frequencies used and is intended to offer administrations information on tuning ranges in use regionally and worldwide. It will also provide foreign broadcasters and/or ENG operators, as appropriate, with the information needed to ensure that they deploy with equipment that will operate in accordance with the administration's guidelines within a given country.

Although this method does not specifically address harmonization it will provide the information needed to work toward regional or worldwide equipment harmonization through standardization organizations, future regional activities and ITU-R Recommendations and Reports. It is considered that rationalization of ENG can be achieved through an increasing emphasis on equipment standardization, the use of advanced equipment concepts and the availability of relevant information including information on frequency bands/tuning ranges.

Advantages

1) Can provide broadcasters and/or ENG operators with information on the spectrum to be used and regulatory requirements for ENG usage in each country, thereby facilitating identification and access to frequencies for coverage of international news events.

2) The associated database for this method can be used by manufacturers, operators and regulators involved in standardization organizations to work toward a long-term solution.

3) Given that harmonization worldwide or regionally may be difficult without numerous and detailed technical sharing and regulatory analyses which may not be completed by WRC-12, this method encourages regulators and manufacturers to work toward equipment standardization which can address current deployment and congestion issues as well as future congestion issues.

Disadvantages

1) Although improving the rationalization of spectrum use by ENG, this does not provide means to harmonize spectrum for ENG, and there may be no motivation for administrations to harmonize the ENG usage.

2) The development, population, maintenance and verification of the accuracy of a database will require extensive time and effort on an ongoing basis.

3) It may be difficult to identify the responsible body for the maintenance of the database mechanism and to clearly mark responsibilities and roles.[**]

3/1.5/5.2 Method B

No change to the RR except addition of a WRC Recommendation/Resolution on tuning ranges for worldwide/regional harmonization for terrestrial electronic news gathering systems

Method B proposes to include in a WRC Recommendation/Resolution a list of frequency bands for harmonization of tuning ranges for ENG use to the extent achievable on a regional/worldwide basis. The frequency bands/tuning ranges considered under this method would take into account those currently allocated to the fixed service and the mobile service in the Radio Regulations, as they are already used by ENG systems. Thus, there is no need to change the Table of Frequency Allocations in RR Article **5**. Worldwide/regional harmonization of ENG spectrum should be made in compliance with RR provisions relevant to the relevant frequency bands and should not constrain usage of existing services allocated in these bands. Regional groups are encouraged to submit contributions at WRC-12 for tuning ranges to the extent achievable. The ITU-R Recommendations and Reports referenced in the CPM text could be used for guidance by administrations in seeking specific tuning ranges for consideration under this method.

Advantages

1) Provides worldwide/regional harmonization of frequency bands/tuning ranges for ENG as ENG is already deployed by some administrations in these frequency bands/tuning ranges and may encourage other administrations/manufacturers to deploy and develop ENG systems in the harmonized frequency bands/tuning ranges.

[**] The issue of the involvement or otherwise of BR in activities related to the relevant databases is a matter to be further studied by administrations and BR.

2) The proposed frequency bands/tuning ranges may provide stability for both administrations and manufacturers as it can only be modified and/or complemented by a future WRC.

3) Provides a Recommendation/Resolution that takes into account harmonization at either the worldwide or regional level where unanimous agreement may not be reached on deployment of ENG in frequency bands/tuning ranges between administrations.

Disadvantages

1) As this method is based upon a WRC Recommendation/Resolution it may be difficult to address amendments arising from technology advancement given the ability to amend these only at a WRC.

2) Deployment of ENG systems in a limited number of frequency bands/tuning ranges may lead to increased congestion without increased frequency planning and management.

3) Studies for the potential frequency bands/tuning ranges proposed for ENG harmonization may not be available in time for consideration at WRC-12.

3/1.5/5.3 Method C

No change to the RR. Development and approval within ITU-R of Recommendation(s) and/or Reports listing preferred frequency bands and tuning ranges for ENG applications preferably on a regional or worldwide basis

Method C will comprise development and approval of ITU-R Recommendations/Reports within the regular activities of the ITU-R Study Groups, specifically addressing measures that would facilitate harmonization for the use of ENG applications.

This can be achieved through the development and approval of ITU-R Recommendation(s)/Reports listing the preferred frequency bands/tuning ranges on a country, regional or worldwide basis for ENG applications.

Consideration may be given to the related ITU-R Recommendations already in force.

These preferred frequency bands/tuning ranges for ENG do not preclude the use of these bands by any application of the services to which they are allocated, and do not establish any priority in the RR.

This method would not require any action at WRC-12 and would not modify the RR.

Advantages

1) May provide some level of worldwide/regional harmonization for frequency bands/tuning ranges for ENG applications and potentially provides administrations with access to a larger number of tuning ranges for ENG applications.

2) Maintenance of ITU-R Recommendation(s) listing preferred frequency bands and tuning ranges for ENG applications readily accessible to administrations.

3) Allows the ITU-R to continue studying this issue outside of the constraints of the WRC schedule, especially if compatibility studies with incumbent services and applications in the potential frequency bands/tuning ranges for ENG harmonization are required.

Disadvantages

1) Relies upon administrations to monitor and maintain any ITU-R Recommendation(s) listing preferred frequency bands and tuning ranges for ENG applications including the maintenance of regional and worldwide coordinated texts over time.

2) May not achieve rationalization/harmonization of tuning ranges and frequency bands assigned by administrations for ENG.

3) Less stability and/or consistency in the tuning ranges and frequency bands to give manufacturers and regulators confidence to adopt the recommended frequencies for ENG.

3/1.5/5.4 Method D

No change to the RR except the development of a WRC Recommendation with a list of frequency bands/tuning ranges for ENG use intended for harmonization to the extent achievable on a regional/worldwide basis. In addition, the method proposes a WRC Resolution intended to encourage the development of a database of frequency bands which may be available for cross-border deployment in each country for ENG and other relevant information

Both the Resolution and the Recommendation encourage further study on ENG in the ITU-R in order to maintain these documents. The tuning ranges considered under this method for inclusion in the Recommendation would take into account those frequency bands currently allocated to the broadcasting[1], fixed and mobile services in the Radio Regulations, which are already used extensively by ENG systems.

The Resolution provides a mechanism to rationalize ENG spectrum usage by developing regional databases under the auspices of Regional Telecommunications Organizations (RTOs) of frequencies which may be available for cross-border deployment in each country for ENG along with the technical and operational requirements for deployment. These databases could be used to conduct analyses of frequencies used and this would provide administrations with information on tuning ranges in use regionally and worldwide. It will also provide broadcasters and/or ENG operators operating cross-border with the information needed to ensure that they deploy with equipment that can operate within a given country and also allow them to seek approval for such spectrum use.

There is no need to change the Table of Frequency Allocations in RR Article **5**.

Advantages

1) Provides worldwide/regional harmonization of tuning ranges for ENG, as ENG is already deployed by some administrations in these tuning ranges and may encourage other administrations and manufacturers to deploy and develop ENG systems within these harmonized tuning ranges.

2) The proposed tuning ranges should provide stability for both administrations and manufacturers as they can only be modified and/or complemented by a future WRC.

3) Urges continued study of required tuning ranges and sharing criteria within ITU-R in support of the Recommendation, as well as the continued presence of an item on the agenda of the next WRC which permits the review of Recommendations and Resolutions of previous WRCs.

4) Can provide broadcasters and/or ENG operators, as appropriate, with information on the spectrum available and the regulatory process to gain access to spectrum for ENG usage in each country.

5) The associated database for this method can be used by manufacturers, operators and regulators involved in ITU-R and standardization organizations to work toward a long-term solution through equipment harmonization by establishing standardized equipment tuning ranges able to provide maximum utility for ENG operations.

Disadvantages

1) As this method is based upon a WRC Recommendation it may be difficult to address amendments arising from technology advancement given the ability to amend these only at a WRC.

2) Deployment of ENG systems in a limited number of tuning ranges may lead to increased congestion without increased frequency planning and management.

3) Studies for the potential tuning ranges proposed for ENG harmonization may not be available in time for consideration at WRC-12.

4) The development, population, maintenance and verification of the accuracy of a database will require extensive time and effort on an ongoing basis.[**]

5) Recurring changes to the tuning range at WRCs would impose excessive equipment upgrade/update burdens for broadcasters and/or ENG operators.

3/1.5/6 Regulatory and procedural considerations

Depending upon the development of Methods a consequential outcome may be suppression of Resolution **954 (WRC-07)**.

3/1.5/6.1 For Method A

Draft Resolution [A105-ENG-METHA] (WRC-12) on Spectrum management guidelines for electronic news gathering (ENG)

The proposed regulatory approach is to make no modifications to the Table of Frequency Allocations in RR Article **5**, but rather to create a WRC Resolution that calls for the development of a database of information on ENG usage around the world that would be accessible to broadcasters and/or ENG operators when needed, thereby facilitating broadcasters' access to spectrum as necessary. The development of such a database would be accomplished by the broadcasting community[3] with support from the ITU and member administrations. If the international broadcasting community cannot agree on a focal point(s) for development of such a database, ITU-R Recommendations and Reports could be developed to provide access to the same information. In addition, this method calls for suppression of Resolution **954 (WRC-07)** since additional WRC action will not be required for ongoing work.

NOC

ARTICLE 5

[**] The issue of the involvement or otherwise of BR in activities related to the relevant databases is a matter to be further studied by administrations and BR.

[3] The phrase "broadcasting community" refers to the international community of broadcasting station operators and their regional organizations. It is expected that a focal point for development of a global database or for individual regional databases would be selected through the broadcasting regional organizations.

ADD

EXAMPLE OF DRAFT RESOLUTION [A105-ENG-METHA] (WRC-12)

Spectrum management guidelines for electronic news gathering

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that some administrations may have different operational needs and spectrum requirements for electronic news gathering, depending on the usage;

b) that the use of terrestrial portable and transportable radio equipment by services ancillary to broadcasting, commonly described as electronic news gathering (ENG), operating in bands allocated to the broadcasting[1], fixed and mobile services has become an important element in the comprehensive coverage of a wide range of internationally noteworthy events, including natural disasters,

recognizing

a) that, in some countries, ENG is utilized as part of an administration's telecommunications/information and communication technologies (ICTs) systems in service of management in emergency and disaster situations for early warning, prevention, mitigation and relief;

b) that Recommendation ITU-R M.1824 provides system characteristics of television outside broadcast, electronic news gathering (ENG) and electronic field production (EFP) in the mobile service for use in sharing studies;

c) that Recommendation ITU-R F.1777 provides system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies;

d) that Report ITU-R BT.2069 provides spectrum usage and operational characteristics of terrestrial ENG, television outside broadcast (TVOB) and EFP systems;

e) that Recommendation ITU-R M.1637 addresses issues to be considered in order to facilitate the global circulation of radiocommunication equipment to be used in emergency and disaster relief situations,

noting

a) that the dynamic nature of the use of ENG is driven by scheduled (e.g. major sporting events, concerts and VIP visits, etc.) and unscheduled events such as breaking news, emergencies and disasters;

b) that when an international newsworthy event occurs, broadcasters and/or ENG operators often have little to no lead time in which to prepare for deployment;

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[1] Within some administrations ENG applications are assigned within bands other than those allocated to the fixed and mobile services, for example wireless microphones can/may operate in bands allocated to the broadcasting services. Also, within some administrations, the use of such microphones is based on the condition that they shall not cause harmful interference to, nor claim protection from, other applications in neighbouring countries.

c) that several broadcasters/organizations/networks often attempt to cover the same event, thus creating a demand for multiple ENG links and an increased demand for access to spectrum;

d) that there is a critical requirement to perform immediate spectrum management actions, including frequency coordination, sharing and spectrum reuse, within an administration where the international newsworthy event takes place;

e) that prior identification of potential frequency availability in individual administrations within which equipment might be able to operate, together with the use of equipment with adequate tuning ranges that allows for operation in various spectrum access scenarios, may ease the frequency assignment process, especially during international news-worthy events that draw broadcast audiences regionally and/or globally,

noting further

that it is in the interest of administrations and their broadcasting community to have access to updated information on national spectrum planning for ENG use,

resolves

1 to encourage administrations to consider frequency bands/tuning ranges for ENG by other administrations when undertaking their own national planning and to communicate this information to the focal point identified by the broadcasting community;

2 to encourage administrations to assist the broadcasting community in developing a database of available frequencies, technical and operational requirements, and spectrum authorization points of contact as appropriate for worldwide usage of ENG systems,

instructs the Director of the Radiocommunication Bureau

1 to provide a link on the ITU-R website to any databases or information systems established by the broadcasting community of currently available ENG frequencies, ENG technical and operational requirements, and spectrum authorization points of contact as appropriate;

2 to report on the progress on this Resolution to a future World Radiocommunication Conference,

urges administrations

1 to provide the broadcasting community with the relevant information concerning their national ENG frequency allocations, ENG spectrum management practices, and appropriate points-of-contact for ENG usage within their administration;

2 to ensure that information provided is kept up to date by submitting any modifications to the information requested above on an ongoing basis.

SUP

RESOLUTION 954 (WRC-07)

Harmonization of spectrum for use by terrestrial electronic news gathering systems

3/1.5/6.2 For Method B

Draft Recommendation/Resolution [B105-ENG-METHB] (WRC-12) on tuning ranges for worldwide/regional harmonization for terrestrial electronic news gathering systems

A WRC Recommendation or a WRC Resolution should be developed to include a list of frequency bands for harmonization of tuning ranges for ENG use on a regional/worldwide basis.

NOC

ARTICLE 5

ADD

EXAMPLE OF DRAFT RECOMMENDATION/
RESOLUTION [B105-ENG-METHB] (WRC-12)

Tuning ranges[1] for worldwide/regional harmonization for terrestrial electronic news gathering[2] systems

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the use of terrestrial portable and transportable radio equipment by services ancillary to broadcasting and programme making, commonly described as electronic news gathering (ENG), operating in the bands allocated to the broadcasting[3], fixed and mobile services has become an important element in the comprehensive coverage of a wide range of internationally noteworthy events, including natural disasters;

b) that, in some situations, studies within ITU-R may indicate that sharing may be feasible between ENG applications and other fixed and mobile service applications;

c) that Report ITU-R BT.2069 provides a conclusion that the existing spectrum used for ENG is insufficient to meet anticipated demands;

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[1] In the context of this Recommendation/Resolution, the term “tuning range” means a range of frequencies over which radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

[2] For the purpose of this text, ENG represents all applications ancillary to broadcasting, such as terrestrial electronic news gathering, electronic field production, TV outside broadcast, wireless radio microphones and radio outside production and broadcast.

[3] Within some administrations ENG applications are assigned within bands other than those allocated to the fixed and mobile services, for example wireless microphones can/may operate in bands allocated to the broadcasting services. Also, within some administrations, the use of such microphones is based on the condition that they shall not cause harmful interference to, nor claim protection from, other applications in neighbouring countries.

d) that a wide diversity of ENG link equipment is currently available from the manufacturers, and also with the broadcasters and/or ENG operators and this important aspect of regional harmonization needs to be addressed;

e) that operational constraints often introduces problems for administrations as little advance notice is often provided for some ENG requirements, which minimizes the possibility for precoordination, however frequency spectrum harmonization of tuning ranges would facilitate ENG link operation, particularly at events requiring cross-border coverage, such as natural disasters;

f) that digitization may provide an opportunity for more efficient spectrum usage for ENG that could assist in meeting a growth in demand for spectrum by these systems;

g) that modular design and miniaturization of terrestrial ENG systems has increased the portability for such equipment and has thus increased the trend towards cross-border operation of ENG equipment;

h) that relevant ITU Recommendations and Reports can assist administrations in addressing ENG operations in their spectrum planning;

i) that Recommendation ITU-R M.1824 provides system characteristics of television outside broadcast, electronic news gathering (ENG) and electronic field production (EFP) in the mobile service for use in sharing studies;

j) that Recommendation ITU-R F.1777 provides system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies;

k) that Report ITU-R BT.2069 provides spectrum usage and operational characteristics of terrestrial ENG, television outside broadcast (TVOB) and EFP systems;

l) that Recommendation ITU-R M.1637 addresses issues to be considered in order to facilitate the global circulation of radiocommunication equipment to be used in emergency and disaster relief situations,

noting

a) that worldwide/regional harmonization of spectrum for use by terrestrial ENG systems should be beneficial for the administrations in their national spectrum planning and to the ENG equipment users in covering the events internationally;

b) that ENG applications can make use of cognitive techniques to facilitate their access to spectrum; see for example, ETSI TR 102 799 v1.2.2 (European Telecommunications Standards Institute),

recognizing

a) that access to a globally harmonized spectrum in terms of agreed tuning ranges is highly desirable to facilitate the rapid and less restrictive deployment and operation of ENG systems from one country to another;

b) that the dynamic nature of the use of ENG is driven by scheduled and unscheduled events such as breaking news, emergencies and disasters;

c) that news gathering and electronic production typically take place in an environment where several television broadcasters/organizations/networks attempt to cover the same event, creating a demand for multiple ENG links which results in an increased demand for access to spectrum in suitable frequency bands;

d) that harmonization of tuning ranges for ENG usage in this Recommendation/Resolution does not preclude the use of these bands for any other application which falls within the service allocation applicable to these bands, nor establish any priority for ENG applications with respect to any other use of these bands,

recommends/resolves

that administrations are encouraged/urged to consider the regionally/worldwide harmonized tuning ranges contained in the Annex to this Recommendation/Resolution for ENG use, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries,

invites ITU-R

to continue studies on operational practices which facilitate the implementation of this Recommendation/Resolution.

ANNEX TO THE EXAMPLE OF DRAFT RECOMMENDATION/RESOLUTION [B105-ENG-METHB] (WRC-12)

TABLE 1

Tuning ranges[3] for consideration of harmonization for ENG audio applications

Typical ENG application	**Preferred tuning ranges for worldwide harmonization**	**Preferred tuning ranges for regional harmonization**
Audio applications	AAA – BBB MHz CCC – DDD MHz E EEE – F FFF MHz	GGG – HHH MHz III – JJJ MHz K KKK – L LLL MHz It is expected that the above-mentioned list of tuning ranges may be a superset of the worldwide tuning ranges and may be different for each region

TABLE 2

Tuning ranges for consideration of harmonization for ENG video applications

Typical ENG application	**Preferred tuning ranges for worldwide harmonization**	**Preferred tuning ranges for regional harmonization**
Video applications	M MMM – N NNN MHz O OOO – P PPP MHz Q QQQ – R RRR MHz S SSS – T TTT MHz UU – VV GHz XX – ZZ GHz	M MOM – N NEN MHz O OAO – P PIP MHz Q QOL – R RON MHz S SXS – T TMT MHz UE – VG GHz XA – ZB GHz

3 The Recommendations and Reports referenced in the CPM text could be used for guidance by administrations in developing specific tuning ranges for consideration under this method. The CPM received a contribution (Document CPM11-2/112) that provided an example of tuning ranges for regional harmonization.

SUP

RESOLUTION 954 (WRC-07)

Harmonization of spectrum for use by terrestrial electronic news gathering systems

3/1.5/6.3 For Method C

Development and approval within ITU-R of Recommendation(s) and/or Reports listing preferred frequency bands and tuning ranges for ENG applications preferably on a regional or worldwide basis

This method aims at development and approval within ITU-R of Recommendation(s) and/or Reports listing preferred frequency bands and tuning ranges for ENG applications preferably on a regional or worldwide basis.

One of the objectives is potential development of additional guidance material for the proper operation of ENG across national boundaries.

NOC Volumes 1, 2, 3 and 4 of the Radio Regulations.

SUP

RESOLUTION 954 (WRC-07)

Harmonization of spectrum for use by terrestrial electronic news gathering systems

3/1.5/6.4 For Method D

This method proposes a WRC Recommendation with a list of frequency bands/tuning ranges for ENG use intended for harmonization to the extent achievable on a regional/worldwide basis. In addition the method proposes a WRC Resolution. The Resolution is intended to encourage the development of a database of frequency bands which may be available for cross-border deployment in each country for ENG and other relevant information. Both the Resolution and the Recommendation encourage further study on ENG in the ITU-R in order to maintain these documents. The tuning ranges considered under this method for inclusion in the Recommendation would take into account those frequency bands currently allocated to the broadcasting[1], fixed and mobile services in the Radio Regulations, which are already used extensively by ENG systems.

NOC

ARTICLE 5

SUP

RESOLUTION 954 (WRC-07)

Harmonization of spectrum for use by terrestrial electronic news gathering[1] systems

ADD

EXAMPLE OF DRAFT RECOMMENDATION [TUNING RANGES]

Tuning ranges[1] for worldwide/regional harmonization for terrestrial electronic news gathering[2] systems

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the use of terrestrial portable and transportable radio equipment by services ancillary to broadcasting and programme making, commonly described as electronic news gathering (ENG), which operate principally in the bands allocated to the broadcasting[3], fixed and mobile services has become an important element in the comprehensive coverage of a wide range of internationally noteworthy events, including natural disasters;

b) that in some situations, sharing may be feasible between ENG applications with other fixed and mobile service applications dependent on studies within ITU-R;

c) that Report ITU-R BT.2069 provides a conclusion that the existing spectrum used for ENG is insufficient to meet anticipated demands;

d) that a wide diversity of ENG link equipment is currently available from manufacturers, and utilized by broadcasters and/or ENG operators, therefore regional harmonization is an important issue which needs to be addressed;

e) that operational constraints often introduces problems for administrations as little advance notice is often provided for some ENG requirements, which minimizes the possibility for pre-coordination, however frequency spectrum harmonization of tuning ranges would facilitate

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1 In the context of this Recommendation, the term “tuning range” means a range of frequencies over which radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

2 For the purpose of this text, ENG represents all applications ancillary to broadcasting, such as terrestrial electronic news gathering, electronic field production, TV outside broadcast, wireless radio microphones and radio outside production and broadcast.

3 Within some administrations ENG applications are assigned within bands other than those allocated to the fixed and mobile services, for example wireless microphones can/may operate in bands allocated to the broadcasting services. Also, within some administrations, the use of such microphones is based on the condition that they shall not cause harmful interference to, nor claim protection from, other applications in neighbouring countries.

ENG link operation, particularly at events requiring cross-border coverage, such as natural disasters;

f) that digitization may provide an opportunity for more efficient spectrum usage for ENG that could assist in meeting a growth in demand for spectrum by these systems;

g) that modular design and miniaturization of terrestrial ENG systems has increased the portability for such equipment and has thus increased the trend towards cross-border operation of ENG equipment;

h) that relevant ITU Recommendations and Reports can assist administrations in addressing ENG operations in their spectrum planning;

i) that Recommendation ITU-R M.1824 provides system characteristics of television outside broadcast, electronic news gathering (ENG) and electronic field production (EFP) in the mobile service for use in sharing studies;

j) that Recommendation ITU-R F.1777 provides system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies;

k) that Report ITU-R BT.2069 provides spectrum usage and operational characteristics of terrestrial ENG, television outside broadcast (TVOB) and EFP systems;

l) that ITU-R should be encouraged to further study required tuning ranges and sharing criteria within in support of this Recommendation;

m) that this Recommendation requires regular review to maintain its currency,

noting

a) that worldwide/regional harmonization of tuning ranges for use by terrestrial ENG systems would be beneficial for administrations in their national spectrum planning and for ENG equipment users in realizing their operational requirements internationally;

b) that wireless microphones may be able to make use of cognitive techniques to facilitate their access to spectrum; see for example, ETSI TR 102 799 v1.2.2 (European Telecommunications Standards Institute),

recognizing

a) that access to a globally harmonized spectrum in terms of agreed tuning ranges is highly desirable to facilitate the rapid and less restrictive deployment and operation of ENG systems from one country to another;

b) that the dynamic nature of the use of ENG is driven by scheduled and unscheduled events such as breaking news, emergencies and disasters;

c) that news gathering and electronic production typically take place in an environment where several television broadcasters/organizations/networks attempt to cover the same event, creating a demand for multiple ENG links which results in an increased demand for access to spectrum in suitable frequency bands;

d) that harmonization of tuning ranges for ENG usage in this Recommendation does not preclude the use of these bands for any other application which falls within the service allocation applicable to these bands, nor establish any priority for ENG applications with respect to any other use of these bands, *recommends*

1 that broadcasters and/or ENG operators should take note of this Recommendation and utilize the tuning ranges in the Annex whenever possible;

2 that this Recommendation should be taken into account in future equipment designs,

recommends administrations

to consider the regional and/or worldwide harmonized tuning ranges contained in the Annex to this Recommendation for ENG applications, taking into account national and regional requirements and having regard to any required negotiation, consultation and cooperation with other concerned countries, particularly for cross-border coverage of events, such as natural disasters,

recommends that ITU-R

continue the studies relating to harmonized tuning ranges for ENG equipment and systems as well as any necessary sharing criteria, in particular amendments to Tables 1 and 2 in the Annex to this Recommendation,

recommends that the Director of the Radiocommunication Bureau

provide the results of further studies on harmonization of ENG for consideration and action at a future WRC.

ANNEX TO THE DRAFT RECOMMENDATION

TABLE 1

Tuning ranges[4] for consideration of harmonization for ENG audio applications

Typical ENG application	Preferred tuning ranges for worldwide harmonization	Preferred tuning ranges for regional harmonization
Audio applications	AAA – BBB MHz CCC – DDD MHz E EEE – F FFF MHz	GGG – HHH MHz III – JJJ MHz K KKK – L LLL MHz It is expected that the above-mentioned list of tuning ranges may be a superset of the worldwide tuning ranges and may be different for each region

[4] The Recommendations and Reports referenced in the CPM text could be used for guidance by administrations in developing specific tuning ranges for consideration under this method. The CPM received a contribution (Document CPM11-2/112) that provided an example of tuning ranges for regional harmonization.

TABLE 2

Tuning ranges for consideration of harmonization for ENG video applications

Typical ENG application	Preferred tuning ranges for worldwide harmonization	Preferred tuning ranges for regional harmonization
Video applications	M MMM – N NNN MHz O OOO – P PPP MHz Q QQQ – R RRR MHz S SSS – T TTT MHz UU – VV GHz XX – ZZ GHz	M MOM – N NEN MHz O OAO – P PIP MHz Q QOL – R RON MHz S SXS – T TMT MHz UE – VG GHz XA – ZB GHz

ADD

EXAMPLE OF DRAFT RESOLUTION [DATABASE]

Frequency information and conditions for electronic news gathering

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that administrations have different operational needs and spectrum requirements for electronic news gathering, depending on their circumstances;

b) that the use of terrestrial portable and transportable radio equipment by services ancillary to broadcasting, commonly described as electronic news gathering (ENG), operating in bands allocated to the broadcasting[1], fixed and mobile services has become an important element in the comprehensive coverage of a wide range of internationally noteworthy events, including natural disasters,

recognizing

a) that in some countries, ENG is utilized as part of an administration's telecommunications/information and communication technologies (ICTs) systems in service of management in emergency and disaster situations for early warning, prevention, mitigation, and relief;

b) that Recommendation ITU-R M.1824 provides system characteristics of television outside broadcast, electronic news gathering (ENG) and electronic field production (EFP) in the mobile service for use in sharing studies;

c) that Recommendation ITU-R F.1777 provides system characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies;

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1 Within some administrations ENG applications are assigned within bands other than those allocated to the fixed and mobile services, for example wireless microphones can/may operate in bands allocated to the broadcasting services. Also, within some administrations, the use of such microphones is based on the condition that they shall not cause harmful interference to, nor claim protection from, other applications in neighbouring countries.

d) that Report ITU-R BT.2069 provides spectrum usage and operational characteristics of terrestrial ENG, television outside broadcast (TVOB) and EFP systems,

noting

a) that the dynamic nature of the use of ENG is driven by scheduled (e.g. major sporting events, concerts and VIP visits, etc.) and unscheduled events such as breaking news, emergencies and disasters;

b) that when an international newsworthy event occurs, broadcasters and/or ENG operators often have little to no lead time in which to prepare for deployment;

c) that several broadcasters/organizations/networks often attempt to cover the same event, thus creating a demand for multiple ENG links and an increased demand for access to spectrum;

d) that there is a critical requirement to undertake expeditious spectrum management actions, including frequency coordination, sharing and frequency reuse, within an administration when an international newsworthy event takes place;

e) that prior identification of potential frequency availability in individual administrations within which equipment might be able to operate, together with the use of equipment with adequate tuning ranges that allow for operation in various spectrum access scenarios, may ease the frequency assignment process, especially during international news-worthy events that draw broadcast audiences regionally and/or globally,

noting further

that it is in the interest of administrations and their broadcasting community to have access to up-to-date information on national spectrum planning for ENG use,

resolves to invite Regional Telecommunications Organizations

to develop a database or other information mechanisms to provide details of available frequencies, technical and operational requirements, and spectrum authorization points of contact for the operation of ENG systems in their member administrations,

resolves to invite administrations

to publicize the frequency bands available as well as conditions and regulations applicable for ENG within their jurisdiction, including any frequency bands that could be considered exceptionally during major events, nationally and through their membership of the applicable Regional Telecommunications Organization for their region,

instructs the Director of the Radiocommunication Bureau

1 to provide a link on the ITU-R website to any databases or information systems established by the Regional Telecommunications Organizations of currently available ENG frequencies, ENG technical and operational requirements, and spectrum authorization points of contact as appropriate;

2 to report on the progress on this Resolution to a future World Radiocommunication Conference,

urges administrations

1 to provide their Regional Telecommunications Organization with the relevant information concerning details of available frequencies, details of the associated frequency assignment process, and appropriate points of contact for ENG usage within their administration;

2 to ensure that information provided is kept up to date by notifying any modifications to the information requested above on an ongoing basis.

AGENDA ITEM 1.8

1.8 to consider the progress of ITU-R studies concerning the technical and regulatory issues relative to the fixed service in the bands between 71 GHz and 238 GHz, taking into account Resolutions 731 (WRC-2000) and 732 (WRC-2000);

Resolution **731 (WRC-2000)**: *Consideration by a future competent world radiocommunication conference of issues dealing with sharing and adjacent-band compatibility between passive and active services above 71 GHz*

Resolution **732 (WRC-2000)**: *Consideration by a future competent world radiocommunication conference of issues dealing with sharing between active services above 71 GHz*

3/1.8/1 Executive summary

WRC-12 Agenda item 1.8 deals with the review of technical and regulatory issues relative to the FS in bands above 71 GHz to address the increasing interest and emerging technology requirements with a view to ensuring that a suitable regulatory environment exists for the advancement (development/deployment) of fixed wireless technology into these higher bands, taking into account existing services and in accordance with Resolutions **731** and **732 (WRC-2000)**.

Studies within ITU-R have been focused on gathering the characteristics/deployment scenarios and future trends and requirements of FS systems in bands above 71 GHz. From these studies it can be established that there is an increasing move towards very wide band, high-capacity fixed wireless systems (> 10 Gbit/s) which may require further consideration on the most appropriate approach to achieve a suitable regulatory framework that will allow the introduction of these very high capacity systems in these bands. The technical characteristics of one high capacity FSS network filed in the 71-76 / 81-86 GHz bands were provided during the study period. However, no detailed sharing studies between FS and FSS have been undertaken to date. ITU-R has initiated in band sharing and adjacent band compatibility studies between FS in the 71-76/81-86 GHz bands and radio astronomy in the 81-86 GHz, 76-77.5 GHz, 79-81 GHz and 86-92 GHz bands and EESS in the 86-92 GHz band.

Further studies are required and ongoing in ITU-R which may require regulatory action by this and/or a future World Radiocommunication Conference as appropriate.

Two methods are proposed to satisfy this agenda item:

Method A consists of no change to the Radio Regulations at this time but with two approaches (Approach A1 – NOC Resolutions **731** and **732 (WRC-2000)**; Approach A2 – SUP Resolutions **731** and **732 (WRC-2000)** and develop new Resolutions as appropriate in the future) to allow continuation of technical and operational considerations related to FS between 71-238 GHz to be addressed in ITU-R Reports and Recommendations as appropriate. Regulatory action can then be taken based on these ITU-R documents by a future World Radiocommunication Conference as appropriate.

Method B consists of introducing unwanted emission power masks on the FS through footnotes in RR Article **5** attached to the FS allocations in the bands 81-86 GHz and 92-95 GHz to protect the EESS in the adjacent band 86-92 GHz, with two approaches. Approach B1 proposes mandatory masks. This approach implies some limitations on the FS. Approach B2 proposes recommended masks that may constrain the FS in countries implementing the mask and may constrain the EESS in countries that are not implementing the mask.

3/1.8/2 Background

WRC-2000 made allocations to both active and passive services in bands above 71 GHz based on what was known at the time about these services. The requirements of passive services were well known as they depend on physical phenomena but little was known at the time about the requirements and technical characteristics of the active services that might wish to exploit these higher bands. Therefore, Resolutions **731 (WRC-2000)** and **732 (WRC-2000)** were adopted during WRC-2000 as a placeholder, setting out the studies required, to address future work in bands above 71 GHz "at a future competent conference".

Although Resolutions **731** and **732** were adopted at WRC-2000 to address all radio services, WRC-07 adopted Agenda item 1.8, which limits the studies with respect to Resolutions **731 (WRC-2000)** and **732 (WRC-2000)** to the FS related issues, and to an upper frequency of 238 GHz.

Since then millimetre wave spectrum above 71 GHz has become the subject of increasing interest for fixed wireless systems (FWS) use due to its propagation characteristics and the wide bandwidth available for carrying communication traffic. New technologies are now emerging that offer the possibility of using these higher bands for fixed wireless applications, taking advantage of the wide bandwidths available to support applications such as high-speed data transmission (e.g. in the range 1 Gbit/s to 10 Gbit/s) for short hop (1-2 km) communication. There is also potential for even higher data-rate systems (up to 100 Gbit/s) provided that sufficient bandwidth is available, in particular in contiguous spectrum blocks. International markets are being established and several administrations have now opened or are in the process of opening these bands for terrestrial fixed wireless applications.

Therefore it is important that appropriate international regulatory environment exists to foster these developments and address the emerging FWS requirements taking into account the requirements of other services in the bands above 71 GHz.

3/1.8/3 Summary of technical and operational studies and relevant ITU-R Recommendations

List of relevant ITU-R Recommendations and Reports: Recommendation ITU-R RA.1031; Reports ITU-R F.2107, F.[FS/PASSIVE 71-81 GHz]

3/1.8/3.1 Characteristics and applications of fixed wireless systems

ITU-R has revised Report ITU-R F.2107 to extend the applicable frequency range up to 130 GHz. Report ITU-R F.2107 provides propagation aspects, system design parameters, possible applications and other technical/operational characteristics, which are required for the implementation of FWS in the frequency ranges 57 to 130 GHz. From these studies it can be established that there is an increasing move towards very wide band, high capacity FWS in bands above 71 GHz. There is already evidence of experimental radio systems in existence capable of data rates of over 10 Gbit/s using simple modulation over 17 GHz bandwidth in bands around 120 GHz. Applications of these radio systems amongst others include last-mile applications including extension of fibre network. It should however be noted that the FWS described in the 120 GHz range are not covered by sufficient FS allocation in the radio regulations and have provisionally used spectrum allocated to passive services.

Therefore interest in these higher millimetre-wave bands appears to be the potential for even higher data rate transmissions provided that very wide bandwidths can be made available. In the wired world, standards already exist for 40 Gbit/s transmission, and 100 Gbit/s draft standards are in existence. To support and complement such data rates wirelessly, larger channel bandwidths than those currently available at the lower frequencies are likely to be required. Only at the higher millimetre-wavelengths can such bandwidths be made available.

3/1.8/3.2 Sharing studies between the fixed service and other co-primary services

The characteristics/deployment scenarios of FS systems and the technical characteristics of one high-capacity FSS network filed in the 71-76 / 81-86 GHz bands were provided during the study period. However, no detailed sharing studies between FS and FSS have been undertaken to date. Future studies may be required.

ITU-R has initiated studies in band sharing and adjacent band compatibility between FS in the 71-76/81-86 GHz bands and radio astronomy in the 81-86 GHz, 76-77.5 GHz, 79-81 GHz and 86-92 GHz bands and EESS in the 86-92 GHz band. However, there were concerns expressed over the content of these technical studies. Therefore, further studies may be required in order to complete the current work.

3/1.8/4 Analysis of the results of studies

3/1.8/4.1 Characteristics, applications and future trends of fixed wireless systems

Very wide bandwidth high-capacity FWS systems (> 10 Gbit/s), which in their early lifecycle stage use basic modulation schemes, are expected to migrate to higher modulation schemes as the technology develops. This approach strikes a balance between the technical challenges in bands above 71 GHz and an early introduction of these systems, to foster future development and enhancement. To achieve such a balance between the technical challenges and to avoid regulatory hindrance to an early introduction of these systems, contiguous spectrum blocks of ≥ 10 GHz may be required to achieve very high capacity systems (possibly up to 100 Gbit/s). Such bandwidths are difficult to make available in lower bands. Therefore, this requires further consideration on the most appropriate approach to achieve a suitable regulatory framework in bands above 71 GHz that will allow the introduction of very high capacity systems. It is recognized that the sharing amongst FWS and FWS with other services, especially active services, is generally easier due to highly directional antennas used by FWS and the propagation conditions in bands above 71 GHz.

3/1.8/4.2 Sharing studies between the fixed service and other co-primary services

No sharing studies between the FS and other co-primary active services, such as FSS and BSS, were undertaken during the study cycle since both FSS and BSS were in the developmental stage and no commercial satellite system characteristics were available at the time.

It appears from the studies that the protection of the RAS from interference in bands adjacent to the FS operating in the bands 71-76 and 81-86 GHz is a national issue which does not require any additional regulatory provision in RR Article **5**.

The protection of radio astronomy stations operating in the band 81-86 GHz from interference from FS stations in the same band may require the establishment of exclusion or coordination area around a radio astronomy station, to be determined on a case-by-case basis taking into account specificities such as terrain elevation and additional clutter. Recommendation ITU-R RA.1031 may be used to calculate those distances. The same would apply for sharing in the bands 92-94 GHz, 94.1-95 GHz and 111.8-114.25 GHz. The regulatory provisions are already contained in RR No. **29.9** and no additional regulatory provisions are required.

3/1.8/4.3 Compatibility studies being carried out in the ITU-R

Some administrations believe that the protection of the EESS operating in the band 86-92 GHz from interference from unwanted emissions from FS stations operating in the adjacent band 81-86 GHz may be achieved by an unwanted emission power mask in the band 86-92 GHz starting with −41 dBW/100 MHz at 86 GHz and decaying to −55 dBW/100MHz at 87 GHz[1]. Report ITU-R F.[FS/PASSIVE 71-81 GHz] contains the results of these studies and also describes some means to design and deploy FS in order to meet the adjacent band unwanted emission limits. Some administrations proposed to apply the same kind of mask (based on a "mirror approach") for the protection of EESS (passive) in the band 86-92 GHz from interference from the FS in the band 92-95 GHz. Concerns were expressed over the restrictions imposed on the FS by the proposed masks. Further concerns were raised about these ITU-R studies for the unwanted emission mask for fixed services in the band 92-95 GHz.

Some administrations believe that further work is needed to address the protection of EESS (passive) in the bands 109.5-111.8 GHz and 114.25-122.25 GHz.

3/1.8/5 Methods to satisfy the agenda item

3/1.8/5.1 Method A

Taking into account the following:

– technological developments in the active services are still at an early product lifecycle or development stage;

– some administrations have not opened the 70/80/90 GHz band for licensing yet;

– spectrum reuse in the 70/80 GHz band is based on a "pencil beam" concept; i.e. there is very high angle discrimination between nearby links ensuring the isolation of signals from mutual interference. Hence, the primary source of interference for narrow-beam 70/80 GHz links would have to be from line-of-sight power directed into the main lobe or a side lobe of a victim receive antenna;

– the use of low-level modulation in first generation 70/80 GHz transceivers has the advantage that less transmitter power is required for a desired level of performance. Consequently, less interference is created to surrounding links and other services; and

– other effects such as multipath and atmospheric stratification are not significant for operation in this band due to the extremely narrow beams in which the radiation propagates.

Therefore, under Method A it is considered that no change to the Radio Regulations is required at the current time. This method can be achieved through two different approaches (Approach A1 and Approach A2).

Approach A1 foresees maintaining Resolutions **731 (WRC-2000)** and **732 (WRC-2000)** asking for future studies.

Approach A2 proposes suppression of these Resolutions with, studies in these bands continuing under the usual ITU-R procedures and new Resolution(s) can be developed as necessary.

Under Method A, technical and operational considerations related to FS between 71-238 GHz would continue to be addressed in ITU-R Reports and Recommendations as appropriate. Regulatory action can then be taken based on these ITU-R documents by a future World Radiocommunication Conference as appropriate.

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[1] It could be noted that FS equipment have recently been standardized in the 81-86 GHz band in Europe and that already takes into account the above-mentioned emission power mask.

Approach A1 advantages

– Allows administrations to facilitate implementation of FS systems between 71-238 GHz.

– Allows administrations more time to continue studies in these bands as technology develops and as more information becomes available.

– Avoids making regulatory provisions that are based on limited knowledge and information.

Approach A1 disadvantages

– It may be difficult to ensure the protection of EESS from FS.

Approach A2 advantages

– Same as A1 above.

Approach A2 disadvantages

– Suppression of regulatory placeholder regarding the future requirements for the studies referred to in Resolutions 731 and 732 (WRC-2000). For Approach A2 see Section 3/1.8/6.2.

– It may be difficult to ensure the protection of EESS from FS.

3/1.8/5.2 Method B

Under this method, no change in the Radio Regulations is required for the protection of the radio astronomy in the bands 76-77.5 GHz and 79-92 GHz. However, for the protection of the EESS in the band 86-92 GHz, unwanted emissions power masks are added in RR Article **5** to introduce limitations on unwanted emission of the FS through footnotes attached to the adjacent band FS allocations in the bands 81-86 GHz and 92-95 GHz. This method can be achieved through two different approaches (Approaches B1 and B2). Approach B1 would apply a mandatory unwanted emission mask; Approach B2 would apply a recommended unwanted emission mask.

Approach B1

Approach B1 would apply a mandatory unwanted emission mask to the FS in the bands 81-86 GHz and 92-95 GHz.

Approach B1 advantages

– Provides protection from harmful interference to the EESS allocated and used in the band 86-92 GHz for observations essential for climate and meteorology.

– Clear coexistence conditions would benefit the FS industry to develop their equipment.

Approach B1 disadvantages

– The studies for the proposed unwanted emission mask for the 81-86 GHz may not apply to all administrations. Further studies are required.

– No studies have been carried out in ITU-R with respect to unwanted emission mask for the band 92-95 GHz band.

– Introduces limitations on FS which may limit future technologies/flexibility particularly at this early stage of evolving FS technology.

Approach B2

Approach B2 would apply a recommended unwanted emission mask to the FS in the bands 81-86 GHz and 92-95 GHz.

Approach B2 advantages

– If all administrations comply with, the recommended unwanted emission mask, this approach provides protection from harmful interference to the EESS allocated and used in the band 86-92 GHz for observations essential for climate and meteorology

– The recommended unwanted emission mask may not impose undue constraint on the FS.

Approach B2 disadvantages

– Interference may be experienced by EESS sensors from administrations which have decided not to implement this unwanted emission mask. As the results of measurements performed by such sensors are used in meteorological models which required measurements to be performed worldwide, this may jeopardize the whole meteorological model.

– The studies for the proposed unwanted emission mask for the 81-86 GHz may not apply to all administrations. Further studies are required. No studies with respect to unwanted emission mask have been carried out in ITU-R for the band 92-95 GHz band.

– May introduce constrains on FS which may limit future technologies/flexibility particularly at this early stage of evolving FS technology.

3/1.8/6 Regulatory and procedural considerations

3/1.8/6.1 Method A - Approach A1

No change (NOC) to the Radio Regulations. As studies still need to be completed under Resolutions **731** and **732 (WRC-2000)**, these Resolutions should be retained.

NOC

RESOLUTION 731 (WRC-2000)

NOC

RESOLUTION 732 (WRC-2000)

3/1.8/6.2 Method A - Approach A2

No change (NOC) to the Articles of Radio Regulations. Studies can continue within ITU-R and new Resolution(s) can be developed as necessary.

SUP

RESOLUTION 731 (WRC-2000)

Consideration by a future competent world radiocommunication conference of issues dealing with sharing and adjacent-band compatibility between passive and active services above 71 GHz

SUP

RESOLUTION 732 (WRC-2000)

Consideration by a future competent world radiocommunication conference of issues dealing with sharing between active services above 71 GHz

3/1.8/6.3 Method B - Approach B1

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

81-86 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
81-84	FIXED ADD 5.A108 FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	
84-86	FIXED ADD 5.A108 FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY 5.149	

ADD

5.A108 Stations in the fixed service shall not exceed the following unwanted emission power limits at the antenna port, where f is the centre frequency of the 100 MHz Earth exploration-satellite service reference bandwidth expressed in GHz:

$-41 - 14(f - 86)$	dBW/100 MHz	in the band 86.05-87 GHz;
-55	dBW/100 MHz	in the band 87-91.95 GHz.

MOD

86-111.8 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
92-94	FIXED ADD 5.B108 MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	
94-94.1	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	
94.1-95	FIXED ADD 5.B108 MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	
…		

ADD

5.B108 Stations in the fixed service shall not exceed the following unwanted emission power limits at the antenna port, where *f* is the centre frequency of the 100 MHz Earth exploration-satellite service reference bandwidth expressed in GHz:

$-41 - 14(92 - f)$	dBW/100 MHz	in the band 91-91.95 GHz;
-55	dBW/100 MHz	in the band 86.05-91 GHz.

3/1.8/6.4 Method B - Approach B2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD
81-86 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
81-84	FIXED ADD 5.C108 FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	
84-86	FIXED ADD 5.C108 FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY 5.149	

ADD

5.C108 Administrations are encouraged to take all reasonable steps to comply with the following fixed service unwanted emission power limits at the antenna port, where f is the centre frequency of the 100 MHz Earth exploration-satellite service reference bandwidth expressed in GHz:

$-41 - 14(f - 86)$	dBW/100 MHz	in the band 86.05-87 GHz;
-55	dBW/100 MHz	in the band 87-91.95 GHz.

MOD

86-111.8 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
92-94	FIXED ADD 5.D108 MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	
94-94.1	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	
94.1-95	FIXED ADD 5.D108 MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	
…		

ADD

5.D108 Administrations are encouraged to take all reasonable steps to comply with the following fixed service unwanted emission power limits at the antenna port, where *f* is the centre frequency of the 100 MHz Earth exploration-satellite service reference bandwidth expressed in GHz:

$-41 - 14(92 - f)$	dBW/100 MHz	in the band 91-91.95 GHz;
-55	dBW/100 MHz	in the band 86.05-91 GHz.

Modifications of Resolution **731 (WRC-2000)** and Resolution **732 (WRC-2000)** may be considered.

AGENDA ITEM 1.17

*1.17 to consider results of sharing studies between the mobile service and other services in the band 790-862 MHz in Regions 1 and 3, in accordance with Resolution **749 (WRC-07)**, to ensure the adequate protection of services to which this frequency band is allocated, and take appropriate action;*

Resolution **749 (WRC-07)**: *Studies on the use of the band 790-862 MHz by mobile applications and by other services*

3/1.17/1 Executive summary

Studies have been carried out by the ITU-R to address the compatibility between the MS and other services in the band 790-862 MHz, taking into account the most recent characteristics for the services concerned.

Three issues have been identified, corresponding to the three different sharing pairs with the MS:

– Issue A: BS;

– Issue B: ARNS;

– Issue C: FS.

The Issues have been further sub-divided by cases according either to an ITU Region[3] (for Issue B and Issue C) or to whether countries are Contracting Members of the GE06 Agreement (Regional Agreement relating to the planning of the digital terrestrial broadcasting service in Region 1 (parts of Region 1 situated to the west of meridian 170° E and to the north of parallel 40° S, except the territory of Mongolia) and in the Islamic Republic Iran, in the frequency bands 174-230 MHz and 470-862 MHz) or not (Issue A). Appropriate methods have been proposed for each Issue and Case.

The protection criteria, methodologies to assess interference, and the studies carried out for each Issue under this agenda item are documented in the JTG 5-6 Compendium[4] on sharing studies in response to Resolution **749 (WRC-07)** as provided in Annex 9 of the Chairman's report (Document 5-6/180).

3/1.17/2 Background

The services currently allocated in the frequency band 790-862 MHz in Regions 1 and 3 are the BS, FS and MS.

The frequency range 790-862 MHz is also allocated to the ARNS on a primary basis in nineteen countries of Region 1 (RR No. **5.312**).

In Region 3 as well as in a number of countries of Region 1 the band 790-862 MHz has been allocated for MS for many years prior to WRC-07. WRC-07 via footnote RR No. **5.316B**, allocated this band to the mobile, except aeronautical mobile, service on a primary basis for the whole of Region 1 effective from 17 June 2015.

In accordance with RR Nos. **5.316** and **5.316A** sixty-seven Region 1 administrations have a primary MS allocation, which is effective until 16 June 2015, under the conditions stipulated in these footnotes. See also RR No. **5.317A,** which makes reference to Resolution **224 (Rev.WRC-07)**.

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[3] See RR provision No. **5.2**.

[4] This compendium is provided for information only.

Resolution **749 (WRC-07)** was adopted to address the protection of the services to which the band 790-862 MHz is currently allocated.

The frequency band 790-862 MHz is used for the GE06 Plan and the List.

3/1.17/3 Summary of technical and operational studies and relevant ITU-R material

3/1.17/3.1 System characteristics of the mobile, broadcasting, fixed and aeronautical radionavigation services

Parameters used in the sharing studies are contained:

a) For the MS, in Annex 2 to Document 5-6/180;

b) For the BS, in Annex 3 to Document 5-6/180;

c) For the FS, in Annex 4 to Document 5-6/180;

d) For the ARNS, in Annex 5 to Document 5-6/180.

Recommendations ITU-R BT.1306, BT.1701, F.758, F.1670, M.1461, M.1767 and M.1830 as well as Report ITU-R M.2039 are relevant.

The methodologies for the sharing studies under WRC-12 Agenda item 1.17 are provided in the relevant annexes of the chairman's report:

a) For sharing between the MS and the BS, in Annex 6 to Document 5-6/180;

b) For sharing between the MS and the FS, in Annex 7 to Document 5-6/180;

c) For sharing between the MS and the ARNS, in Annex 8 to Document 5-6/180.

3/1.17/3.2 Relation with the GE06 Agreement and Radio Regulations

3/1.17/3.2.1 Points to be taken into account when dealing with WRC-12 Agenda item 1.17

The following points have been established for consideration based on the current (2008) version of the Radio Regulations:

1) Provision RR No. **9.21** invokes a procedure to seek agreement related to conformity with the Table of Frequency Allocations in RR Article **5**. Identification by the Radiocommunication Bureau (the Bureau or BR) of the administrations from which agreement needs to be sought depends on the use of criteria (such as a coordination distance) and such criteria are yet to be established and agreed by administrations and included in the RR. The application of RR No. **9.21** is called for in footnotes RR Nos. **5.316A** and **5.316B**.

2) Three footnotes (RR Nos. **5.316**, **5.316A** and **5.316B**) provide details of the allocation to the mobile, except aeronautical mobile, service in Region 1 following decisions taken at WRC-07. A number of conditions apply when administrations seek to use these allocations.

3) Both provisions RR Nos. **5.316** and **5.316A** are mutually exclusive with RR No. **5.316B** (due to their dates of application).

4) Prior to 17 June 2015, the application of provision RR No. **9.21** (in order to seek agreement to the allocation to mobile, except aeronautical mobile, service) by the countries mentioned in RR No. **5.316A** is with respect to agreement by the administrations concerned obtained under that provision and under the GE06

Agreement, as appropriate, including those administrations mentioned in RR No. **5.312** where appropriate.

5) As from 17 June 2015 in Region 1 the application of RR No. **9.21** (in order to seek agreement to the allocation to mobile, except aeronautical mobile, service) under RR No. **5.316B** is only with respect to the ANRS (see also RR No. **5.312**) and for administrations, Contracting Members to the GE06 Agreement, the provisions of this Agreement continue to apply.

6) Previous WRCs decided that when terrestrial assignments are submitted under RR Article **11** to the Bureau in frequency bands allocated to terrestrial services on a primary basis and which are not shared with the space service with equal rights, the Bureau, apart from conducting the conformity examination with respect to the Table of Frequency Allocation (RR Nos. **11.31** and **11.31.1**[5]), performs no other examination, except, when appropriate for those countries which are Contracting Members to a World or Regional Allotment or Assignment Plan(s), an examination with respect to conformity to the associated provisions of the subject Plan or Agreement (RR No. **11.34**). Apart from this particular case, coordination[6] between terrestrial services is thus left to the administrations concerned to be effected on a bilateral or multilateral basis.

7) § 8.1 of Article 8 of the GE06 Agreement stipulates that “the Agreement shall bind Contracting Members in their relations with one another but shall not bind those members in their relations with non-Contracting Members”. Consequently countries which are not Contracting Members of the Agreement are not bound to apply any provisions of the Agreement.

8) The allocation to the MS in the band 790-862 MHz in Region 3 (including the Islamic Republic of Iran) exists since several decades and there is no formal coordination requirement between the terrestrial services (including the MS) in Region 3 and the ANRS service of countries mentioned in RR No. **5.312**.

9) With respect to relations between Region 1 countries, between countries of Regions 1 and 3, and between Region 3 countries see also Resolution **224 (Rev.WRC-07).**

3/1.17/3.2.2 Case of countries which are Contracting Members to the GE06 Agreement

For Contracting Members to the GE06 Agreement, relevant provisions for a situation where at least one of the considered services is broadcasting can be found in the Agreement. However, the GE06 Agreement contains no provisions for the coordination of two primary terrestrial services other than broadcasting.

The GE06 Agreement contains regulatory and technical provisions for the BS and other terrestrial services, a Plan for digital TV, a Plan for analogue TV and the List of other primary terrestrial services which covers, *inter alia*, the band 790-862 MHz. The GE06 Agreement applies only to Region 1 countries (except Mongolia) and to the Islamic Republic of Iran.

The coordination of the newly allocated primary MS in Region 1 with the primary digital BS of that Region and of the Islamic Republic of Iran (Contracting Members to the GE06 Agreement) is covered by the procedure contained in that Agreement. The provisions in the GE06 Agreement

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[5] RR No. **11.31.1** together with the associated Rules of Procedure covers the case of the application of RR No. **9.21**.

[6] This is not coordination referred to in the RR.

require an administration wishing to implement other primary terrestrial services to obtain prior agreement from the administration whose current and future BS may be affected. Section 1 of Annex 4 of the GE06 Agreement contains the limits and methodology for determining when agreement with another administration is required.

In accordance with the GE06 Agreement, the agreement required to protect the BS is based on the protection of the territory (i.e. existing and future broadcasting requirements), whereas for other terrestrial primary services including the MS, agreement is required on the basis of the assignments and their associated service areas and not based on the territory (i.e. assignments already contained in the List and assignments submitted to the ITU in application of the relevant provisions of Article 4 of the Agreement).

This is an important element to be taken into account in effecting the required coordination under the GE06 Agreement.

Regarding the protection of digital broadcasting system, Table A.1.10 of Appendix 1 to Section I of Annex 4 of the GE06 Agreement defines a trigger field strength of 25 dBμV/m in 8 MHz in the frequency range including 790 to 862 MHz for the identification of potentially affected administrations for the protection of the Plan from other primary terrestrial services.

For the case when the same frequency is used in a cellular network throughout a large geographical area like parts of or the whole of a country, the impact of multiple interfering mobile stations is addressed in the studies in § 3/1.17/4.1.

For receiving stations of other services other than broadcasting, calculations to identify affected administrations are based on the development of a coordination contour using the total maximum radiated power and maximum effective height envisaged for the broadcasting stations (53 dBW and 600 m) and on the notified characteristics of the assignment of the other primary service including mobile.

In particular, trigger levels for the protection of MS are either based on pre-defined characteristics corresponding to some systems deployed when the GE06 Agreement was developed (e.g. NA type code applying to CDMA) or based on a generic formula (NB type code) which applies generically to cellular mobile systems. The protection criteria is currently calculated based on the notified characteristics of the stations in the MS and on the typical values which are provided for the noise figure, the antenna gain, the feeder loss and the man-made noise. These values correspond to certain assumptions and are broadly technology independent.

It was noted that some mobile applications may not require such a high level of protection, as well as there could be mobile applications which may require a higher protection not covered by the GE06 Agreement. It has to be noted that the use of more stringent protection criteria results in more difficulties to obtain the agreements. In addition, § 5.2.2 of Section 1 of Annex 4 of the GE06 Agreement states that if the procedure does not result in the identification of an administration operating, or planning to operate, a station that exceeds the maximum characteristics envisaged for broadcasting "the administration responsible for the receiving station[7] agrees that there will be no claim for protection from the administration responsible for the broadcasting station, unless otherwise agreed in the coordination process".

When the coordination between administrations is being effected, if the protection ratios applicable to the generic case (NB type) are used[8], the technical parameters provided in the Agreement for

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7 This refers to a receiving station of the other primary service.

8 Table A.4.4-11 and Table A.4.4-12 of Appendix 4.4 to Chapter 4 of the GE06 Agreement.

these generic cases should be used with care in the assessment of the protection of broadcasting during such coordination because these protection ratios are for a bandwidth of 25 kHz. If another bandwidth is used, the relevant protection ratios can be found in Recommendation ITU-R BT.1368. Administrations are advised to determine the most appropriate characteristics to be used during their coordination, once the administrations with which coordination is required have been identified.

In addition, the GE06 Agreement in Article 5 provides that a digital entry in the Plan may also be notified with characteristics different from those in the Plan for transmissions in the BS or other primary services under the conditions specified in that Article.

This illustrates that each administration has obtained in the GE06 Agreement a certain level of rights in terms of spectrum access with the possibility to use these rights for any services to which the band is allocated. Overall, each administration has the opportunity to negotiate with its neighbours to adapt its rights to spectrum access in this band to the intended deployment.

3/1.17/3.2.3 Case of countries which are not Contracting Members to the GE06 Agreement

For the Region 3 countries which are not Contracting Members to the GE06 Agreement, and Mongolia, there have been no difficulties concerning TV services between these countries and there has not been a need to develop Regional agreements for either analogue or digital television.

In Region 3 a wider range of TV standards (including various TV channel rasters) have been implemented than in Region 1 and, where required, bilateral agreements have been developed for sharing.

Moreover, the countries, which are not Contracting Members to the GE06 Agreement, do not wish to extend the approach implemented in the GE06 Agreement for the determination of the need to coordinate between administrations implementing different services in adjacent countries.

3/1.17/3.2.4 Case between countries which are not Contracting Members to the GE06 Agreement in relation to countries which are Contracting Members to the GE06 Agreement

There is no regulatory mechanism, other than those that are currently in force to be applied between the countries which are Contracting Members to the GE06 Agreement and those countries that are not Contracting Members to that Agreement. The current practice of ITU for the terrestrial services is given in *Point 6* of § 3/1.17/3.2.1.

For the three cases described in §§ 3/1.17/3.2.2, 3/1.17/3.2.3, and 3/1.17/3.2.4 there is a possibility to use draft Recommendation **[JTG 5-6] (WRC-12)**, as appropriate.

3/1.17/3.3 Relevant ITU-R Recommendations and agreed elements of ITU-R Reports[9]

ITU-R Recommendations relevant for the BS for the frequency range 790-862 MHz include BT.417, BT.419, BT.1206, BT.1306, BT.1368, BT.1735, SM.851, SM.1682, and SM.1792.

ITU-R Recommendations relevant for the FS for the frequency range 790-862 MHz include F.699, F.758, and F.1670.

ITU-R Recommendations relevant for the ARNS for the frequency range 790-862 MHz include M.1461 and M.1830.

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[9] The GE06 Agreement is also referenced as it provides background information on the development of the Plan and coordination triggers.

ITU-R Recommendations relevant for the MS for the frequency range 790-862 MHz include M.687, M.819, M.1036-3, M.1634, M.1635, M.1767, M.1768, M.1808, M.1823, M.1824, M.1825, and Report ITU-R M.2039.

Other ITU-R materials, which are relevant for sharing and protection of services in the frequency range 790-862 MHz include: Recommendations ITU-R P.452, P.1546, P.1812 and Report ITU-R SM.2028.

3/1.17/4 Analysis of the results of studies

3/1.17/4.1 Protection of the broadcasting service for countries Contracting Members to the GE06 Agreement

In the frequency band 790-862 MHz, for countries Contracting Members to the GE06 Agreement, this Agreement contains all the required technical and regulatory mechanisms (e.g. coordination procedures) for the protection of the BS from the MS.

Modifications to the Plans and the List are governed by Article 4 of the Agreement. The procedure defined in Article 4 (a coordination trigger field strength of 25 dB(∝V/m) in 8 MHz for DVB-T) provides the necessary mechanisms to identify those administrations with which coordination is to be sought. Similar to other Plans the details of carrying out coordination activity are left to administrations in their bi- and multilateral negotiations.

Studies requested by Resolution **749** (**WRC-07**) investigated the impact of MS on BS on a co-channel basis between two administrations. These studies address the potential aggregated effect of multiple base stations located beyond and within the single cell coordination distance (SCCD), calculated with a base station producing a field strength of 25 dBµV/m in 8 MHz at the border. A first set of studies indicated that the cumulative field strength could be up to 21 dB above the triggering field strength, for 616 base stations (urban environment, e.i.r.p. = 55 dBm, transmitter height (Htx) = 30 m, radius = 1.3 km).

A second set of studies has been conducted to assess the potential impact of multiple interference from up to 378 base stations of a mobile network on the quality of the digital terrestrial television (DTT) service, expressed in percentage of interfered area through the whole DTT service area on the one hand and at the cell edge on the other hand. The base stations are located beyond the single cell coordination distance (SCCD). The DTT service area is placed in such a way that the DTT cell edge is tangent with the border. The mobile network is taken to be in urban environment (e.i.r.p. = 55 dBm, Htx = 30 m, cell radius = 1.3 km). The calculation was made for fixed DTT reception and for two types of DTT coverage areas: A large area (e.r.p. = 70 dBm, Htx = 100 m, radius = 28.7 km) and a small area (e.r.p. = 34 dBm, Htx = 30 m, radius = 2.4 km).

The wanted signal (DTT) is calculated using the 50% time propagation curves.

The interfering signals are normally computed with the 1% time propagation curves[10], as this was done in the planning process of the Regional Radiocommunication Conference 2006 (RRC–06). The results are shown in the following table for 378 base stations in terms of decrease:

– in location coverage probability relative to the situation in the absence of interference;

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[10] It could be interesting to consult with the relevant ITU-R Study Group if the statistics of the aggregated interfering signal for a given time variability percentage (e.g. for 1% of the time) is the summation of the statistics of the individual contributors with the same percentage of time variability.

– in signal to interference and noise ratio relative to 21 dB,

in the entire coverage area and at the edge, respectively.

1% time for the interfering signals	Large DTT areas	Small DTT areas
Decrease in location coverage probability	5.2% (in the entire area) 18.2% (at the edge)	20.2% (in the entire area) 40.8% (at the edge)
Decrease in SINR	5.7 dB (in the entire area) 5.3 dB (at the edge)	12.7 dB (in the entire area) 11.4 dB (at the edge)

During coordination the administrations concerned can agree to use a percentage of time different than 1%. One study used 50% of time propagation curves for the interfering signal. The results for the same mobile network configuration as above are shown in the following table:

50% time for the interfering signals	Large DTT areas	Small DTT areas
Decrease in location coverage probability	1% (in the entire area) 4.7% (at the edge)	11% (in the entire area) 25% (at the edge)
Decrease in SINR	1.6 dB (in the entire area) 1.7 dB (at the edge)	9 dB (in the entire area) 8.5 dB (at the edge)

Elements mentioned below show that the potential impact of cumulative interference could be less significant. These are:

– These studies are based on a theoretical regular lattice mobile network structure with the same maximum e.i.r.p. for all base stations located beyond the single station coordination distance. In real mobile networks, the structure is not regular and the network characteristics are not uniform over the whole network given that a number of elements can impact a network design (strategy of the operators, terrain profile and the service provided). Moreover, in order to minimize the intra system noise, mobile operators use techniques which results in reduction of the e.i.r.p. in the base stations. This contributes to the reduction of the estimated cumulated interference on broadcasting.

– The mobile network in these studies is located beyond the SCCD. It is likely that the mobile operators will try to coordinate base station closer to the border. If the agreement is obtained the effect of these might mask the cumulative effect of the stations non subject to coordination.

– As an example of a potential real situation, calculations have been conducted on a number of tests points at the border between two administrations. It was assumed that the newly allocated MS in the 800 MHz band will use the existing configuration of a 900 MHz mobile network (GSM/UMTS). With regard to the BS, the study used all of the assignments of one layer of the second country as they are recorded in the GE06 Plan, with DVB-T mobile/portable outdoor reception. Although the cumulative field strength at 10 m height from this real mobile network located beyond SCCD exceeds by up to 21 dB the trigger field strength of 25 dB(μV/m) in 8 MHz, the results show that for all test points considered to be appropriate according to the methodology chosen, the aggregation of all non-coordinated base stations in the first country remains below the maximum allowable interfering field strength at the border of the second country. This shows that the heterogeneity of the mobile network (density and power of base station) is an important factor. It gives also an indication that for cases with DTT planned for DVB-T mobile/portable outdoor reception (higher planning field strength that for fixed reception but no antenna discrimination) may be more favourable than for DTT planned for fixed reception.

– The studies show that the potential impact is the highest in areas covered by low power DTT transmitters. When these low power transmitters are used for complementary coverage of a main transmitter, the population concerned might be covered by several transmitters and this would reduce the risk of the impact. When they are used as stand-alone transmitters, the risk of impact might be higher, as shown in the studies. This shows that the potential impact depends on the actual situation on a case by case basis.

In conclusion, the studies showed that the potential impact of the cumulative effect of interference from base stations, which individually did not trigger the need for coordination with broadcasting, could be significant. On the other hand, taking into account the elements previously mentioned, the potential impact of cumulative interference might be less significant in practice. Therefore it is suggested to draw the attention of the administrations to this subject.

3/1.17/4.2 Protection of the broadcasting service for cases between countries Contracting Members and Non-Contracting Members to the GE06 Agreement

With respect to relations between the above mentioned countries see § 3/1.17/3.2.1.

Administrations are invited to consider the results of ITU-R studies with the view to encourage administrations to carry out bi-lateral and multilateral negotiations for the efficient use of the frequency band 790-862 MHz. The current practice of ITU for the terrestrial services is given in *Point 6* of § 3/1.17/3.2.1.

3/1.17/4.3 Protection of the fixed service

Notwithstanding the decision of WARC-79 that abandoned the formal coordination between the FS and the MS and vice versa, this section considers a study on interference from the MS into the FS. This study[11] showed that the field strength equal to 11 dB(μV/m) in the bandwidth 5 MHz is the appropriate level for protection of FS systems from MS in the band 790-862 MHz.

However, it should be noted that, in the band 790-862 MHz, coordination[12] between the MS and the FS has been dealt through arrangements developed on a bilateral and multilateral basis between administrations concerned.

There is a possibility to use draft Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6.

3/1.17/4.4 Protection of the aeronautical radionavigation service

3/1.17/4.4.1 Studies in relation to application of RR No. 9.21 in Region 1 relating to footnotes Nos. 5.316A and 5.316B

RR Nos. **5.316A** and **5.316B** specifying operation of the MS in the frequency band 790-862 MHz contain the requirement for coordination of MS with ARNS subject to RR No. **9.21**. Current Radio

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[11] The technical studies on the protection of fixed service are summarized in the JTG 5-6 Compendium developed during the studies. This compendium, which was not discussed by JTG 5-6 but only noted, is provided for information only (Annex 9 to the Chairman’s report).

[12] This is not coordination referred to in the RR.

Regulations contain no provisions with explicit criteria for determination of affected administrations under RR No. **9.21** to be used for identifying such administrations on the basis of RR Appendix **5**. It is required to define the predetermined coordination trigger for application of RR No, **9.21** called for in above-mentioned footnote for coordination between MS and ARNS. Some administrations are of the view that the consideration of RR No. **9.21** in this section should not be seen as the only option to satisfy the agenda item.

At the same time it should be noted that RR No. **5.316A** is already in force. In the absence of technical criteria for identification of the affected administrations the RRB developed a Rule of Procedure in relation to RR No. **5.316A**. Under this rule the identification of potentially affected administrations would be carried out using the GE06 Agreement coordination triggers. Certainly this rule is not confirmed by the appropriate technical studies and as it was mentioned above these field strength trigger values do not take into account the aggregate interference impact from the MS. However, it is required to take into consideration that the main purpose of this Rule of procedure is to fill in gaps in the RR during the preparation period to WRC-12. This Rule of Procedure is provisional and the list of affected administrations identified in such way is purely informative. Certainly WRC-12 will decide what criteria are to be used for RR No. **5.316A** during the period 2012-2015 and for RR No. **5.316B** after 2015.

Analysis of interference to ARNS stations dealt with two different scenarios of interference effect. They refer to interference caused to ARNS airborne receivers and that caused to ARNS ground-based receiving stations. Depending on interference scenarios different propagation models could be used, e.g., the scenario of interference caused to ARNS airborne receivers requires a free-space propagation model whereas estimation of interference to ARNS ground station requires a propagation model in Recommendation ITU-R P.1546-4.

Both scenarios deal with aggregate level of produced interference.

The conducted estimations defined a required predetermined coordination distance between borders of service areas related to ARNS station and MS stations with different densities of their deployment. Power control techniques were also taken into consideration for MS stations.

Results of estimations based on deterministic and statistical approaches imply that consideration of power control at MS stations when using a statistical approach would reduce an aggregate level of interfering field strength.

One possible way may be to establish a predetermined coordination distance in order to provide an adequate protection of ARNS stations. Thus, specifying the predetermined coordination distance of 432 km ensures adequate protection of the ARNS stations subject to applying the procedures of coordinating the MS stations with every type of the ARNS stations when MS stations with signals of 5 MHz bandwidth are transmitting co-frequency with ARNS receivers.

However, if base stations with a bandwidth of 1.25 MHz are only used the predetermined coordination distances should be increased (to 515 km). Whereas a value of 515 km represents the highest required pre-determined coordination distance, lower values will be required in other cases (down to 175 km).

When specific information (e.g. during bilateral coordination) on propagation conditions, MS deployment scenario for the particular country is available one study indicated that separation distances may be decreased significantly.

All studies have been made for FDD systems, further studies would be required to define specific values of the predetermined coordination distances for the MS stations operating in TDD mode.

In order to make use of known details of the actual implementation of the services, one approach would be to use predetermined aggregate field strength limits as means for triggering coordination.

Such a coordination trigger can take into account information such as power levels, antenna height and direction in a different way than the predetermined coordination distance.

Permissible aggregate co-channel interference field strength values may be derived from values used in the ITU-R studies (e.g. Doc. 5-6/136 Annex 5).

3/1.17/4.4.2 Studies in relation to sharing between ARNS in countries mentioned in RR No. 5.312 and MS in Region 3

There is the possibility to consider draft Recommendation **[JTG 5-6] (WRC-12)**, provided in § 3/1.17/6. The current practice of ITU for the terrestrial services is given in *Point 6* of § 3/1.17/3.2.1.

3/1.17/4.5 Protection of the mobile service

Resolution **749 (WRC-07)** invites ITU-R to conduct sharing studies between MS and other services to which the frequency band 790-862 MHz is allocated in order to protect these services, emphasizing “that the requirements of the different services to which the band is allocated, including MS and BS, shall be taken into account”. However, the protection of MS in Region 1 from other services is not explicitly mentioned in *resolve* part of Resolution **749 (WRC-07)**.

It is worthwhile to mention that a number of administrations have introduced or are in the process of introducing MS in the band 790-862 MHz based on International Mobile Telecommunications (IMT) systems.

For countries Contracting Members to GE06

The GE06 Agreement was actually based on the digital video broadcasting-terrestrial (DVB-T) standard but since then, a number of modifications have already been put into place for the advancement of digital broadcasting. Hence, there was a need to check whether the protection of MS given by the GE06 Agreement is adequate for the protection of IMT MS from the BS in this band.

To this effect a sharing study found that the coordination mechanism of the GE06 Agreement might not adequately protect IMT systems with base station antenna heights higher than 27 m.

The administrations, which are Contracting Members to the GE06 Agreement, are invited to use the technical studies on the protection of MS summarized in the JTG 5-6 Compendium[13]. There is a possibility to use draft Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6.

For cases between countries Contracting Members and Non-Contracting Members to the GE06 Agreement

There is a possibility to use Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6. The current practice of ITU for the terrestrial services is given in *Point 6* of § 3/1.17/3.2.1.

For cases between Non-Contracting Members to the GE06 Agreement

In Region 3, various mobile and broadcasting systems are deployed, and where it has been found necessary, coordination has been undertaken on a bilateral or multilateral basis. Additional measures in the Radio Regulations are not necessary to ensure the protection of MS from other primary services in the 790-862 MHz band.

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[13] This compendium is provided for information only (Annex 9 to the Chairman’s report).

3/1.17/5 Methods to satisfy the agenda item

Agenda item 1.17 covers several points for the protection of various services that need to be addressed separately. For this reason the methods to satisfy the agenda item are divided into three issues corresponding to different services to be addressed in this agenda item[14]:

Issue A: BS.

Issue B: ARNS.

Issue C: FS.

Consequently, there is a need to have separate methods to satisfy the agenda item in relation to each of the above issues.

In so doing it is worth to mention that the band 790-862 MHz was allocated to the MS in Region 3 and in a number of countries in Region 1 by previous conferences prior to WRC-07 under conditions stipulated in relevant footnotes.

Consequently, the above issues need to take this fact into account. When considering the results of the sharing studies called for in Resolution **749 (WRC-07**), it was indicated that it would be desirable to invite administrations of Region 1 and Region 3 in accordance with the current practice of ITU-R, which are Contracting Members of the GE06 Agreement, in their relation with administrations, which are Non-Contracting Members of the same Agreement, and vice versa, to consider, *inter alia*, the results of the sharing studies, on an optional basis and, with mutually agreed criteria, in their bilateral and/or multilateral negotiations/coordination[15] with a view to facilitate the use of the above mentioned band for services, to which this band is allocated.

3/1.17/5.1 Methods to satisfy Issue A

3/1.17/5.1.1 In countries Contracting Members to the GE06 Agreement

Method A1: No need to change current provisions in RR in force. The provisions of the GE06 Agreement continue to apply. With respect to additional arrangements to be taken to protect the BS from the MS there are three options:

Option I: No additional arrangements;

Option II: Optional arrangements to take account of a potential impact of the cumulative effect of interference from the MS to the BS. The cumulative effect of interference to the BS from the identified MS could be addressed in a draft Resolution **749 (Rev. WRC-12)**;

Option III: Mandatory arrangements to take account of a potential impact of the cumulative effect of interference from the MS to the BS. The cumulative effect of interference to the BS from the identified MS is addressed in draft Resolution **749 (Rev. WRC-12)** (see § 3/1.17/6).

For the coordination issues between BS and MS for countries, who are Contracting Members of the GE06 Agreement, there is a possibility to use draft Recommendation **[JTG 5-6] (WRC-12)**.

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[14] There was a view that the protection of the mobile service is also to be studied under WRC-12 Agenda item 1.17. There was also a view that the protection of the mobile service is adequately covered in the GE06 Agreement.

[15] This is not coordination referred to in the RR.

3/1.17/5.1.2 In countries Non-Contracting Members to the GE06 Agreement

Method A2: No need to change current provisions in RR in force.

3/1.17/5.1.3 Between countries Contracting Members and Non-Contracting Members to the GE06 Agreement

Method A3: No need to change current provisions in RR in force. With respect to additional arrangements to be taken, there are two options:

Option I: No additional arrangement;

Option II: Application of draft Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6.

3/1.17/5.2 Methods to satisfy Issue B

3/1.17/5.2.1 In Region 1

Method B1: Inclusion of a predetermined coordination distances equal to 175-515 km or coordination aggregate field strength threshold in the RR or in a conference Resolution referred to in a corresponding footnote, as appropriate, for coordination subject to RR No. **9.21** as specified in RR Nos. **5.316A** and **5.316B**.

Method B1*bis*: Same as Method B1 with additional details on seeking agreement procedure in accordance with RR No. **9.21** as specified in RR Nos. **5.316A** and **5.316B**.

With respect to Method B2 as presented in View 1 below a discussion took place in JTG 5-6. In order to move forward the meeting decided to reflect different views in the draft CPM Report in accordance with Resolution ITU-R **2-5**[16]:

View 1: The following method (Method B2) was proposed to the meeting by arguing that it can also resolve Agenda item 1.17 for Issue B. Justification: According to the Terms of Reference of JTG 5-6 (*considering* b), the band 790-862 MHz is currently allocated to the BS, FS, ARNS (RR No. **5.312**) and mobile services on a primary basis. Method B2 proposes a balanced solution to ensure protection to ARNS while providing conditions for an equitable access to spectrum to the ARNS and the MS after 16 June 2015.

Method B2: Deactivate RR No. **9.21** in RR No. **5.316B.** RR No. **9.21** would continue to apply in RR No. **5.316A** (until 16 June 2015) whereas a draft new Resolution **[MOBILE/ARNS] (WRC-12)** would apply in RR No. **5.316B** and would contain provisions for the reciprocal consultation between assignments of a base station of one administration and assignments of ARNS stations (ground-based and airborne) of a neighbouring administration. It shall be noted that the same criteria as the one of Method B1 would apply for both RR No. **5.316A** (application of RR No. **9.21**) and RR No. **5.316B** (application of draft Resolution **[MOBILE/ARNS] (WRC-12)**).

View 2: The proposed method (Method B2) falls outside AI 1.17. Justification: Noting that:

– the WRC-07 adopted Resolution **749 (WRC-07)** to invite ITU-R to conduct sharing studies for Regions 1 and 3 in the band 790-862 MHz between the MS and other services in order to protect the services to which the frequency band is currently allocated;

[16] It should be noted, however, that Method B2 was not extensively discussed by JTG 5-6 due to the disagreement in opinions.

– that the allocation to MS in the frequency band 790-862 MHz become effective in Region 1 from 17 June 2015;

– RR Nos. **5.316** and **5.316A** stipulate that stations of the mobile service allocated in some Region 1 countries mentioned in connection with each band referred to in these footnotes shall not cause harmful interference to, or claim protection from, stations of services operating in accordance with the Table in countries other than those mentioned these footnotes;

– the Agenda item 1.17 does not request the protection of MS whose allocation become effective only in 2015, or which is on a secondary basis with respect to other services;

– application of RR No. **9.21** in RR No. **5.316B** is an allocation issue and it was the condition for the MS allocation in Region 1;

– provisions of RR No. **9.21** are applied to a large number of services in different frequency bands, the proposal to replace RR No. **9.21** with the coordination procedure modifies the Table of frequency allocations and affects all the cases of application of RR No. **9.21**,

Method B2 is out of the scope of Agenda item 1.17 and, therefore, it should not be considered by the CPM; however, the administrations proposing the Method may present this proposal, if they so wish, to the competent conference.

Major concern was expressed that this proposal reviews delicate compromise reached at WRC-07 and reopens the agreement on the frequency band 790-862 MHz which involves Regions 1, 2 and 3, and ITU-R JTG 5-6 was not entitled to make a proposal to the CPM Report suggesting modifications to the Table of Frequency Allocation.

Moreover, no difficulties were reported to ITU-R JTG 5-6 from submitting administrations with the application of RR No. **9.21** under RR No. **5.316A**. Therefore, it was not clear why RR No. **9.21** should be replaced.

Also, the ARNS existed long before the newly allocated MS and it is not clear why it should accept additional constraints and in fact be precluded from operation by the new proposed procedure.

It should be mentioned that currently there are no coordination procedures between terrestrial services in the RR.

View 3: **Method B2*bis*** is proposed to take account of difficulties mentioned in Method B2, namely that it is not possible to equitably share the frequency band 790-862 MHz between the MS in Region 1 with the ARNS in countries mentioned in RR No. **5.312** due to the difficulties emanating from application of RR No. **9.21** by Region 1 countries for MS in relation with the above-mentioned ARNS. One possible option would be to limit the allocation of MS together with application of RR No. **9.21** in the subject frequency band to Region 1, except for those countries which have indicated that they would have difficulties in applying RR No. **9.21** to the MS in relation with the ARNS in countries mentioned in RR No. **5.312** and to allow these Region 1 countries, which have stated the subject difficulties, to use the band for MS on a primary basis under the condition that stations of the MS in the countries mentioned in connection with each band referred to in this footnote shall not cause harmful interference to, or claim protection from, stations of services operating in accordance with the Table in countries other than those mentioned in connection with the band. It is worth to mention that such condition is in force until 17 June 2015 and it is thus only required to make it applicable after that date.

3/1.17/5.2.2 Between Region 1 and Region 3

Method B3: No need to change current provisions in RR in force. With respect to additional arrangements to be taken, there are two options:

Option I: No additional arrangement;

Option II: Application of draft Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6.

3/1.17/5.3 Method to satisfy Issue C

The method below is applicable to Region 1 and Region 3 as well as between these regions.

Method C: No need to change current provisions in RR in force. With respect to additional arrangements to be taken with respect to Issue C there are two options:

Option I: No additional arrangement;

Option II: See also draft Recommendation **[JTG 5-6] (WRC-12)** provided in § 3/1.17/6.

3/1.17/6 Regulatory and procedural considerations

3/1.17/6.1 Treatment of RR Nos. 5.316, 5.316A and 5.316B at WRC-12

It is noted that RR Nos. **5.316** and **5.316A** are applicable until 16 June 2015.

MOD (applies to Methods A1 - Options II and III, B1, B1bis)

5.316B In Region 1, the allocation to the mobile, except aeronautical mobile, service on a primary basis in the frequency band 790-862 MHz shall come into effect from 17 June 2015 and shall be subject to agreement obtained under No. **9.21** with respect to the aeronautical radionavigation service in countries mentioned in No. **5.312**. For countries party to the GE06 Agreement, the use of stations of the mobile service is also subject to the successful application of the procedures of that Agreement. Resolutions **224 (Rev.WRC-07)** and **749 (Rev.WRC-0712)** shall apply, as appropriate. (WRC-~~07~~12)

MOD (applies to Method B2; see View 1 in § 3/1.17/5.2.1)[17]

5.316B In Region 1, the allocation to the mobile, except aeronautical mobile, service on a primary basis in the frequency band 790-862 MHz shall come into effect from 17 June 2015. ~~and shall be subject to agreement obtained under No. **9.21** with respect~~From this date, Resolution **[MOBILE/ARNS] (WRC-12)** applies to the mobile, except aeronautical mobile, service in Region 1 and to the aeronautical radionavigation service in countries ~~mentioned~~ listed in No. **5.312**. For countries party to the GE06 Agreement, the use of stations of the mobile service is also subject to the successful application of the procedures of that Agreement. Resolutions **224 (Rev.WRC-07)** and **749 (Rev.WRC-0712)** shall apply. (WRC-~~07~~12)

MOD (applies to Method B2bis, see View 3 in § 5.2.1)[17]

5.316B In Region 1, except (list of the countries which are concerned about the application of No. **9.21** ….), the allocation to the mobile, except aeronautical mobile, service on a primary basis in the frequency band 790-862 MHz shall come into effect from 17 June 2015 and shall be subject to agreement obtained under No. **9.21** with respect to the aeronautical radionavigation service in

[17] These modifications/additions were not sufficiently discussed in JTG 5-6.

countries mentioned in No. **5.312**. For countries party to the GE06 Agreement, the use of stations of the mobile service is also subject to the successful application of the procedures of that Agreement. Resolutions **224 (Rev.WRC-07)** and **749 (WRC-07)** shall apply. (WRC-~~07~~12)

ADD 5.A117 (applies to Method B2bis, see View 3 in § 5.2.1)[17]

Additional allocation: in countries of Region 1 listed in MOD No. **5.316B** the band 790-862 MHz is also allocated to the mobile, except aeronautical mobile, service on a primary basis. However, in these countries stations of the mobile service shall not cause harmful interference to, or claim protection from, stations of services operating in accordance with the Table in countries other than those mentioned in this footnote above. For countries Contracting Members to the GE06 Agreement, the use of stations of the mobile service is also subject to the successful application of the procedures of that Agreement. Resolutions **224 (Rev.WRC-07)** and **749 (Rev.WRC-12)** shall apply. This allocation is effective from 17 June 2015. (WRC-12)

3/1.17/6.2 Optional procedures (referred to in Methods A1, A3 (Option II), B3 (Option II), C (Option II))

(Editorial note: Other methods which may refer to this draft Resolution need to be further clarified)

ADD

DRAFT RECOMMENDATION [JTG 5-6] (WRC-12)[1]

Use of the band 790-862 MHz in Region 1 and Region 3

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the GE06 Agreement covers Region 1 (except Mongolia) and the Islamic Republic of Iran in Region 3;

b) that in Article **5** of the Radio Regulations the band 790-862 MHz is allocated to several services such as fixed, mobile, broadcasting and aeronautical radionavigation in Regions 1 and 3;

c) that Resolution **749 (WRC-07)** invited ITU-R to conduct sharing studies for Regions 1 and 3 in the band 790-862 MHz between mobile service and other services in order to protect services to which the frequency band is currently allocated;

d) that this Conference has considered, *inter alia*, the proposals of administrations, the Report of the Conference Preparatory Meeting CPM to WRC-12 with respect to the results of sharing studies referred to in *considering c)* above;

e) that the operation of broadcasting stations and other services, to which the above-mentioned frequency band is allocated in the same geographical area and under certain circumstances may create incompatibility issues;

f) that the mechanisms of the GE06 Agreement may not adequately protect IMT systems from the future modifications to the Plan for digital television;

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1 Region 3 administrations that are not Contracting Members of the GE06 Agreement in attendance at CPM11-2 are of the view that there should be no regulatory outcomes in relation to Agenda item 1.17 that impact on the band 790-862 MHz in Region 3.

g) that the band 790-862 MHz is used in a number of countries of Region 1 and Region 3 by mobile service, including IMT,

recognizing

a) that for countries Contracting Members of the GE06 Agreement, the coordination of the services in the band 790-862 MHz is covered by the procedure contained in that Agreement;

b) that in frequency bands above 28 MHz, which are not shared with the space service with equal rights, including the band 790-862 MHz, apart from examination of conformity with the Table of Frequency Allocations and the other provisions of the RR (Nos. **11.31** and **11.31.1**), no other technical and/or regulatory examinations are performed by the Bureau, except for frequency bands which are subject to Regional or World Plan(s),

noting

a) that *resolves* 4 of Resolution **224 (Rev.WRC-07)** emphasizes the coordination needed with all neighbouring administrations prior to implementing IMT in the bands 790-862 MHz;

b) that some countries mentioned in RR Nos. **5.316** and **5.316A** use parts of the band 790-862 MHz, for public safety services; see *recognizing b)* of Resolution **224 (Rev.WRC-07)**;

c) that the frequency band 790-862 MHz, as part of a wider frequency band, was allocated to the mobile service in Region 3 since 1971 (that is prior to WRC-07) and the protection of the MS from the other services was not considered in ITU-R sharing studies called for in Resolution **749 (WRC-07)**,

recommends

1 to invite administrations of Region 1 and Region 3, which are Contracting Members of the GE06 Agreement, in their relation with administrations, which are Non-Contracting Members of the same Agreement, and vice versa, to consider, *inter alia*, the results of the sharing studies referred to in *considering c)* and *d)* above, on an optional basis and, with mutually agreed criteria, in their bilateral and/or multilateral negotiations/coordination[2] with a view to facilitate the use of the above-mentioned band for services, to which this band is allocated;

2 to invite administrations, which are Contracting Members of the GE06 Agreement when the protection of the mobile service, in particular IMT, from broadcasting service is concerned, to consider the results of the sharing studies referred to in *considering c)* and *d)* above, on an optional basis and, with mutually agreed criteria, in their bilateral and/or multilateral negotiations/coordination[2] with a view to facilitate the use of the above-mentioned band for services, to which this band is allocated.

3/1.17/6.3 Methods A1 (Option I), A2, A3 (Option I), B3 (Option I) and C (Option I)

No additional regulatory and procedural considerations are required to support specifically these methods.

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[2] This is not coordination referred to in the RR.

3/1.17/6.4 Methods A1 (Options II and III), B1, B1*bis*

MOD

RESOLUTION 749 (Rev.WRC-~~07~~12)

~~Studies on the u~~Use of the band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that the favourable propagation characteristics of the band 470-806/862 MHz are beneficial to provide cost-effective solutions for coverage, including large areas of low population density;

b) that the operation of broadcasting stations and base stations of the mobile service in the same geographical area may create incompatibility issues;

~~*c)* that, according to Resolution **646 (WRC-03)**, the bands 764-776 MHz and 794-806 MHz are currently used in some countries for Public Protection and Disaster Relief (PPDR); and the bands 806-866 MHz (in Region 2) and 806-824 MHz and 851-869 MHz (in Region 3) are currently identified for PPDR;~~

~~d~~c) that many communities are particularly underserved compared to urban centres;

~~e~~d) that applications ancillary to broadcasting are sharing the band 470-862 MHz with the broadcasting service in all three Regions, and are expected to continue their operations in this band;

~~f~~e) that it is necessary to adequately protect, *inter alia*, terrestrial television broadcasting and other systems in this band,

recognizing

a) that, in Article **5** of the Radio Regulations, the band 790-862 MHz, or parts of that band, is allocated, and is used on a primary basis for services ~~other than~~ including broadcasting;

b) that ~~the frequency band 470-806/862 MHz is allocated to the broadcasting service on a primary basis in all three Regions and used predominantly by this service, and that~~ the GE06 Agreement applies in ~~all~~ Region 1 countries except Mongolia and the Islamic Republic of Iran~~one country in Region 3~~ in the frequency band 174-230 and 470-862 MHz;

c) that the transition from analogue to digital television is expected to result in situations where the band 790-862 MHz will be used for both analogue and digital terrestrial transmission; and the demand for spectrum during the transition period may be even greater than the stand-alone usage of analogue broadcasting systems;

d) the switch-over to digital may result in spectrum opportunities for new applications;

e) the timing of the switch-over to digital is likely to vary from country to country;

f) that the use of spectrum for different services should take into account the need for sharing studies;

g) that the Radio Regulations provide that the identification of a given band for IMT does not preclude the use of that band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations;

h) that the GE06 Agreement contains provisions for the terrestrial broadcasting service and other terrestrial services, a Plan for digital TV, and the List of other primary terrestrial services,

further recognizing

a) that the frequency band 790-862 MHz, as part of a wider frequency band, was allocated to mobile service in Region 3 (including the Islamic Republic of Iran) since 1971 (prior to WRC-07);

b) that the use of the above-mentioned frequency band in Region 3 (excluding the Islamic Republic of Iran) is only subject to the conformity examination with respect to the Table of Frequency Allocations (No. **11.31** examination) by the Bureau;

c) that the Radio Regulations do not contain any regulatory provisions requiring the seeking of agreement by Region 3 countries under No. **9.21** from the countries mentioned in No. **5.312**;

d) that the GE06 Agreement, in its relevant Annexes, establishes the relation between the digital terrestrial broadcasting, on the one hand, and other primary terrestrial services, including the aeronautical radionavigation service in the countries mentioned in No. **5.312**, on the other hand;

e) that WRC-07, under No. **5.316B**, allocated the frequency band 790-862 MHz in Region 1 to the mobile, except aeronautical mobile, service on a primary basis, and this allocation shall come into effect as of 17 June 2015 and shall be subject to agreement obtained under No. **9.21** with respect to the aeronautical radionavigation service in countries mentioned in No. **5.312**;

f) that the band 790-862 MHz in Region 1 and the band 790-806 MHz in Region 3 were identified by the WRC-07 for use by administrations wishing to implement International Mobile Telecommunications (IMT), whereas the band 806-960 MHz in Region 3 was identified for IMT in the WRC-2000;

g) that for Contracting Members to the GE06 Agreement, the use of stations of the mobile service in relation to the broadcasting services is also subject to the successful application of the procedures of the GE06 Agreement;

h) that Resolution **749 (WRC-07)** resolved to invite ITU-R to conduct sharing studies for Regions 1 and 3 in the band 790-862 MHz between the mobile service and other services in order to protect the services to which the frequency band is currently allocated and to report the results of the studies for consideration by WRC-12 to take appropriate action;

(Relevant to Method A1 Option III)
i) that the potential impact of the cumulative effects of interference of the mobile service to the broadcasting service has not been duly addressed in the coordination procedures (in particular, in the coordination trigger field-strength thresholds) contained in the GE06 Agreement,
(End of relevance to Method A1 Option III)

i) that for countries which are Contracting Members of the GE06 Agreement, the coordination of the mobile service with respect to the digital terrestrial broadcasting service is covered by the procedure contained in that Agreement;

j) that the coordination between the digital terrestrial broadcasting service in the Islamic Republic of Iran and the primary mobile service in countries that are Contracting Members to the GE06 Agreement is covered by the procedure contained in the GE06 Agreement;

k) that the coordination between terrestrial services (fixed, mobile and broadcasting) in the frequency band 790-862 MHz between the Islamic Republic of Iran, on the one hand, and the other countries of Region 3, on the other hand, is a matter to be left to the administrations concerned, based on bilateral or multilateral negotiations, if it is mutually agreed by the administrations concerned,

noting

a) that Resolution ITU-R 57 provides principles for the process of development of IMT-Advanced and this process ~~is~~ had ~~planned to~~ already started after WRC-07~~this~~ ~~Conference,~~;

b) that *resolves* 4 Resolution **224 (Rev.WRC-07)** emphasizes the coordination needed with all neighbouring administrations prior to implementing IMT in the bands 790-862 MHz;

c) that some countries mentioned in RR Nos. **5.316** and **5.316A** use parts of the band 790-862 MHz, for public safety services; see *recognizing b)* of Resolution **224 (Rev.WRC-07)**,

emphasizing

a) that the use of the band 470-862 MHz by broadcasting and other primary services is also covered by the GE06 Agreement;

b) that the requirements of the different services to which the band is allocated, including the mobile, aeronautical radionavigation and broadcasting services, shall be taken into account,

taking into account

a) that the results of the studies carried out by ITU-R pursuant to Resolution **749 (WRC-07)** indicates that there is a need to protect certain other primary terrestrial services from the newly allocated mobile service in Region 1;

(Relevant to Method A1 Option III)
b) that there is a need to establish an additional arrangement for the protection of the primary digital terrestrial broadcasting services in countries, which are contracting members to the GE06 Agreement, from the cumulative interference effect of the allocated mobile service,
(End of relevance to Method A1 Option III)

resolves

1 that in Region 1:

(Relevant to Method B1)
1.1 the mobile service in Region 1 needs to seek agreement under No. **9.21** as per Nos. **5.316A** and **5.316B** with respect to the aeronautical radionavigation services in the countries mentioned in No. **5.312** of the Radio Regulations using the criteria, which are based on the results of ITU-R studies, as contained in Annex 1 to this Resolution;
(End of relevance to Method B1)

(Relevant to Method B1*bis*)
1.2 the assignments to the mobile service in the frequency band 790-862 MHz in Region 1 need to seek agreement under No. **9.21**, in application of Nos. **5.316A** and **5.316B**, with respect to the assignments to the aeronautical radionavigation service of countries mentioned in No. **5.312** of the Radio Regulations, using the criteria, which are based on the results of ITU-R studies, as contained in Annex 1 to this Resolution. When seeking the above-mentioned agreement only the ARNS assignments of countries mentioned in No. **5.312** of the Radio Regulations in the frequency band 790-862 MHz, to be taken into account, which are operating in accordance with the Radio Regulations, or to be so operated prior to the date of bringing into use the assignments to the mobile service, or for which coordination procedure under Article 4 of the GE06 Agreement has been

initiated or within the next three months from the date the objection under No. **9.21** has been made by any country mentioned in No. **5.312**, whichever is the longer;

1.2*bis* assignments to the mobile service mentioned above, which have not successfully completed the seeking agreement procedure mentioned above with respect to the assignments to the ARNS referred to *resolves* 3.1 above shall not cause unacceptable interference to nor claim protection from assignments to the ARNS;

1.2*ter* (Option 1) the ARNS assignments, which are brought into operation after three months commenting period under No**. 9.21**, are subject to bi- and multilateral coordination between the administrations concerned based on the provisions of Radio Regulations in force. To this effect, administrations responsible for ARNS assignments are urged to take into account the assignments to the mobile service in the frequency band 790-862 MHz, for which the agreement seeking procedure under No. **9.21** has been successfully completed or initiated with respect to the ARNS administration(s);

1.2*ter* (Option 2) the ARNS assignments, which are brought into operation after three months commenting period under No. **9.21** excluding the assignments for which coordination procedure under Article 4 of GE06 has been initiated before the date of application of No. **9.21** for respective assignments of mobile service and successfully completed, shall not cause harmful interference to nor claim protection from the assignments into the mobile service successfully recorded as described in *resolves* 1.1, unless otherwise agreed;

1.2*ter* (Option 3) the ARNS assignments other than those which were taken into account in seeking agreement process of mobile service assignments which were successfully recorded as described in *resolves* 1.1 shall not cause harmful interference to nor claim protection from these mobile service assignments, unless otherwise agreed;

(End of relevance to Method B1*bis*)

(Relevant to Method A1 Option III)

1.3 in addition, for stations in the mobile service having frequency overlap in that television channel with which the submitted station has the largest degree of frequency overlap, Article 4 of the GE06 Agreement shall be applied in the same way as for stations of the broadcasting service forming a single-frequency network (i.e. Section I of Annex 4 of the GE06 Agreement, § 4.3) in order to take account of the effect of cumulative interference;

(End of relevance to Method A1 Option III)

1.4 when the coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz. If another bandwidth is used, the relevant protection ratios are to be found in Recommendation ITU-R BT.1368;

2 that for the Islamic Republic of Iran:

(Relevant to Method A1 Option III)

2.1 in addition, for stations in the mobile service having frequency overlap in that television channel with which the submitted station has the largest degree of frequency overlap, Article 4 of the GE06 Agreement shall be applied in the same way as for stations of the broadcasting service forming a single-frequency network (i.e. Section I of Annex 4 of the GE06 Agreement, § 4.3);

(End of relevance to Method A1 Option III)

2.2 when the coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz. If another bandwidth is used, the relevant protection ratios are to be found in Recommendation ITU-R BT.1368;

3 that with respect to adjacent channel interference:

3.1 that in the band 790-862 MHz, adjacent channel interference within a given country is a national matter and needs to be dealt with by each administration as a national matter;

3.2 that adjacent band interference (below 790 MHz and above 862 MHz) should be treated by administrations concerned, using mutually agreed criteria or those contained in relevant ITU-R Recommendations (tbd),

~~1 to invite ITU-R to conduct sharing studies for Regions 1 and 3 in the band 790-862 MHz between the mobile service and other services in order to protect the services to which the frequency band is currently allocated;~~

~~2 to invite ITU-R to report the results of the studies referred to in *resolves* 1 for consideration by WRC-11 to take appropriate action,~~

(Relevant to Method A1 Option II)

further resolves

1 to invite ITU-R to develop a Recommendation describing i) a calculation procedure to assist Contracting Members to the GE06 Agreement in identifying the assignments in the mobile service generating a cumulative interference exceeding the coordination trigger field strength and ii) a methodology that administrations could apply in their bi- and multilateral coordination to take into account the cumulative effect of interference from the mobile service to the broadcasting service;

2 to invite administrations, which are Contracting Members of the GE06 Agreement, to consider, *inter alia*, the results of the sharing studies conducted by ITU-R in response to Resolution **749** (**WRC-07**) as well as in *further resolves* 1, on an optional basis and, with mutually agreed criteria, in their bilateral and/or multilateral negotiations/coordination[2] with respect to the potential impact of the cumulative effect of interference from the mobile service to the broadcasting service;

(End of relevance to Method A1 Option II)

(Relevant to Method A1 Option III)

further resolves

to invite ITU-R to develop a Recommendation describing a methodology that administrations could apply in their bi- and multilateral coordination to take into account the cumulative effect of interference from the mobile service to the broadcasting service;

(End of relevance to Method A1 Option III)

instructs the Director of Radiocommunication Bureau

to bring this Resolution to the attention of ITU-R Study Groups and report the results of implementation to WRC-[15].

~~*invites administrations*~~

~~to participate in the studies by submitting contributions to ITU-R.~~

~~*invites the Director of the Telecommunication Development Bureau*~~

~~to draw the attention of the Telecommunication Development Sector to this Resolution.~~

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[2] This is not coordination referred to in the RR.

ANNEX 1 TO RESOLUTION 749 (Rev.WRC-12)

The criteria for identifying potentially affected administrations with respect to the aeronautical radionavigation service in countries listed in No. 5.312

NOTE – The seeking agreement procedure under No. **9.21** can be based either on predetermined coordination distances or on coordination aggregate trigger field-strength thresholds. To this effect options 1 and 2 are provided below.

Option 1 - Predetermined coordination distances

For the application of the procedure for seeking agreement in accordance with No. **9.21** by the mobile service with respect to the aeronautical radionavigation service operating in countries mentioned in No. **5.312** as stipulated in Nos. **5.316A** and **5.316B** the criteria for identifying affected administrations provided below should be used.

TABLE A1-1

Predetermined coordination distances for FDD mobile stations mode

<table>
<tr><th rowspan="3"></th><th rowspan="3">Type of MS stations</th><th colspan="3">ARNS type and MS deployment scenario</th></tr>
<tr><th colspan="2">ARNS terrestrial stations</th><th>ARNS airborne stations</th></tr>
<tr><th>FDD (5 MHz)</th><th>FDD (1.25 MHz)</th><th>FDD (5 MHz, 1.25 MHz)</th></tr>
<tr><td rowspan="2">Required predetermined coordination distance, km</td><td>Downlink – transmitting base stations</td><td>400 (100% land path)
450 (40% land path 60% cold sea path)</td><td>475 (100% land path)
515 (40% land path 60% cold sea path)</td><td>432</td></tr>
<tr><td>Uplink – transmitting user terminals (receiving base stations)</td><td>125 (100% land path)
175 (40% land path 60% cold sea path)</td><td>180 (100% land path)
220 (40% land path 60% cold sea path)</td><td>410</td></tr>
</table>

NOTE – With respect to proposed predetermined coordination distances additional studies may be presented to WRC-12 by administrations.

Option 2 - Coordination aggregate trigger field-strength thresholds

For the application of the procedure for seeking agreement in accordance with No. **9.21** by the mobile service with respect to the aeronautical radionavigation service operating in countries mentioned in No. **5.312** as stipulated in Nos. **5.316A** and **5.316B** the criteria for identifying affected administrations provided below should be used.

Aggregate trigger field-strength value is calculated from all the sources of interference including new assignment to mobile station at the border of the service area of potentially affected ARNS assignments confined to national territory. However, the methodology for verification of aggregate interference trigger field-strength values from the mobile service needs to be developed.

Also since the mobile user terminals are not notified it is not clear how mobile user terminals should be taken into account while identifying affected administrations through application of aggregate trigger field-strength values. Therefore, it needs to be further studied (one possibility could be to apply predetermined coordination distance for the uplink).

Option 2a

For the protection of assignments of the aeronautical radionavigation service from assignments of the mobile service, the coordination aggregate trigger field strengths and the propagation data as contained in Section I of Annex 4 to the GE06 Agreement shall be used to identify potentially affected administrations.

Option 2b

TABLE A1-1

Predetermined aggregate trigger field-strength values from a mobile service station when identifying affected administrations

ARNS type	Predetermined aggregate trigger field-strength values from a mobile service station (dB(µV/m))
RSBN	42 at 10 m in a 3 MHz reference bandwidth
RLS 2 (Type 1) (aircraft receiver)	52[1] / 59[2] at 10 000 m in a 4 MHz reference bandwidth
RLS 2 (Type 1) (ground receiver)	29[1] / 33[2] at 10 m in a 4 MHz reference bandwidth
RLS 2 (Type 2) (aircraft receiver)	73 at 10 000 m in a 3 MHz reference bandwidth
RLS 2 (Type 2) (ground receiver)	24[1] / 28[2] at 10 m in a 8 MHz reference bandwidth
RLS 1 (Type 1 and 2)	13 at 10 m in a 6 MHz reference bandwidth
Other type ARNS terrestrial stations	13 at 10 m in a 6 MHz reference bandwidth
Other type ARNS airborne stations	52 at 10 000 m in a 4 MHz reference bandwidth

NOTE 1 – Provided by RCC countries.

NOTE 2 – May be used with respect to some other countries in No. **5.312** apart from RCC.

NOTE 3 – The values provided in this table refer to the permissible aggregate co-channel interference field strength values provided for the necessary emission bandwidth (from all services). Two values are given for use in the sharing studies and these values need to be refined following detailed reviews of the results of the studies and should not contradict the GE06 Agreement.

Option 2c

TABLE A1-1

Predetermined trigger field-strength values from a single mobile service station (dB(µV/m)) when identifying affected administrations

Type of MS stations	ARNS type and MS deployment scenario			
	ARNS terrestrial stations (Scenario 2)		ARNS airborne stations (Scenario 1)	
	FDD (5 MHz)	FDD (1.25 MHz)	FDD (5 MHz)	FDD (1.25 MHz)
Base stations	–19.78 (dB(µV/m)) at 10 m	–25.42 (dB(µV/m)) at 10 m	–19.38 (dB(µV/m)) at 10 m	–26.19 (dB(µV/m)) at 10 m
User terminals	–24.24 (dB(µV/m)) at 10 m	–29.53 (dB(µV/m)) at 10 m	–49.51 (dB(µV/m)) at 10 m	–56.32 (dB(µV/m)) at 10 m

NOTE 1 – The calculations were done for the mixed path scenario: 40% land path 60% cold sea path).

NOTE 2 – The proposed predetermined trigger field-strength values were not verified. Therefore, additional studies may be presented to WRC-12 by administrations.

3/1.17/6.5 Method B2 (see View 1 in § 3/1.17/5.2.1)[18]

With respect to the modification to RR No. **5.316B** (Method B2) as described in § 3/1.17/6.1, draft Resolution [**MOBILE/ARNS] (WRC-12)**] would:

– apply, from 17 June 2015, to assignments of both the mobile, except aeronautical, service in Region 1 and the ARNS in countries listed in RR No. **5.312**,

– establish a procedure by which an administration wishing to bring into operation such assignments would previously consult with potentially affected administrations in order to get their agreement to such operation (the list of potentially affected administrations would be determined by the Bureau through the application of a technical trigger, such as a distance or a field strength),

– ensure that assignments to be taken into account in this procedure are those:

  – either already recorded in the Master Register under RR Nos. **11.31**, **11.32**, **11.32A** or **11.41**, or

  – for which the procedure contained in the WRC Resolution has been initiated,

– replace the examination under RR No. **11.31**, by the Bureau, of conformity under RR No. **9.21** by an examination under RR Nos. **11.32** and **11.32A** of the outcome of the consultation procedure,

– allow administrations to record assignments under RR No. **11.41** if the consultation procedure has not been yet successfully completed at the time of notification.

Transitory measures may also be needed to cover notifications initiated before, but not finished on, 17 July 2015.

A view on the above Resolution can be found in Document CPM11-2/**44**.

[18] The text in this section was not sufficiently discussed in ITU-R.

AGENDA ITEM 1.20

1.20 to consider the results of ITU-R studies and spectrum identification for gateway links for high altitude platform stations (HAPS) in the range 5 850-7 075 MHz in order to support operations in the fixed and mobile services, in accordance with Resolution ***734 (Rev.WRC-07)****;*

Resolution **734 (Rev.WRC-07)**: *Studies for spectrum identification for gateway links for high altitude platform stations in the range from 5 850 to 7 075 MHz*

3/1.20/1 Executive summary

In accordance with the directions of WRC-07 (Resolution **734 (WRC-07)**), the ITU-R has extended the studies with a view to identifying two channels of 80 MHz each for gateway links for HAPS in the range from 5 850 to 7 075 MHz, in bands already allocated to the FS while ensuring the protection of existing services. All or parts of this frequency range are also shared with planned FSS systems in accordance with RR Appendix **30B (Rev.WRC-07)** and non-geostationary satellite orbit (GSO) MSS space-to-Earth feeder links, as well as unplanned FSS (Earth-to-space), MS, EESS (passive), radio astronomy and conventional FS stations. Based on the results of studies, two methods have been proposed.

Method A proposes no change to Article **5** of the RR. Under this method, it is envisaged that HAPS gateway links may be able to make use of the existing identified spectrum in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in RR No. **5.552A** (and the bands 27.9-28.2 GHz and 31.0-31.3 GHz for the countries listed in RR Nos. **5.537A** and **5.543A**).

Method B consists in a new identification of two channels of 80 MHz each for HAPS gateway links preferable within the sub-bands 6 440-6 520 MHz (down) and 6 560-6 640 MHz (up) within the range of 5 850-6 725 MHz through a country footnote in the Table of Frequency Allocations of RR Article **5** within the territory of the countries listed in the footnote with operational conditions to protect existing services from co-channel and adjacent channel interference in a WRC Resolution. Some administrations are of the view that if HAPS are allowed to operate it shall be on a non-interference, non-protection basis while other administrations are of the view that HAPS will operate on a non-protection basis (No. **5.43A** does not apply).

3/1.20/2 Background

WRC-97 made provisions for the operation of HAPS gateway links within the FS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz by Resolution **122 (Rev.WRC-07)**. Since the 47 GHz bands are susceptible to rain attenuation, WRC-2000 adopted RR Nos. **5.537A** and **5.543A**, which were modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the FS in the band 27.9-28.2 GHz and in the band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis by Resolution **145 (Rev.WRC-07)**. In addition, countries in Region 2 may use this frequency band for HAPS on a non-harmful interference, non-protection basis in accordance with Resolution **145 (Rev.WRC-07)**. Considering the high rain attenuation levels in higher frequency bands and the desirability to have greater flexibility in the choice of spectrum for gateway operations in support of HAPS networks, consideration is being given to the potential use of the 6 GHz band for HAPS gateway links.

The location of the proposed HAPS spectrum identification within the 6 GHz band will largely be dependent on mutual interference factors amongst the services sharing the spectrum. The HAPS payload architecture and design provides the flexibility to operate the gateway links virtually anywhere in the 6 GHz band.

RR No. **4.15A** stipulates that transmissions to or from HAPS shall be limited to bands specifically identified in RR Article **5**.

The band 5 925-7 075 MHz is heavily used worldwide by the FS for low, medium and high capacity point-to-point links. These links are essential in many parts of the world to provide transport facilities to support both wireline and wireless telecommunications services.

The band 5 850-6 725 MHz is an FSS uplink band that is heavily used worldwide by GSO FSS applications. The low atmospheric absorption in this band enables highly reliable Earth-to-space communication links with wide service coverage, particularly in, but not limited to, geographical areas with severe rain fade conditions. The wide coverage enables services to be provided in developing countries, to sparsely populated areas and over large distances.

The 5 850-6 725 MHz band has been used by the GSO FSS for over 40 years. The technology is mature and offers equipment at low cost. This, together with the wide coverage, has led to satellites in this band being an important part of the telecommunications infrastructure in many developing countries. Satellites operating in this band are the only efficient means for providing today global satellite coverage of the Earth.

Satellite services in this band currently include VSAT (very small aperture terminal) networks, internet services, point-to-point links, backhaul service (telephony, Internet), distribution of television programmes, satellite news gathering, feeder-link for TV and data broadcasting to SMATV (satellite master antenna television) and DTH (direct-to-home) receivers, feeder links for the MSS. Due to their wide coverage characteristics, satellites operating in this band have been extensively used for disaster relief operations.

Furthermore, in this band very high power telecommand signals, both for on-station operation and for transfer orbits (launch and early operation phase – LEOP), are required to communicate with the satellite's omnidirectional antenna. There are additional satellites with service links operating in other frequency bands which have their tracking, telemetry and command (TT&C) in this band.

The use of the band 5 850-6 725 MHz by the GSO FSS includes governmental uses and international commitments within the WMO and ICAO which are essential for public security, civil aviation and weather, water, climate and environmental alerts.

Before July 2010, there were approximately 160 geostationary satellites operating in the band 5 850-6 725 MHz, comprising a total capacity exceeding two thousand 36 MHz transponders. Moreover, about two out of three satellites in production use this band. The GSO FSS usage is thus ever increasing.

The band 7 025-7 075 MHz is currently used by GSO FSS systems in a way similar to the band 5 850-6 725 MHz.

The band 6 725-7 025 MHz is the uplink band for the FSS Plan of Appendix **30B (Rev.WRC-07)** of the Radio Regulations.

The FSS Plan includes the bands 4 500-4 800 MHz and 6 725-7 025 MHz.

Use of these bands is subject to the provisions of RR Appendix **30B**, which sets out the regulatory and technical requirements to be met by FSS networks employing the band and also the protection to be afforded to those networks by systems of the other services having allocations in the band (currently the FS and the MS). Another source of interference would have a negative effect on the possibility of this Plan "guaranteeing in practice equitable access to the geostationary orbit."

The FSS Plan (RR Appendix **30B**) is intended to preserve orbit/spectrum resources for future use, on an equitable basis among all Member States of the ITU, and is of the utmost importance to developing countries that may not have the possibility to implement satellite systems in unplanned bands (that suffer more and more from congestion) in the short- and mid-terms.

To safeguard the value of the allotted capacity in this Plan, it is important that administrations can implement this capacity at any time that they so wish without encountering interference or disruption.

The band 6 700-7 075 MHz is used by non-GSO MSS feeder links in the space-to-Earth direction according to RR No. **5.458B**. These non-GSO MSS systems utilize these feeder downlinks between the spacecraft and gateway earth stations. The companion feeder Earth-to-space allocation is in the range 5 091-5 250 MHz. The downlinks also support spacecraft telemetry traffic for both on-station and transfer orbit applications.

The links are in operation worldwide. Frequency reuse on the basis of polarization or spatial isolation ensures efficient use of the feeder link spectrum. Feeder links form integral parts of MSS systems providing links between the MSS system spacecraft and gateway stations while service links are used between the spacecraft and MSS terminals. MSS systems enable telecommunication links to sparsely populated areas and are important in providing vital links between these underserved areas and the rest of the world. Recommendation ITU-R M.1184 provides technical characteristics of these downlinks.

HAPS gateway links can support backhaul connections of all types (e.g. for cellular networks and complex wireless multi-protocol networks), access to terrestrial public and private networks, data collection, exploration data, surveillance information, safety radar data, and broadcast and interactive video. Telemetry, tracking, command and control information related to the operation of the HAPS vehicle itself can also be contained in the HAPS gateway link. HAPS applications can also provide a broad spectrum of disaster response, emergency communications, remote medical assistance, distance learning, public safety and government system applications on a real time multi-mode and global basis. These deployments support scenarios will impact the gateway link data requirements.

3/1.20/3 Summary of technical and operational studies and relevant ITU-R Recommendations

The ITU-R has conducted the following studies:

– General consideration of sharing between HAPS gateway links in the range 5 850-7 075 MHz and existing services and interference modelling and analysis methodologies for the sharing studies. The sharing studies cover both directions i.e. between HAPS/existing services, which means that the potential interference from/to existing services to/from HAPS is covered with the understanding that conventional systems in existing services are ensured protection.

– An additional evaluation of the interference between FS systems using HAPS gateway links and conventional fixed wireless systems in the range 5 850-7 025 MHz was considered. Interference zones, definition of an e.i.r.p. mask at platform level and required separation distances are identified.

Relevant ITU-R Recommendations

F.[HAPS CHAR], F.1094, F.[HAPS GATEWAY], S.1328, RS.1861 and M.1453.

Relevant ITU-R Report

F.[HAPS Modelling]

3/1.20/4 Analysis of the results of studies

3/1.20/4.1 Compatibility between HAPS and FSS systems

– **Interference from HAPS gateway link stations to GSO FSS space stations**

The worst interference scenario is that the HAPS stratospheric base station is aligned with the GSO FSS space station such that the main lobe of the transmitting antenna of the HAPS gateway link station points towards both the HAPS stratospheric and the GSO FSS space station. Such interference signals could compromise the safe operation of the satellite because that the band is also shared by telecommand signals through the omnidirectional antennas on-board the satellite for on-station operation and for transfer orbits (LEOP).

Protection of GSO FSS receiving space stations from terrestrial stations of other types of FS systems is governed by the separation angles and hard e.i.r.p. limits specified in RR Nos. **21.2 to 21.5**. It should be possible for HAPS operators to meet the e.i.r.p. limits by appropriate measures. For example, HAPS network parameters can be designed to improve the radiation pattern of the transmitting antenna of the HAPS gateway link station by beam forming techniques to reduce interference. Also, the HAPS gateway link stations could be sited at appropriate locations such that pointing towards the GSO is avoided or falls outside the GSO orbit within certain angles yet to be determined.

A study of the interference from HAPS gateway ground stations into FSS space stations receivers has shown that large areas around a HAPS platform station are available to place HAPS gateway uplink stations while minimizing interference into GSO FSS space station receivers. However, an appropriate value of maximum pfd created by HAPS transmitters at the GSO orbit should be further considered.

– **Interference from** HAPS **stratospheric base stations to GSO FSS space stations**

In the case of HAPS stratospheric base stations transmitting towards the horizon and thus pointing towards the GSO, interference could occur. In addition side and back lobe emissions from antennas on-board HAPS could also create interference to GSO FSS receiving space stations.

The same measures (pfd value towards the GSO orbit) to protect FSS receiving space stations from HAPS stratospheric base stations as from HAPS gateway ground stations should apply.

– **Interference from FSS earth stations to HAPS stations**

The interference impact from a transmitting FSS earth station upon a receiving HAPS gateway station and a receiving HAPS airborne station was analysed. The results of the analysis indicate the following:

1) In order to provide long-term and short-term interference protection to a receiving HAPS gateway station, an FSS earth station transmitting to a geostationary satellite at minimum elevation (of 5º) must be separated from a receiving HAPS gateway station that operates within the urban area coverage (UAC) zone by typically 17 km in critical directions in an area where the terrain is relatively flat, and by typically 29 km in critical directions in an area of moderately hilly terrain. For earth stations pointed to satellites at higher elevations angles, smaller separation distances will be required.

2) In cases where the interference path is from the main beam of an FSS earth station antenna into a main beam of a HAPS airborne platform antenna the interference will be extremely high. In such cases, the HAPS airborne platform would receive excessive levels of interference from an FSS earth station located up to a distance of 202 km away from the nadir point of the HAPS airborne platform, as projected on the ground.

3) In cases where the interference path is from a far side lobe of an FSS earth station into a main beam of a HAPS airborne platform the interference will also be very high.

4) In cases where the interference path is from the main beam of an FSS earth station antenna into the side lobe of the HAPS airborne station antenna, the interference would not be excessive, if the gain of the HAPS airborne antenna is at its minimum value in direction of the transmitting FSS earth station. However, the HAPS antenna gain in the direction of a FSS earth station that determines the minimum required distance separation between that station and a HAPS airborne station in any given direction does not reach its minimum value. Depending on the earth station's angle of travel, a transmitting FSS earth station must maintain a distance separation ranging from 120-202 km relative the nadir point of the HAPS airborne platform, as projected on the ground, in order to not cause excess interference into the receiving HAPS airborne station.

5) For earth station pointing direction of 10º with respect to the HAPS airborne station, and an angle of travel of less than 27º, long-term interference protection of the UAC zone gateway-to-HAPS airborne station link will require that the transmitting FSS station not be located anywhere from 20 to 65 km from the nadir point of the HAPS airborne platform as projected on the ground. For a pointing direction of approximately 0º with respect to the HAPS airborne station, this preclusion zone would extend from 0 km up to 120-202 km from the nadir point of the HAPS airborne platform as projected on the ground, with the maximum distance being dependent on the angle of travel.

6) There will be many cases where interference from an individual earth station to a HAPS airborne platform will be from side lobe to side lobe. However, at 21 km altitude, a circle of about 1 033 km diameter on the Earth's surface is visible, and a HAPS platform up-link would receive the aggregate interference from all co-frequency earth stations operating within that circle. The aggregate interference may well exceed the harmful threshold even if the contributions from the individual earth stations are each comfortably below it.

Such protection has the potential to constrain the existing and future deployment of FSS earth stations including SNG and VSAT services. Therefore HAPS systems, based on the characteristics currently assumed for use by HAPS, may be incompatible with the FSS.

– Interference from HAPS gateway links into the FSS allotments (RR Appendix 30B)

Based on these studies it can be concluded that there will be low probability of single entry interference from HAPS down link and uplink into FSS Plan allotments of RR Appendix **30B**.

However the small value of margin (3.9 dB), when single entry of HAPS gateway station uplink to FSS Plan allotments is considered, gives opportunity to suppose, that there will be interference from HAPS gateway links into FSS Plan allotments when aggregate case is considered.

Furthermore existing systems of RR Appendix **30B**, operating in the frequency band 6 725-7 025 MHz in accordance with Resolution **148 (WRC-07)**, as well as other systems are not part of this study. Therefore the study results may be not applicable for these systems that are also a subject to the provisions of the FSS Plan of RR Appendix **30B**.

Therefore the identification of two channels of 80 MHz each for gateway links for HAPS, should not be considered in the frequency band 6 725-7 025 MHz.

– Protection of non-GSO MSS space-to-Earth feeder links

Non-GSO MSS system gateway earth stations utilize sensitive receivers to acquire the feeder downlink signals from the spacecraft. The non-GSO aspect of the MSS systems means that, depending on gateway earth station location, the earth station antennas are required to receive downlink signals at all azimuths and at elevation angles ranging from 6 to 90 degrees. Studies have shown, that for the purpose of protecting feeder links for non-GSO MSS systems in the band 6 700-7 075 MHz, the e.i.r.p. of the HAPS downlink needs to be limited to a maximum of [−66.6] dBW/MHz* in the direction of any feeder-link earth station, within ±1 degree.

– **Interference from HAPS into non-geostationary FSS systems**

Studies have shown that there is a low probability of interference from HAPS into non-GSO FSS uplinks for MOLNIA-type systems in the 6 GHz band. Based upon the large values of positive margin found for the single entry case, it can be inferred that there would be no interference to non-GSO FSS MOLNIA-type systems both from HAPS uplink and HAPS downlink when the aggregate interference from HAPS stations, located in non-GSO FSS service areas, is considered.

3/1.20/4.2 Compatibility between HAPS and fixed wireless systems

Taking into account that the 5 850-7 075 MHz frequency band is heavily used by the FS in many countries all over the world it is emphasized that any deployment of HAPS has to be done with the aim to protect existing services.

With regard to the fixed wireless system point-to-point applications technical studies have shown that HAPS interference could occur both from aeronautical platform (downlink) and from gateway station (uplink).

For *I*/*N* value of −17.5 dB the nominal long-term interference criterion is −147.5 dBW/10 MHz. This interference criterion is derived from Recommendation ITU-R F.1094 and apportionment considerations of the allowable interference into the FS.

The studies enabled to define an e.i.r.p. mask for HAPS aeronautical platform (downlink) and separation distances for HAPS gateway station (uplink) assuming free-space loss.

– **Definition of e.i.r.p. mask for HAPS downlink for *I*/*N* value of −17.5 dB**

In order to meet the FWS nominal long term interference criterion of −147.5 dBW/10 MHz, an e.i.r.p. limit of −0.5 dBW/10 MHz for HAPS (downlink) is proposed which is invariant to an off-axis angle up to 60° from the nadir, which corresponds to a minimum elevation angle for the gateway station of 30°.

– **Definition of separation distances for HAPS up-link for *I*/*N* value of −17.5 dB**

In clear-sky conditions the minimum separation distance is 730 m whereas in rainy conditions this minimum distance is 1 850 m.

3/1.20/4.3 Compatibility between HAPS and mobile service systems

– **Interference from HAPS into intelligent transportation systems**

Within European countries the frequency band 5 855-5 875 MHz is identified in MS for intelligent transportation systems (ITS) non-safety applications while the band 5 875-5 925 MHz is identified for ITS safety-related applications.

Recommendation ITU-R M.1453 describes technical and operational characteristics of dedicated short-range communications (DSRC) for ITS at 5.8 GHz.

* *Editorial note: The value in brackets is still under consideration within ITU-R.*

–   Interference from the MS into the HAPS platform

No studies on this mode of interference have been presented.

–   Interference from HAPS to the MS (ITS)

– HAPS platform (downlink)

From the technical studies, a derived preliminary e.i.r.p. mask could be proposed for the protection of ITS antenna mounted on a car and operating in co-frequency at 5 900 MHz from interference that may occur from the HAPS platform station:

e.i.r.p = 12.6 dBm/MHz   for $0° \leq \theta \leq 22°$,

e.i.r.p linearly increases from 12.6 dBm/MHz to 16.2 dBm/MHz   for $22° < \theta \leq 60°$.

θ is the off-axis angle from the nadir.

This mask relates to the e.i.r.p. that would be obtained assuming free-space loss.

– HAPS gateway station (uplink)

Considering a mobile antenna mounted on a car, in clear-sky conditions the minimum separation distance is 320 m whereas in rainy conditions this minimum distance is equal to 800 m.

As a consequence HAPS gateway stations should be installed at the distance of 800 m from a road distance beyond which no coordination would be necessary between HAPS gateway station and ITS.

– Compatibility between HAPS and the aeronautical mobile service

Under RR No. **5.457C**, aeronautical mobile telemetry for flight testing by aircraft stations operates under a primary mobile allocation in Region 2 in the band 5 925-6 700 MHz. Such use shall be in accordance with Resolution **416 (WRC-07)** and shall not cause harmful interference to, nor claim protection from, the FSS and FS.

3/1.20/4.4   Compatibility between HAPS and radio astronomy

Under RR No. **5.149**, in making assignments to stations of other services to which the band 6 650-6 675.2 MHz is allocated, administrations are urged to take all practicable steps to protect the RAS from harmful interference. The provision also elaborates that emissions from space borne or air borne stations can be particularly serious sources of interference to the RAS. Since HAPS platform gateway links in a HAPS network may be considered as a quasi-space borne system this also needs to be noted.

3/1.20/4.5   Compatibility between HAPS and Earth exploration-satellite service systems

Although there is no allocation to EESS in the frequency range 5 850-7 075 MHz, RR No. **5.458** mentions that in the band 6 425-7 075 MHz, passive microwave sensor measurements are carried out over the oceans and that administrations should bear in mind the needs of the EESS (passive) and SRS (passive) in their future planning of the band 6 425-7 075 MHz. This frequency range is currently used by one operational passive sensor, AMSR-E, which is implemented on the AQUA satellite operated by NASA, and will be used by future sensors as well. The technical characteristics of this sensor may be found in the Recommendation ITU-R RS.1861.

3/1.20/5 Methods to satisfy the agenda item

3/1.20/5.1 Method A

No change to Article **5** of the RR. Under this method, it is envisaged that HAPS gateway links may be able to make use of the existing identified spectrum in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in RR No. **5.552A,** which indicates that the use of these bands by HAPS is subject to the provisions of Resolution **122 (Rev.WRC-07)**. This Resolution, in its recognizing a) states that these bands are expected to be required for both gateway and ubiquitous terminal applications. It is therefore clear that there is already spectrum designated for gateway operations for HAPS.

In addition, the bands 27.9-28.2 GHz and 31.0-31.3 GHz are also available for use by HAPS in the countries listed in RR Nos. **5.537A** and **5.543A**. Added flexibility with respect to spectrum to be used by gateway links could be achieved by administrations by adding their name to these footnotes (in case their names were not yet in these provisions).

Advantages

– Identifications for HAPS already exist and gateway links can be used in these already identified bands. These identifications are currently not used, allowing for rapid implementation.

– Avoidance of difficult sharing situations to ensure the protection of existing deployed services in the band 5 850-7 075 MHz.

– Does not impose additional burdens to the provisions currently applied in the band 5 850 to 7 075 MHz.

Disadvantages

– No new identification for HAPS gateway links in the range from 5 850 to 7 075 MHz. Does not have flexibility in the choice of spectrum for gateway link operations in support of HAPS networks, especially given rain fade conditions in some countries.

3/1.20/5.2 Method B

This method recognizes the need to identify HAPS gateway links in the range 5 850-7 075 MHz. This method proposes identification of two channels of 80 MHz for HAPS gateway links preferable within the sub-bands 6 440-6 520 MHz (down) and 6 560-6 640 MHz (up) through a country footnote in the Table of Frequency Allocations of RR Article **5** within the territory of these countries with their operational conditions to protect services to which the frequency band is allocated from co-channel and adjacent channel interference in a WRC Resolution (see regulatory examples). Some administrations are of the view that if HAPS are allowed to operate it shall be on a non-interference, non-protection basis while other administrations are of the view that HAPS will operate on a non-protection basis (No. **5.43A** does not apply).

Advantages

– Enables a portion of the range 5 850-6 725 MHz for HAPS gateway links, which would result in these links experiencing significantly less rain attenuation than exists in bands previously identified for HAPS. This identification would facilitate gateway links acceptable real time continuous voice and data transmissions, which is not feasible in the higher band allocations for HAPS because of the substantially higher degree of latency and service outages caused by rain attenuation in high rain rate countries and areas.

– The deployment of HAPS gateway links in the sub-bands 6 440-6 520 MHz (down) and 6 560-6 640 MHz (up) and the regulatory provision of the sharing conditions, including antenna pattern specification at gateway and platform, and the pfd limits in the proposed new Resolution associated with the additional footnote (**ADD 5.A120**) would potentially protect existing services.

– Avoids any frequency overlap with Appendix 30B and MSS feeder link allocations in the band 6 725-7 075 MHz.

Disadvantages

– This method of proposed operation of HAPS gateway links within the territory of a country would require a process for elimination of harmful interference at the borders of other countries and may be difficult to implement and gateway link performance may not be guaranteed.

– Does not avoid frequency overlap with FS, FSS, and EESS (passive) and does not preclude the possibility of co-channel or adjacent channel interference to existing services.

– This method lacks evidence to justify an additional spectrum identification in the band 5 850-6 725 MHz taking also into account that spectrum actually allocated to HAPS (28/31 or 47/48 GHz) has not been utilized.

3/1.20/6 Regulatory and procedural considerations

The following sections provide example regulatory text to implement the methods to satisfy the agenda item as described in section 3/1.20/5.

3/1.20/6.1 Method A

NOC

ARTICLE 5

SUP

RESOLUTION 734 (Rev.WRC-07)

Studies for spectrum identification for gateway links for high-altitude platform stations in the range from 5 850 to 7 075 MHz

3/1.20/6.2 Method B

The regulatory approach under this Method is to add a new footnote in the Table of Frequency Allocations of RR Article **5**, and to suppress Resolution **734 (Rev.WRC-07)**.

MOD

5 570-7 250 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
5 925-6 700	FIXED ADD 5.A120 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458	

ADD

5.A120 In [X, Y, Z,…][20], the allocation to the fixed service in the bands 6 440-6 520 MHz (HAPS-to-ground direction) and 6 560-6 640 MHz (ground-to-HAPS direction) may also be used by gateway links for high-altitude platform stations (HAPS) within the territory of these countries. Such use of two channels of 80 MHz in the fixed service allocation by HAPS in the above countries is limited to operation in HAPS gateway links and shall not claim protection from existing services. Resolution **[A120-HAPS-GATEWAY] (WRC-12)** shall also apply. (No. **5.43A** does not apply.) Furthermore, the development of these other services shall not be constrained by HAPS gateway links.

Editorial note: In the footnote above, the term "existing services" will need to be clarified at WRC-12.

ADD

PROPOSED RESOLUTION [A120-HAPS-GATEWAY] (WRC-12)

Use of the bands 6 440-6 520 MHz and 6 560-6 640 MHz by gateway links for high-altitude platform stations (HAPS) in the fixed service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that ITU has among its purposes "to promote the extension of the benefit of the new telecommunication technologies to all the world's inhabitants" (No. **6** of the Constitution);

b) that systems based on new technologies using high-altitude platform stations (HAPS) can potentially be used for various applications such as the provision of high-capacity services to urban and rural areas;

c) that provision has been made in the Radio Regulations for the deployment of HAPS in specific bands, including as base stations to serve IMT-2000 networks;

d) that at WRC-07, a need for adequate provision for gateway links to serve HAPS operations was expressed;

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[20] List of country names to use the frequency bands for HAPS gateway links in accordance with this provision.

e) that WRC-07 revised Resolution **734** to invite ITU-R to conduct sharing studies, with a view to identifying two channels of 80 MHz each for gateway links for HAPS in the range from 5 850 to 7 075 MHz, in bands already allocated to the fixed service, while ensuring the protection of existing services;

f) that the band 5 850-7 075 MHz is already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;

g) that in order to accommodate the need stated in *considering d)*, WRC-12 adopted No. **5.A120** to permit the use of HAPS gateway links in the fixed service in the bands 6 440-6 520 MHz and 6 560-6 640 MHz in the countries listed in the footnote, based on the study results in *considering e)*;

h) that while the deployment HAPS gateway links in the band 6 440-6 520 MHz and 6 560-6 640 MHz is taken on a national basis, such deployment may affect other administrations,

recognizing

a) that ITU-R has studied technical and operational characteristics of HAPS gateway links in the fixed services in part of the 6 GHz band resulting in Recommendation ITU-R F.[HAPS CHAR];

b) that ITU-R has also conducted sharing studies between HAPS gateway links and other existing services leading to Recommendation ITU-R F.[HAPS GATEWAY] and Report ITU-R F.[HAPS MODELLING] to provide interference evaluation methodologies based on Recommendation ITU-R F.[HAPS CHAR] referred to in *recognizing a)*;

c) that the World Summit on the Information Society has encouraged the development and application of emerging technologies to facilitate infrastructure and network development worldwide with special focus on underserved regions and areas,

noting

1 that for the purpose of protecting the Earth exploration-satellite service (passive) in the band 6 425-7 075 MHz, No. **5.458** shall apply[2];

2 that for the purpose of protecting the radio astronomy service in the band 6 650-6 675.2 MHz, No. **5.149** shall apply,

resolves

1 that the antenna pattern for both the HAPS platform and the HAPS gateway station in the bands 6 440-6 520 MHz and 6 560-6 640 MHz shall meet the following antenna beam patterns:

$G(\psi) = G_m - 3(\psi/\psi_b)^2$	dBi	for	$0° \leq \psi \leq \psi_1$
$G(\psi) = G_m + L_N$	dBi	for	$\psi_1 < \psi \leq \psi_2$
$G(\psi) = X - 60 \log(\psi)$	dBi	for	$\psi_2 < \psi \leq \psi_3$
$G(\psi) = L_F$	dBi	for	$\psi_3 < \psi \leq 90°$

where:

$G(\psi)$: gain at the angle ψ from the main beam direction (dBi)

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[2] Protection of EESS (passive) shall also be considered in the light of No. **5.458** of the Radio Regulations in developing final regulatory text in the *resolves* section.

G_m: maximum gain in the main lobe (dBi)

ψ_b: one-half of the 3 dB beamwidth in the plane considered (3 dB below G_m) (degrees)

L_N: near side-lobe level (dB) relative to the peak gain required by the system design, and has a maximum value of −25 dB

L_F: far side-lobe level, G_m – 73 dBi.

$$\psi_1 = \psi_b \sqrt{-L_N / 3} \quad \text{degrees}$$

$$\psi_2 = 3.745\ \psi_b \quad \text{degrees}$$

$$X = G_m + L_N + 60 \log(\psi_2) \quad \text{dBi}$$

$$\psi_3 = 10^{(X - L_F)/60} \quad \text{degrees}$$

The 3 dB beamwidth ($2\psi_b$) is estimated by:

$$(\psi_b)^2 = 7\ 442/(10^{0.1G_m}) \quad \text{degrees}^2;$$

2 that the maximum angle of deviation of the HAPS airborne antenna from the nadir should be limited to 60 degrees corresponding to the UAC of the HAPS;

3 that for the purpose of protecting the FSS (Earth-to-space), the pfd of the HAPS uplink shall be limited to a maximum of [−183.8 or −177.8 dBW/m^2 in 4 kHz]* toward the geostationary arc;

4 that for the purpose of protecting the fixed wireless systems in other administrations in the band 5 850-6 725 MHz, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of −0.5 dBW/10 MHz for off-axis angles from nadir below 60 degrees;

5 that for the purpose of protecting the mobile service systems (i.e., ITS applications) in other administrations in the band 5 875-5 925 MHz, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of 12.6 dBm/MHz for off-axis angles from nadir below 60 degrees;

6 that for the purpose of protecting the FSS (space-to-Earth) operating as feeder links for non-GSO mobile-satellite service (MSS) systems in the band 6 700-6 725 MHz in other administrations, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of [−66.6] dBW/MHz** in the direction of any feeder-link earth station, ±1 degree;

7 that administrations planning to implement a HAPS gateway links pursuant to No. **5.A120** shall notify the frequency assignment(s) by submitting all mandatory elements of Appendix **4** to the Radiocommunication Bureau for the examination of compliance with *resolves* 1 to 6 above.

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* *Editorial note: The values in brackets in resolves* 3 *are still under consideration within ITU-R.*

** *Editorial note: The value in brackets in resolves* 6 *is still under consideration within ITU-R.*

SUP

RESOLUTION 734 (Rev.WRC-07)

Studies for spectrum identification for gateway links for high-altitude platform stations in the range from 5 850 to 7 075 MHz

MOD

ARTICLE 11

Notification and recording of frequency assignments[1, 2, 3, 4, 5, 6, 7] (WRC-~~07~~12)

11.26A Notices relating to assignments for high altitude platform stations operating as base stations to provide IMT-2000 in the bands identified in **5.388A** and their gateway links in the bands identified in **5.A120** shall reach the Bureau not earlier than three years before the assignments are brought into use. (WRC-~~03~~12)

MOD

APPENDIX 4 (Rev.WRC-07)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

Needs to be updated to include system characteristics for HAPS gateway links as appropriate.

AGENDA ITEM 1.22

*1.22 to examine the effect of emissions from short-range devices on radiocommunication services, in accordance with Resolution **953 (WRC-07)**;*

Resolution **953 (WRC-07)**: *Protection of radiocommunication services from emissions by short-range radio devices*

3/1.22/1 Executive summary

Resolution **953 (WRC-07)** and WRC-12 Agenda item 1.22 invite ITU-R to study emissions from short-range devices (SRDs), in particular radio-frequency identification devices (RFIDs), operating inside and outside the frequency bands designated for ISM applications (RR Nos. **5.138** and No. **5.150)** to ensure adequate protection of radiocommunication services. This Resolution considers the deployment of SRDs, which can typically cross borders, such as RFIDs and ultra-wideband (UWB) devices, across various frequency bands and recognizes the work already carried out on UWB by ITU-R.

Four methods have been identified to satisfy this agenda item:

– Method A: No change to the RR. National or regional regulations are considered to be appropriate to provide relevant solutions, in addition to relevant ITU-R Recommendations and Reports.

– Method B: proposes a WRC Resolution inviting the ITU-R to study the regional and global harmonization of SRDs, and develop ITU-R Recommendations and Reports accordingly.

– Method C: proposes to recognize a limited number of harmonized frequency bands, emission levels and other relevant technical characteristics for SRD applications, either by a WRC Resolution or regulatory changes in RR Article **5** for SRDs, similar to those in specific bands for ISM applications, including limits on the aggregated use of SRDs or total radiation of SRDs.

– Method D: proposes to add RR provisions to define SRD applications and their conditions of operation.

3/1.22/2 Background

Resolution **953 (WRC-07)**:

a) resolves that to ensure that radiocommunication services are adequately protected, further studies are required on emissions from SRDs, inside and outside the frequency bands designated in the Radio Regulations (RR) for industrial, scientific and medical (ISM) applications;

b) describes short-range devices as radio transmitters or receivers or both that generate and use radio frequencies locally. Short-range devices operate in various frequency bands, including the ISM bands, under various national rules. While SRDs can operate in ISM bands, they are not considered ISM applications. RR No. **1.15** defines ISM applications (of radio-frequency energy) as: operation of equipment or appliances designed to generate and use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications[23];

c) describes SRDs and recognizes that they hold promise for an array of new applications that may provide benefits for users. Certain types of SRDs, such as medical SRDs, have allowed for huge improvements in the health and quality of life of citizens, while RFIDs have created significant benefits in numerous sectors of the economy. SRDs have fostered economic productivity, which in turn generates cost savings in commerce, health care, education and government. Such productivity gains have greatly benefitted consumers. SRDs such as radio local area networks (RLANs) have also enabled tremendous growth in the delivery of broadband wireless access.

SRD applications have been introduced in various ways in order to meet national requirements. For example, some SRD systems may operate on a non-interference and non-protected basis[24] in ISM bands and non ISM bands, whereas, other SRDs may operate under a particular service.

In some countries, a flexible national regulatory regime in which devices are exempt from licensing has been implemented in the ISM bands. The essence of such a regime is twofold: i) access to non-exclusive spectrum for certified devices is provided, and ii) basic technical requirements for devices are minimal. Such a regime facilitates spectrum sharing among devices while minimizing constraints on product designs. Moreover, barriers to entry are low in such regimes, thereby facilitating the development of a large eco-system of licence-exempt devices, including short-range devices such as cordless telephones, wireless access systems, RFID, push-to-talk walkie-talkie like products, alarm systems and baby monitors.

A number of SRDs have also been introduced on a licence-exempt basis in non-ISM bands and operate on a non-interference, non-protected basis with licensed services. Such operation is premised on the fact that these SRDs have been certified based upon emissions of very low signal levels. Radiation limits and other technical/operating rules are usually established as a result of compatibility studies. For example, operating parameters can include the specification of indoor use only, the requirement for an enabling signal prior to transmission, and a prohibition against configuring external antennas for permanent outdoor use. Technical parameters can include the specification of radiated power levels, duty-cycles, threshold power detection capability and the inclusion of listen-before-talk techniques.

UWB devices were studied extensively in ITU-R; the relevant Recommendations and Reports can be found in section 3/1.22/3.

ITU-R needs to complete studies for determining operating conditions under which SRDs provide adequate protection of radiocommunication services operating in accordance with the Radio Regulations. When deploying SRDs, administrations should take into consideration the protection criteria and service quality objectives provided in the Recommendations listed in section 3/1.22/3.

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[23] NOTE − There is a view, however, that many applications using ISM bands are no longer covered by this definition and that the term “household” is more appropriate than “domestic”.

[24] Non-interference and non-protected basis means that that no harmful interference shall be caused to any radiocommunication service (including the radio astronomy service, see RR No. **4.6**), and that no claim shall be made for protection of these devices against harmful interference originating from radiocommunication services.

3/1.22/3 Summary of technical and operational studies and relevant ITU-R Recommendations

3/1.22/3.1 Frequency bands, technical and operational characteristics of short-range devices

Report ITU-R SM.2153 provides applications, frequency ranges, technical and operational characteristics of short-range devices, as well as guidance on the radiated power limits allowed by a number of administrations. The Report highlights that SRDs are permitted to operate on a non-interference/non-protection basis subject to relevant standards or national regulations. This Report also underscores that "SRDs should not be restricted more than necessary in their use and should be subject to recognized certification and verification procedures".

Table 1 of Report ITU-R SM.2153 lists frequency bands that are commonly used for the deployment of SRDs in various regions of the world. However, not all of these bands commonly used are harmonized for SRD use either regionally or globally.

Report ITU-R SM.[RFID] is an examination of existing technical rules on RFID deployment in various countries and frequency bands. This document underlines the fact that there is a lack of harmonization in spectrum allocations and access conditions for RFID at UHF, as well as for other frequency bands.

A number of other ITU-R Recommendations list technical and operating parameters of SRDs, and frequency bands of operation.

As many SRDs could be carried by travellers across national boundaries, interference from these could potentially create unacceptable service degradation for some other radiocommunication services across those national boundaries. Restriction of frequencies to be used by SRDs on a regional/global basis and their harmonization should be studied in ITU-R.

3/1.22/3.2 Compatibility studies

Short-range devices employ various interference mitigation techniques when required in order to achieve their performance while ensuring the protection of existing services which use the frequency band. In-band compatibility studies are usually necessary, in particular when specific frequency bands and services require further protection; for this purpose case-by-case studies are conducted. However, carrying out studies on the impacts of a large number of SRD applications on radiocommunication services operating in a large number of frequency bands is time-consuming and thus may be difficult to achieve.

A number of specific studies between SRDs and various radiocommunication services were submitted to ITU-R for reference and can be found in Report ITU-R SM.[WRC-12-AI-1.22]. In addition, a study on RFIDs in the GSM guardband can be found in this Report. Also, Report ITU-R SM.2057 considers interference from UWB on radiocommunication services. As a main objective, this Report evaluates SRD e.i.r.p. density required for the protection of radiocommunication services.

3/1.22/3.3 Consideration of current practices for short-range devices

3/1.22/3.3.1 Emission masks for the short-range devices

Short-range devices shall conform to the spurious domain emission limits given in RR Appendix **3** (see RR No. **3.6**). Specifically, Table II of RR Appendix **3** lists the attenuation values used to calculate maximum permitted spurious domain emission power levels for use with radio equipment. For example, low-power radio device equipment intended for short-range communication or control purposes and operating at output power less than 100 mW, must meet an attenuation level of 56 +10 log(P), or 40 dBc, whichever is less stringent.

Recommendation ITU-R SM.329 should be considered as well for the spurious emissions from short-range devices.

Report ITU-R SM.2153 and Recommendation ITU-R SM.1756 can be used in addition to the limits given in RR Appendix **3** as guidelines for administrations when they choose frequency bands and set power limits for the deployment of short-range devices.

3/1.22/3.3.2 Frequency bands with restrictions

There are some discrete frequencies and/or frequency bands identified in the RR with restrictions due to the services to which they are allocated. Some examples are those bands allocated to passive services and those ensuring safety of life according to the relevant RR provisions.

Examples of frequencies/frequency bands that may have restrictions are specified in RR Nos. **5.82**, **5.108**, **5.109**, **5.110**, **5.180**, **5.200**, **5.223**, **5.226**, **5.328**, **5.337**, **5.375**, **5.444A**, **5.448B** and **5.497**. It should be noted that RR No. **5.149** lists bands for which administrations are urged to take all practicable steps to protect the RAS from harmful interference when making assignments to other services. Furthermore, RR No. **5.340** lists frequency bands in which all emissions are prohibited.

Administrations need to consider these restrictions in their national rules when making frequencies and/or frequency bands available for use by SRDs.

3/1.22/3.3.3 Harmonized bands

Recommendation ITU-R SM.[SRD] lists frequency bands regionally or globally identified for SRDs. Report ITU-R SM.2153 also lists many frequency bands for short-range devices that are already globally or regionally harmonized. The further harmonization of frequency used by short-range devices that can be easily imported and carried by travellers across national boundaries would benefit users, regulators and manufacturers, as these SRDs could create harmful interference to radiocommunication services.

Some harmonization of SRDs is possible, which allows them to operate in frequency bands that differ country by country or region by region. The harmonization of frequency bands might be necessary for some short-range devices that cross borders and which have the potential to create interference to radiocommunication services. This could be achieved through regional arrangements or ITU-R Recommendations. Such ITU-R Recommendations may be developed for specific SRD applications in accordance with Resolution ITU-R 54 (Studies to achieve harmonization for short-range radiocommunication devices (SRDs)). In addition, administrations can adopt national regulations and standards that are harmonized with other countries.

The emissions of specific SRDs – those that have great growth potential and that are portable across national borders – may continue to be studied within ITU-R. These ITU-R studies would be specific to frequency bands where it is expected that SRDs would be deployed.

3/1.22/4 Analysis of the results of studies

To provide protection to radiocommunication services, the deployment of SRDs generally requires limits on emissions, usage and, if needed, the implementation of methods to avoid harmful interference.

Many SRDs are expected to be deployed worldwide and may be transported between and used in multiple countries. A lack of global or regional harmonization of SRD rules and frequency bands creates risks of harmful interference to radiocommunication services. Some administrations are of the view that mitigating the risks to radiocommunication services can be addressed through appropriate ITU-R Recommendations and Reports, while other administrations are of the view that this situation should be addressed through changes to the Radio Regulations.

While it is recognized that the regulation and certification of SRDs is a matter for administrations, some are of the view that the work required to advance the harmonization of certain SRD applications can be done through ITU-R Recommendations and/or Reports. Such work could build on efforts undertaken 1) under Resolution ITU-R 54, "Studies to achieve harmonization of radiocommunication short-range devices", and 2) at the national and regional level to establish common spectrum allocations and technical rules. Work at the ITU-R level would encourage closer collaboration between ITU-R, international and regional standards organizations and manufacturers in these efforts.

However, other administrations are of the view that such harmonization is better achieved via inclusion of the harmonized frequency bands in RR Article **5**.

ITU-R Recommendations could provide guidance to administrations on bands suitable for the deployment of SRDs and on required technical parameters, including methods, to avoid interfering with radiocommunication services. These Recommendations could also provide methods that would allow SRDs with similar operating characteristics and interference potential to operate without causing harmful interference to radiocommunication services.

3/1.22/5 Methods to satisfy the agenda item

Four methods have been identified to satisfy this agenda item.

3/1.22/5.1 Method A

No change to the RR. This method proposes no change to the RR in relation to this agenda item. Under this method, it is considered that the radiocommunication services can be sufficiently protected from possible interference caused by SRD emissions. National or regional regulations are considered to be appropriate to provide relevant solutions, in addition to relevant ITU-R Recommendations and Reports.

Advantages

– Maintains the current flexibility of national or regional arrangements, if available.

– No regulatory change needed.

Disadvantages

– International harmonization of frequency bands and technical characteristics of SRDs may not be advanced.

– Radiocommunication services operating in accordance with the Radio Regulations may receive unacceptable levels of interference, in particular due to the global circulation of many SRDs.

3/1.22/5.2 Method B

WRC Resolution inviting ITU-R to study the regional and global harmonization of SRDs and develop ITU-R Recommendations and/or Reports accordingly. This method proposes only a WRC Resolution inviting ITU-R to study the regional and global harmonization of SRDs, and develop ITU-R Recommendations and Reports accordingly.

The goal of this Resolution is to study the harmonization of specific frequency bands and technical requirements for SRD applications, such as those that are portable across borders and also those that have the potential to cause interference to radiocommunication services. This Resolution would allow administrations, regional and international standards bodies and manufacturers to collaborate more closely to improve the level of global harmonization.

Advantages

- No regulatory change needed to Articles **1** and **5** of the RR.
- Greater user confidence in the functioning of devices when travelling abroad.
- A broader manufacturing base and increased volume of equipment (globalization of markets) resulting in economies of scale and expanded equipment availability.
- A reduction in the potential for harmful interference from SRDs to radiocommunication services when SRDs operate in suitable harmonized frequency bands.
- A reduction in the influx of non-conforming SRDs into the marketplace.
- Greater collaboration between regulators and industry.
- Addresses the protection of radiocommunication services.
- Recognizes the need to build on work already under way on harmonization of frequency bands and technical rules for SRD applications under Recommendation ITU-R SM.[SRD] and Report ITU-R SM.2153.

Disadvantages

- Some work has progressed to date on harmonization of frequency bands and technical rules for SRD applications under Recommendation ITU-R SM.[SRD] and Report ITU-R SM.2153.
- Carrying out studies on the impacts of a variety of SRD applications on radiocommunication services operating in several frequency bands is time consuming.

3/1.22/5.3 Method C

Under Method C, it is proposed to recognize a limited number of harmonized frequency bands, emission levels and other relevant technical characteristics for SRD applications, as appropriate, either by a WRC-12 Resolution or regulatory changes in RR Article **5** for SRDs, similar to those in specific bands for ISM applications, including limits on the aggregated use of SRDs or total radiation of SRDs.

Advantages

- To limit the use of SRDs by these frequency bands thereby limiting their impact on recognized radiocommunication services.
- SRDs would be defined in the RR similar to ISM with limited frequency bands and emission limits; as a result of such a definition and designation of frequency bands, protection for radiocommunication services to which the identified frequency bands are currently allocated would be provided.
- Defining frequency bands for different SRD applications would enable administrations to take appropriate regulatory decisions regarding those devices.

Disadvantages

- SRDs are given a recognition and status in the Radio Regulations, i.e. Articles **1** and **5**.
- A definition of "short-range" communications would be required in the RR. Arriving at this definition would be difficult given the wide range of SRD characteristics.
- SRDs may no longer operate on a non-interference basis and may claim protection from radiocommunication services.

- It might be required for radiocommunication services to accept interference from SRDs operating in accordance with the RR provisions, even if this causes the service quality objectives for these services not to be met.
- Carrying out studies on the impacts of a variety of SRD applications on radiocommunication services operating in several frequency bands is time consuming.
- This would require revisions to the RR for the introduction of new SRD applications.

3/1.22/5.4 Method D

Under Method D, the RR would contain a definition of SRD applications and provisions for under what conditions they can operate (e.g. harmonized frequency bands, exclusion bands or emission limits).

Advantages

- International harmonization is achieved.
- A defined maximum interference scenario for radiocommunication services operating in accordance with the RR is achieved.
- SRDs would be defined in the RR similar to ISM with limited frequency bands and emission limits; as a result of such a definition and designation of frequency bands, protection for radiocommunication services to which the identified frequency bands are currently allocated would be provided.
- Defining frequency bands for different SRD applications would enable administrations to take appropriate regulatory decisions regarding those devices.

Disadvantages

- SRDs are given a recognition and status in the Radio Regulations, i.e. Articles **1** and **5**.
- A definition of “short-range” communications would be required in the RR. Arriving at this definition would be difficult given the wide range of SRD characteristics.
- This may constrain the introduction of new allocations to the radiocommunication services.
- SRDs may no longer operate on a non-interference basis and may claim protection from radiocommunication services.
- It might be required for radiocommunication services to accept interference from SRDs operating in accordance with RR provisions, even if this causes the service quality objectives for these services not to be met.
- Carrying out studies on the impacts of a variety of SRD applications on radiocommunication services operating in several frequency bands is time consuming.

3/1.22/6 Regulatory and procedural considerations

3/1.22/6.1 Method A

NOC to the Radio Regulations.

3/1.22/6.2 Method B

An example of a draft general WRC Resolution [A122-SRD-METHOD-B] (WRC-12) on the use of the radio-frequency spectrum by short-range radio devices is provided below.

ADD

EXAMPLE DRAFT RESOLUTION [A122-SRD-METHOD-B] (WRC-12)

Use of the radio-frequency spectrum by short-range radio devices (SRDs)

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that some administrations have introduced SRDs in various frequency bands, including bands designated for the deployment of industrial, scientific and medical (ISM) applications, under Nos. **5.138** and **5.150**;

b) that these administrations are developing regional and national rules and approaches for managing the regulation and certification of SRDs;

c) that frequency bands and technical rules are not always harmonized either regionally or globally;

d) that there are a number of ITU-R Recommendations defining the protection of radiocommunication services from devices and applications without a corresponding service allocation in the RR;

e) that SRDs use the radio spectrum on a non-interference non-protected basis;

f) that appropriate spectrum access techniques can allow the use of the frequency spectrum by SRDs to ensure adequate protection of stations in the radiocommunication services operating in accordance with the RR;

g) that SRDs will continue to use frequency bands already allocated to radiocommunication services;

h) that these compatibility studies are usually band- and service-specific;

i) that many SRDs may create the potential for harmful interference to radiocommunication services, and they can be carried by travellers across national boundaries;

j) that some SRDs, such as RFIDs, certain types of medical devices, etc., have great growth potential and may require new spectrum;

k) that SRDs, their applications, their underlying technologies, and their frequencies of operation are continuously evolving;

l) that some SRDs increasingly are playing a role in the mobile Internet economy and mobile broadband applications,

recognizing

a) the benefits of harmonization for end users, manufacturers and regulators, such as:

− greater end-user confidence in the reliable functioning of devices when travelling abroad;

− a broader manufacturing base and increased volume of devices (globalization of markets) resulting in economies of scale and expanded equipment availability;

− improved spectrum management;

b) that encouraging SRD operation in suitable harmonized frequency bands could reduce the potential for harmful interference from SRDs to radiocommunication services;

c) that globally and/or regionally harmonized bands could reduce the influx of non-conforming SRDs into the marketplace of countries;

d) that the ITU-R provides administrations, standardization, and scientific and industrial organizations an opportunity to share technical information on current SRD deployments and future spectrum requirements of SRDs,

noting

a) that decision on frequency bands for use by SRDs is a national matter, while recognizing significant advantages of harmonization of international band usage;

b) that frequency bands commonly used by SRDs are listed in Table 1 of Report ITU-R SM.2153, Technical and operating parameters and spectrum use for short-range radiocommunication devices;

c) that not all of these bands are harmonized for SRD use either regionally or globally;

d) that the work required to advance harmonization can be done through ITU-R Recommendations and or Reports,

resolves

to encourage administrations to work through ITU-R to harmonize frequency bands and rules for SRDs on a regional and/or global basis,

invites ITU-R

1 to study, in collaboration with standardization, and scientific and industrial organizations, the regional and/or global harmonization of technical and operating parameters, including frequency ranges, for specific SRDs, such as those that are portable across borders and that have the potential to cause interference to radiocommunication services;

2 to continue to develop the necessary monitoring and measurement procedures to enable administrations to verify technical and operating parameters of SRDs and to examine the effect of emissions from SRDs on radiocommunication services;

3 to promote and maintain an ongoing exchange of information on SRDs between ITU-R members and other organizations as per Resolution ITU-R 9-3;

4 to study spectrum utilization and technical requirements of SRDs to promote the efficient use of spectrum;

5 to conduct technical studies to evaluate the feasibility of deploying SRDs in specific frequency bands that could be harmonized;

6 to document these studies in ITU-R Reports and Recommendations,

invites

administrations, standardization, and scientific and industrial organizations to participate actively in these studies,

instructs the Director of the Radiocommunication Bureau

to bring this Resolution to the attention of ITU-T, ISO/IEC and other relevant organizations in accordance with Resolution ITU-R 9-3.

3/1.22/6.3 Method C

*Editorial Note: A footnote similar to RR No. **5.150** is to be developed.*

3/1.22/6.4 Method D

ADD

5.A122 SRD applications may operate in the bands [ZZZZ-ZZZZ] MHz on the condition that no harmful interference shall be caused to any radiocommunication service (including the radio astronomy service, see No. **4.6**), and that no claim shall be made for protection of these devices against harmful interference originating from radiocommunication services.

*Note: In addition, a definition of SRDs would need to be included in Article **1**.*

CHAPTER 4

Science issues

(Agenda items 1.6, 1.11, 1.12, 1.16, 1.24)

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AGENDA ITEM 1.6

*1.6 to review No. **5.565** of the Radio Regulations in order to update the spectrum use by the passive services between 275 GHz and 3 000 GHz, in accordance with Resolution **950 (Rev.WRC-07)**, and to consider possible procedures for free-space optical-links, taking into account the results of ITU-R studies, in accordance with Resolution **955 (WRC-07)**;*

4/1.6/1 Resolution 950 (Rev.WRC-07)

Consideration of the use of the frequencies between 275 and 3 000 GHz.

4/1.6/1.1 Executive summary

Resolution **950 (Rev.WRC-07)** addresses the frequency range between 275 and 3 000 GHz. Currently, RR No. **5.565** addresses the use by the passive services of the range 275 to 1 000 GHz and makes provision for the protection of passive services until such time as the Table of Frequency Allocations is extended. Resolution **950 (Rev.WRC-07)** calls for studies with a view to modifying RR No. **5.565** on the passive use and applications of the spectrum between 275 and 3 000 GHz.

One method to satisfy this part of the agenda item is proposed that consists of modifying RR No. **5.565** to specify the frequency bands between 275 and 1 000 GHz that are identified for radio astronomy and passive remote sensing usage while noting that the entire 1 000 to 3 000 GHz frequency range is of interest for passive observations and can be shared without constraint by both active and passive services.

4/1.6/1.2 Background

The 275-3 000 GHz frequency range is used by the following passive services that have varying requirements: (EESS (passive), RAS and SRS (passive).

The frequency range between 275 and 3 000 GHz is currently used by the EESS (passive) for passive microwave remote sensing of the Earth's atmosphere and environment. As fundamental measurements related to such things as global warming, climate change, and the ozone destruction process become more and more important areas of scientific study, frequencies within this range will be increasingly used to study various elements of the Earth's atmosphere and its changing climate. Elements of climate change such as the global water and carbon cycles need to be studied over decades to understand the ways in which the Earth's climate and environment are changing as these changes affect all aspects of human life on Earth. Ground and balloon-based passive microwave remote sensing systems use this same frequency range to observe the Earth's atmosphere and environment.

This frequency range is also used by the RAS for observations of important spectral lines and continuum bands which assist in the study and understanding of the Universe. New receiver technology and new instruments (both ground-based and space-based) being used in the 275-1 000 GHz region are helping to refine the results of radio astronomy observations in this spectrum range, while similar developments in the 1 000-3 000 GHz range are leading to a better understanding of specific spectral lines and specific atmospheric windows that are of interest to radio astronomers. Significant infrastructure investments are being made under international collaboration for the use of these bands between 275 and 3 000 GHz. For example, the Atacama Large Millimeter/submillimeter Array (ALMA), a facility currently under construction in northern Chile, will provide new insights on the structure of the universe through observations in the 30-1 000 GHz range. It is to be noted that radio astronomy conducted from space falls under the

SRS (passive). Space-based highly sensitive telescopes observe spectral lines from a variety of molecules and atoms and continuum thermal radiation from very small particles (cosmic dust).

Terrestrial use of frequencies in this range is strongly constrained by the Earth's atmosphere. This is especially true above 1 000 GHz, where atmospheric absorption at sea level sites can exceed thousands of dB per km due to the effects of water vapour and oxygen.

At sea level, the attenuation at 275 GHz is approximately 5 dB/km, but exceeds 550 dB/km at 1 000 GHz. Between those two frequencies, attenuation exceeds 20 000 dB/km at certain resonant frequencies of constituent atmospheric gases (oxygen and water vapour being the dominant contributors). Above 1 000 GHz, attenuation is even larger, varying between 550 dB/km at the lowest frequency, to over 4 000 dB/km at 3 000 GHz. At resonances in the 1 000-3 000 GHz range, attenuation can be effectively infinite (numerically exceeding 570 000 dB/km). Attenuation by atmospheric gases at frequencies below 1 000 GHz is addressed in Recommendation ITU-R P.676; the numbers quoted here are based upon similar calculations for a standard sea-level atmosphere, with extension to frequencies above 1 000 GHz.

4/1.6/1.3 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

Existing relevant ITU-R Recommendations: ITU-R RA.314, ITU-R RS.515, ITU-R RS.1028 and ITU-R RS.1029 and ITU-R RA.1860.

New relevant ITU-R Reports: ITU-R RA.2189 and ITU-R RS.2194.

4/1.6/1.3.1 Frequency range 275-1 000 GHz

4/1.6/1.3.1.1 EESS (passive)

ITU-R studies have resulted in Report ITU-R RS.2194 providing list and rationale for relevant frequency bands identified for EESS (passive) use.

Consequently, Recommendation ITU-R RS.515 giving frequencies used for passive remote sensing in the EESS as well as Recommendations ITU-R RS.1028 and ITU-R RS.1029 providing the associated performance and protection criteria respectively are expected to be revised.

4/1.6/1.3.1.2 SRS (passive)

The SRS (passive) includes applications of both passive remote sensing of extra-terrestrial planets and their atmospheres, and radio astronomy observations conducted from space-based platforms. The former application would use some of the same frequency bands as the EESS (passive) uses for space-based passive remote sensing of the Earth and its atmosphere while the latter application would use frequency bands determined by spectral lines of astrophysical interest and by continuum bands needed for non-spectral-line observing. ITU-R studies have resulted in Recommendation ITU-R RA.314.

4/1.6/1.3.1.3 Radio astronomy service

RAS conducted from the ground is strongly influenced by the atmospheric windows in the 275-1 000 GHz range. The bands presently listed in RR No. **5.565** are those bands in which radio astronomy is feasible from the ground. The frequencies of interest to radio astronomy below 1 000 GHz are contained in Recommendation ITU-R RA.314. See also: Report ITU-R RA.2189.

4/1.6/1.3.2 Frequency range 1 000-3 000 GHz

4/1.6/1.3.2.1 EESS (passive)

(See section 4/1.6/1.3.1.1.)

4/1.6/1.3.2.2 SRS (passive)

(See also section 4/1.6/1.3.1.2.)

Recommendation ITU-R RA.1860 contains a list of frequencies of interest to radio astronomers for space-based observing based on spectral lines of astrophysical importance.

4/1.6/1.3.2.3 Radio astronomy service

Radio astronomy is even more constrained by the atmosphere in this range than it is below 1 000 GHz, because of extreme atmospheric absorption. See: Recommendation ITU-R RA.1860 and Report ITU-R RA.2189 which contain studies that demonstrate sharing among passive and active services is easily accomplished at all frequencies in the 1 000-3 000 GHz range.

4/1.6/1.4 Analysis of the results of studies

4/1.6/1.4.1 Frequency range 275-1 000 GHz

4/1.6/1.4.1.1 EESS (passive)

There are two primary EESS measurement "classes", namely meteorology/climatology and atmospheric chemistry. The meteorology/climatology measurements are mainly focused around the water vapour and oxygen resonance lines and the associated "atmospheric windows" to retrieve necessary physical parameters, such as humidity, pressure, cloud ice and temperature. It should be noted that there is a direct correlation between the temperature and the submillimetre emissions from oxygen. Remote sensing of atmospheric chemistry measures the many smaller spectral lines of the various atmospheric chemical species.

An important difference between these two classes of measurements is in the geometry of the measurement. Most meteorology/climatology measurements are performed using vertical nadir sounders at lower frequencies (typically below 600 GHz) and limb sounders at higher frequencies whereas atmospheric chemistry measurements are mostly performed using limb sounding across the whole frequency range.

In some cases, apparent redundant coverage (i.e. a single molecule having several transitions is observed in several different bands) is required for various reasons, such as different frequency bands being sensitive at different altitudes within the atmosphere.

As frequency increases above 200 GHz, atmospheric attenuation greatly increases and the variability of the attenuation due to water vapour increases dramatically. For this reason the low frequencies (below 200 GHz) are the most suitable for vertical nadir measurements of the lower layers of the atmosphere, while the higher frequencies are better suited for the higher layers of the atmosphere. Above 600 GHz, the oxygen lines are only observable above the water vapour over frequency ranges with very dry atmosphere. Measurements at these frequencies are therefore typically from limb sounders and are exclusively used for observation of the upper atmospheric layers.

Among these upper frequency bands, it is important to note that ranges around the water vapour resonance at 380 GHz and the oxygen line at 424 GHz are unique in their opacity and high enough in frequency to permit practical antennae to be used at geosynchronous altitudes, yet low enough for technology to provide practical, sensitive instrumentation.

Cloud ice and water vapour are two components of the hydrological cycle in the upper troposphere and both components are currently poorly measured. The hydrological cycle is the most important subsystem of the climate system for life on the planet and its understanding is of the utmost importance. The use of passive submillimetre-wave measurements to retrieve cloud ice water content and ice particle size was suggested years ago in scientific literature and refined in subsequent publications over many years. Since then, a number of missions have been proposed that focus on this technique to measure cloud ice water path, ice particle size and cloud altitude. Currently, these cloud ice and water vapour measurements focus on the 183 GHz, 325 GHz, 340 GHz, 448 GHz, 664 GHz and 874 GHz frequencies.

Atmospheric chemistry measurements are typically made with limb sounders, scanning the atmosphere layers at the horizon as viewed from the satellite orbital position. These measurements relate to a large number of chemical species in the atmosphere and refer to spectral lines that are much narrower in bandwidth and much larger in occurrence than the water vapour and oxygen resonance lines.

The minimum bandwidth required for measurements of atmospheric spectral lines is proportional to the frequency of the spectral line (i.e. a measurement around 600 GHz requires more bandwidth than that required for a measurement at 300 GHz). This is essentially due to the fact that the sensor filtering capability is limited to a certain percentage absolute value of the frequency.

As a first order approximation, this implies a bandwidth requirement of about 1 GHz on both sides of the spectral line for measurements up to 500 GHz, while 2 GHz on both sides of the spectral line would be sufficient for measurements between 500 and 1 000 GHz.

The frequency bands for remote sensing of meteorology/climatology and atmospheric chemistry between 275 and 1 000 GHz are given in Report ITU-R RS.2194.

4/1.6/1.4.1.2 SRS (passive)

Radio astronomy observations may be conducted in this frequency range from satellites under the aegis of SRS (passive).

4/1.6/1.4.1.3 Radio astronomy service

Radio astronomy in this frequency range must be conducted from high and dry sites in order to reduce the effects of atmospheric attenuation. Even then, successful observations can only be conducted in the atmospheric “windows,” which are portions of the spectrum in between resonant absorption lines of molecular constituents of the atmosphere. The list of atmospheric windows in the range 275-1 000 GHz already exists in RR No. **5.565** and no changes are necessary.

4/1.6/1.4.2 Frequency range 1 000-3 000 GHz

4/1.6/1.4.2.1 EESS (passive)

As currently envisioned, water vapour and oxygen resonance lines above 1 000 GHz are not expected to be of interest for meteorological/climatological investigations.

There are a large number of spectral lines that may be of interest for chemistry atmospheric limb sounding between 1 000 GHz and 3 000 GHz. Due to the very large number of stratospheric and tropospheric molecules spectral absorption lines that are found in this frequency range, the atmospheric chemistry spectral lines become extremely dense above 1 000 GHz, meaning that, potentially, any frequency above 1 000 GHz could be used for future measurements from satellites.

The Earth’s atmosphere is virtually opaque at frequencies above 1 000 GHz. Consequently, terrestrial services would not present interference potential to spaceborne passive sensors. Similarly, such instruments are expected to be limb sounding, rather than nadir pointing, and potentially subject only to interference from space-to-space communications, should any exist.

4/1.6/1.4.2.2 SRS (passive)

Radio astronomy observations may be conducted in this entire frequency range from satellites under the aegis of SRS (passive).

4/1.6/1.4.2.3 Radio astronomy service

Atmospheric absorption between 1 000-3 000 GHz varies between hundreds to hundreds of thousands of dB per km at sea level. Emissions from active terrestrial systems located more than 1 km from a radio telescope will not create interference to radio astronomy observations. Because of the exceedingly high attenuation in this frequency range, terrestrial radio astronomy can only be conducted at the very highest and driest sites, where THz-frequency emitters are unlikely to be located. Because of very narrow antenna beam widths at these frequencies, interference from airborne and non-geostationary satellites will be of extremely short duration and will not disrupt observations. In the case that a radio telescope points directly toward a geostationary satellite that is simultaneously pointed at the radio telescope and emitting in this frequency range, interference could occur, but such cases are expected to be very rare, and coordination would mitigate possible interference.

Ground-based radio astronomy observations can be conducted only through atmospheric windows. The suggested bands for radio astronomy are:

1 000-1 060 GHz
1 250-1 320 GHz
1 325-1 385 GHz
1 445-1 540 GHz
1 545-1 570 GHz
1 975-2 000 GHz

There are no suitable atmospheric windows in which radio astronomy observations from the ground are feasible above 2 000 GHz.

4/1.6/1.5 Method to satisfy the part of the agenda item related to Resolution 950 (Rev.WRC-07)

One method is proposed under this part of the agenda item.

Under this method, RR No. **5.565** would be modified to update the list of bands of interest to EESS, SRS, and RAS in the range 275-1 000 GHz. This modified footnote will also stress the interest of the passive services in all frequencies from 1 000-3 000 GHz, recognizing that sharing this frequency range with active services on the ground or in space should be possible due to the extremely strong atmospheric absorption and the very narrow antenna beamwidths encountered in this range. Resolution **950 (Rev.WRC-07)** would be consequentially suppressed.

Advantages:

– This method allows passive services requirements to be updated in the 275-3 000 GHz frequency range.

– This method does not significantly expand the length of RR No. **5.565**. The details needed to justify the passive services interests are given in ITU-R Recommendations and/or Reports.

Disadvantages: None.

4/1.6/1.6 Regulatory and procedural considerations

The Table of Frequency Allocations in RR Article **5** should be modified as follows:

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

248-~~1~~3 000 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
275-~~1~~3 000	(Not allocated) MOD 5.565	

In addition, RR No. **5.565** could be modified as follows:

MOD

5.565 A number of bands in ~~T~~the frequency range ~~band~~ 275-1 000 GHz ~~may be used~~ are identified for use by administrations for ~~experimentation with, and development of, various active and~~ passive service~~s~~ applications. ~~In this band a need has been identified for t~~The following specific frequency bands are identified for ~~spectral line~~ measurements by ~~for~~ passive services:

– radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;

– Earth exploration-satellite service (passive) and space research service (passive): 275-~~277~~286 GHz, ~~294~~296-306 GHz, ~~316~~313-~~334~~356 GHz, ~~342-349 GHz,~~ ~~363~~361-365 GHz, ~~371~~369-~~389~~392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, ~~442~~439-~~444~~467 GHz, ~~496~~477-~~506~~502 GHz, 523-527 GHz, ~~546~~538-~~568~~581 GHz, ~~624~~611-~~629~~ 630 GHz, 634-654 GHz, ~~659~~657-~~661~~692 GHz, ~~684-692 GHz,713-718~~ GHz, ~~730~~729-~~732~~ 733 GHz, 750-754 GHz, 771-776 GHz, 823-846 GHz, ~~851~~850-~~853~~854 GHz, 857-862 GHz, 866-882 GHz, 905-928 GHz,~~and~~ 951-956 GHz, 968-973 GHz and 985-990 GHz.

The use of the range 275-1 000 GHz by the passive services does not preclude use of this range by active services.

~~Future research in this largely unexplored spectral region may yield additional spectral lines and continuum bands of interest to the passive services.~~ Administrations wishing to make frequencies in the 275-1 000 GHz range available for active service applications are urged to take all practicable steps to protect these passive services from harmful interference until the date when the Table of Frequency A~~a~~llocations ~~Table~~ is established in the above-mentioned 275-1 000 GHz ~~above-mentioned~~ frequency range~~band~~.

All frequencies in the range 1 000-3 000 GHz may be used by both active and passive services. (WRC-~~2000~~12)

SUP

RESOLUTION 950 (Rev. WRC-07)

Consideration of the use of the frequencies between 275 and 3 000 GHz

4/1.6/2 Resolution 955 (WRC-07)

Consideration of procedures for free-space optical links

4/1.6/2.1 Executive summary

Agenda item 1.6 (Resolution **955 (WRC-07)**) considers possible procedures for free-space optical links, taking into account the results of ITU-R studies. Technical studies within the ITU-R have resulted in Recommendations and Reports on various applications of free-space optical links. No information has been provided to indicate that interference between free-space optical systems is a concern. One method to satisfy this part of the agenda item has been identified. The method makes no changes to the Radio Regulations for free-space optical systems.

4/1.6/2.2 Background

Resolution **955 (WRC-07)** considers possible procedures for free-space optical links. Because the atmosphere is essentially opaque at frequencies between 3 000 GHz and the near-infrared range, terrestrial free-space optical links operate at frequencies in or above the near-infrared range. Although inter-satellite links do not suffer from absorption, such links also generally use frequencies in the near-infrared range, due to the ready availability of transceiver (laser) technology in that range.

No. **78** of the ITU Constitution indicates that the Radiocommunication Sector shall fulfil the purposes of the Union relating to radiocommunications *inter alia*, by carrying out studies without limit of frequency range. No. **1005** of the Annex to the ITU Convention indicates that the term "radiocommunication" is limited to "electromagnetic waves of frequencies arbitrarily lower than 3 000 GHz"[1], except in the context of radiocommunication study groups addressing study questions and WRC Resolutions and recommendations. However, the 2002 Plenipotentiary Conference adopted Resolution **118** (Marrakesh, 2002), which resolves that world radiocommunication conferences can include in agendas for future conferences, items relevant to spectrum regulation of frequencies above 3 000 GHz and take any appropriate measures, including revision of the relevant parts of the Radio Regulations.

4/1.6/2.3 Summary of technical and operational studies and relevant ITU-R Recommendations

No Recommendations or Reports were developed under Question ITU-R 228/1, "Possibility and relevance of including in the Radio Regulations frequency bands above 3 000 GHz" nor was a Report, "regarding the possibility and relevance of including in the Radio Regulations frequency bands above 3 000 GHz" developed under *considering d)* of Resolution **955 (WRC-07)**.

Relevant ITU-R Recommendations referenced under *considering c)* of Resolution **955 (WRC-07)**: ITU-R P.1621, ITU-R P.1622, ITU-R S.1590, ITU-R RA.1630, ITU-R SA.1742, ITU-R SA.1805

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1 In the French text, the frequency limit is "by convention." In the Spanish text it is termed "conventionally," and in the English text it is termed "arbitrarily."

and ITU-R RS.1744 contain information pertaining to propagation, astronomical uses, meteorological observations and space-based telecommunication above 3 000 GHz, but no specific information about terrestrial free-space optical links; other relevant ITU-R Recommendations and Reports addressing propagation as well as fixed, remote sensing and astronomical applications: Recommendations ITU-R P.1814, ITU-R P.1817 and ITU-R RS.1804 and Reports ITU-R F.2106 and ITU-R RA.2163.

4/1.6/2.4 Analysis of the results of studies

The following summarizes the relevant findings of concluded studies.

The performance of earth stations operating with satellites at frequencies above 30 THz is strongly influenced by the atmosphere. Propagation considerations include atmospheric absorption, Rayleigh and Mie scattering, refraction, and turbulence. To avoid atmospheric loses as much as possible, optimal locations for an earth station are typically at high altitudes, usually at least 2 km above sea level. In addition, it is difficult to maintain an optical communication link with an earth station operating with an elevation angle below 40° due to the atmospheric effects at lower angles.

Atmospheric absorption, scattering and turbulence are also significant considerations for terrestrial free-space optical systems. These systems may also operate with some degradation through fog, rain and snow.

Free-space optical communication systems operating in the Earth-to-space, space-to-Earth and space-space directions are all exemplified by very narrow beams. The largest fields of regard are used between non-GSO spacecraft during acquisition mode but are still no more than 700 ∝radian (0.04º). Their field of view typically reduces to the order of 10 ∝radian (0.0006º) for regular communication. Unwanted energy received in the side lobes of the receiving antenna pattern may be neglected in the course of interference analyses. Typical transmitting beamwidths are also on the order of 10 ∝radian.

In the future, like fibre-optic broadband wireless connections, free-space optical links will be a promising system to provide point-to-point line-of-sight networks. For terrestrial applications, the beam divergence of the transmitting signal and the field of view of the receiver are typically a few milliradians or less. However, in the case of initial acquisition of the target terminal, a combination of a higher power beacon with a larger beam divergence and a sensitive acquisition sensor with a wide field of view, such as a CCD (Charge Coupled Device) image sensor, is frequently used. Terrestrial free-space optical links may be deployed at any time and in any place. This is based on today's assumption that no coordination is required to avoid interference between such links operated by different operators. Theoretically, interference between free-space optical links may occur. However, the interference will never have harmful effects unless two links operate under a quite limited geographical environment.

There are many telescopes in the world with the capability to make astronomical observations in the THz bands, and the number is increasing. Although the "antenna beams" are individually narrow, so that the probability for beam-to-beam coupling is low, most of these telescopes are imagers, with an array of many pixels at the focus, "seeing" collectively a patch of sky that could be a substantial fraction of a degree across. Since telescopes observing at frequencies above 100 THz are based at isolated, high-altitude sites, there are few suitable places in the world, and in general these are far from population concentrations (Mauna Kea, USA is a possible exception). It is, therefore, feasible to avoid transmitting towards such sites. Providing spatial separation is large enough, the low-attenuation windows in the atmosphere may be used both by active and passive services.

Active and passive sensing devices utilizing spectrum above 3 000 GHz offer the most diverse technical and operational characteristics of any technology studied with sensitivities and fields of view varying by orders of magnitude. Active sensors take the form of light detection and ranging (LIDAR) devices used by the EESS (active) and terrestrial MetAids type applications. Beamwidths and receiver fields of view of terrestrial applications are wider than those of space-based active sensors but are typically no more than a few mradian. Terrestrial meteorological aid systems also make active measurements by transmitting pulsed signals from a fixed source. Atmospheric conditions are determined by analysing signal characteristics received at the other end of the path. To minimize effects of energy from other sources, EMI (electromagnetic interference) filters are placed on the receivers of these types of systems.

EESS passive systems collect information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment. Instruments operating above 3 000 GHz may be present on about half of all EESS spacecraft. About one to three new EESS systems utilizing spectrum above 3 000 GHz are anticipated to be launched each year for the foreseeable future, with additional instruments being temporarily deployed on space shuttles and the International Space Station. The majority of EESS systems utilize non-geostationary orbits, with a significant portion of these systems in sun-synchronous orbits. Each EESS system has unique technical characteristics and mission requirements that directly influence instrument sensitivity. Sensitivity requirements will also vary with solar illumination, measurement subject, and even instrument age. As for passive meteorological aid devices, they conduct measurements such as sunshine detection and sky luminance. Both utilize sensors which may be exposed to direct sunlight.

In summary, because emitters used in near-infrared free-space links have extremely narrow beamwidths, and terrestrial emitters can only cause interference over very short distances, cases of terrestrial interference will be very rare and easily resolved on a local basis. Moreover, interference between inter-satellite links would also be rare due to directed and narrow beamwidths, and the vast geometry of space.

No evidence up until now has been provided that interference between free-space optical systems is a concern. Existing ITU-R Recommendations and Reports sufficiently address free-space optical links. Furthermore, no possible procedures have been identified for free-space optical links.

4/1.6/2.5 Method to satisfy the part of the agenda item related to Resolution 955 (WRC-07)

No change to the RR and consequential suppression of Resolution **955 (WRC-07)**.

Advantages:

– This method would not require changes to the Radio Regulations.

– No additional action would consequentially be required by the ITU Plenipotentiary Conference.

– Resolution **118** (Marrakesh, 2002) remains in force thereby providing a procedure for regulatory issues to be addressed if such need ever arises.

– ITU-R Study Groups may continue to conduct studies without limit of frequency range as new technologies or sharing scenarios emerge.

Disadvantages:

– There is no recognition in the Radio Regulations of free-space optical links or radio services above 3 000 GHz at this time.

4/1.6/2.6 Regulatory and procedural considerations

SUP

RESOLUTION 955 (WRC-07)

Consideration of procedures for free-space optical links

AGENDA ITEM 1.11

1.11 to consider a primary allocation to the space research service (Earth-to-space) within the band 22.55-23.15 GHz, taking into account the results of ITU-R studies, in accordance with Resolution ***753 (WRC-07)****;*

Resolution **753 (WRC-07)**: "*Use of the band 22.55-23.15 GHz by the space research service*"

4/1.11/1 Executive summary

Resolution **753 (WRC-07)** invites ITU-R to conduct of sharing studies between SRS systems operating in the Earth-to-space direction and systems operating in the FS, ISS and MS in the band 22.55-23.15 GHz, with a view to recommend appropriate sharing criteria for an allocation to the SRS (Earth-to-space). WRC-12 Agenda item 1.11 calls for consideration of making a primary SRS (Earth-to-space) allocation within the band 22.55-23.15 GHz, taking into account criteria needed to facilitate the sharing between the SRS and the FS, ISS and MS in the band 22.55-23.15 GHz.

Sharing between stations of the SRS (Earth-to-space) and the FS, MS and ISS in the band 22.55-23.15 GHz, has been studied. These studies all showed that sharing was feasible. Compatibility was also studied between stations in the SRS in the 22.55-23.15 GHz band and stations in the non-GSO ISS in the 23.183-23.377 GHz band. These studies showed compatibility between systems using the SRS and the non-GSO ISS allocations with large positive margins. The results of all these studies are reported in a number of ITU-R Reports. In addition, development of an ITU-R Recommendation on protection of certain incumbent services was undertaken.

One method is proposed to satisfy the agenda item:

Make a primary SRS (Earth-to-space) allocation in the band 22.55-23.15 GHz in the Table of Frequency Allocations in RR Article **5**. Add a new footnote regarding the location of SRS earth stations to protect existing and future deployment of FS and MS systems in neighbouring administrations and add the 22.55-23.15 GHz band to Table **21-3** in RR Article **21** so that the limits given in RR No. **21.8** also apply to the new SRS allocation.

Taking into account that studies related to WRC-12 Agenda item 1.11 have been completed, suppression of Resolution **753 (WRC-07)** is also proposed.

4/1.11/2 Background

To support the SRS missions in near-Earth orbit, including robotic and other missions in transit to the Moon and at or near the Moon, downlink (space-to-Earth) transmissions will operate in the existing 25.5-27.0 GHz SRS (space-to-Earth) allocation. This 1.5 GHz wide downlink band will be used for both scientific data retrieval and voice/video communication with the Earth.

An allocation to the SRS (Earth-to-space) to support various missions including referenced lunar missions, Lagrangian missions and other near-Earth space research missions in the range 22.55-23.15 GHz is needed as a companion band to the existing 25.5-27.0 GHz SRS (space-to-Earth) allocation.

Resolution **753 (WRC-07)** calls for sharing studies between SRS systems operating in the Earth-to-space direction in the band 22.55-23.15 GHz and systems in FS, ISS and MS in the band 22.55-23.55 GHz. Resolution **753 (WRC-07)** also recognizes that the band 22.55-23.55 GHz is allocated to the FS, ISS and MS, that those systems need to be protected and their future requirements be taken into account. Non-GSO ISS links have been operating for several years and are expected to continue to operate in the 23.183-23.377 GHz band. These links are increasingly being used in situations of emergencies and natural disaster. Appropriate sharing criteria for an allocation to the SRS in the Earth-to-space direction and protection criteria for the other services have been agreed.

The number of SRS earth stations transmitting in the range 22.55-23.15 GHz will be small. Rather than building new SRS earth stations, upgrading selected existing SRS earth stations will predominate. Selecting which SRS earth stations to upgrade will be based on a number of factors, including the type of mission to be supported. The number of SRS earth station sites capable of supporting referenced lunar and/or L2 missions is not expected to exceed ten to fifteen on a global basis over the next few decades.

SRS channel plan examples have shown that up to 36 channels would be available in a contiguous bandwidth of 600 MHz, of which around 9 channels would not be globally available due to regional restrictions. The net bandwidth for these 36 channels is around 446 MHz. Added to this will be guardbands between the various channels. For the narrower channels, around 2-4 MHz may be sufficient, while wideband channels may require significantly higher guardbands, on the order of 4-8 MHz. On average, it is assumed that approximately 4 MHz of guardband is needed between any 2 channels. Consequently, an additional 140 MHz of bandwidth is needed, based on the above identified 36 channels. This results in a total required bandwidth of 586 MHz for this example and leaves around 7 MHz of guardband at each end of the potential allocation to increase protection of adjacent services. Around 60 MHz of the total 600 MHz band will not be usable in areas where the separation distance to RAS stations is not sufficient. Also, in some locations, additional spectrum may be unavailable due to the need to protect FS stations.

In summary, a contiguous bandwidth of 600 MHz would be required to accommodate minimum bandwidth demands identified for space agencies worldwide. Efficient use of this bandwidth will require very careful planning and coordination at an early stage to enable the accommodation of all mission requirements in the longer term. This is notwithstanding that a number of practical constraints such as DRS channel plan compatibility, protection of other services and ranging coherency requirements may limit the choice of available frequencies within the band.

Therefore, an allocation to the SRS in the range 22.55-23.15 GHz is essential to satisfy a minimum of expected spectrum requirements for planned SRS missions.

Further information on the spectrum requirements is addressed in Report ITU-R SA.2191.

4/1.11/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R S.1591, ITU-R SA.1155, ITU-R SM.1541, ITU-R SM.1448.

New relevant ITU-R Recommendations and Reports: Recommendation ITU-R SA.1882, Reports ITU-R SA.2193, ITU-R SA.2192 and ITU-R SA.2191.

The ITU-R has developed Reports ITU-R SA.2193 and ITU-R SA.2192 on sharing and compatibility studies in the 22.55-23.55 GHz band. The studies have examined the compatibility between a transmitting SRS earth station and stations in the ISS, FS and MS. The ITU-R has also developed Report ITU-R SA.2191 on the bandwidth required for SRS operations in the 22.55-23.15 GHz band.

Studies of interference to ISS systems addressed sharing with GSO-to-GSO, GSO-to-non-GSO, non-GSO-to-GSO and non-GSO-to-non-GSO inter-satellite links (Report ITU-R SA.2193).

Also, studies of interference to ISS systems addressed out-of-band compatibility with non-GSO-to-non-GSO inter-satellite links (Report ITU-R SA.2192). These studies were based on information with respect to the ISS links of the non-GSO operating system particularly as regards protection criteria, antenna radiation patterns and analysis method to be used. It is envisioned that this information will be incorporated in a future ITU-R S-series Recommendation which is presently under development and may be approved prior to WRC-12 given that all sharing particulars have already been agreed.

The SRS system characteristics used in the studies are those in Recommendation ITU-R SA.1882.

Sharing with FS systems was evaluated using methods of RR Appendix **7** to determine separation distances under certain circumstances such as flat terrain and an obstacle of up to 50 m in height located 5 km from the transmitting SRS earth station. The separation distance using the static analysis, the time-invariant gain (TIG) and time-variant gain (TVG) were compared and addressed in Report ITU-R SA.2193. In addition, sharing of transmitting FS stations with the receiving SRS satellites was evaluated.

4/1.11/4 Analysis of the results of studies

4/1.11/4.1 Compatibility with the inter-satellite service (ISS)

Positive margins were found for each of the scenarios involving ISS systems using GSO-to-GSO, GSO-to-non-GSO, non-GSO-to-GSO, and non-GSO-to-non-GSO inter-satellite links in the band 22.55-23.15 GHz. Sharing between those ISS systems and transmitting SRS earth stations described in Recommendation ITU-R SA.1882 is therefore feasible without any constraint.

With respect to non-GSO-to-non-GSO, one study conducted with a simulation tool concluded that a hypothetical non-GSO system operating at 1 400 km, based on Recommendation ITU-R S.1591, can share with large protection margins.

With respect to the HIBLEO-2 non-GSO-to-non-GSO ISS system, a number of studies were conducted with independent dynamic simulation tools as well as with deterministic and analytical methods. An ITU-R agreed in-band protection criterion of $I_o/N_o = -10$ dB, based on Recommendation ITU-R SA.1155, not to be exceeded for more than 0.1% of time per inter-satellite link was applied. All studies concluded that in-band sharing between systems using non-GSO-to-non-GSO ISS links of future HIBLEO-2 type systems is feasible with minimum protection margins of around 38 dB based on 3 SRS earth stations deployed at mid-latitudes transmitting on the same channel down to elevation angles of 5 degrees.

Based on an ITU-R agreed out-of-band protection criterion of $I_o/N_o = -16$ dB, aggregated from all SRS earth stations, not to be exceeded for 0.01% of time per inter-satellite link, out-of-band compatibility has been shown under hypothetical worst-case conditions with minimum protection margins of around 48 dB. These hypothetical worst-case margins were obtained by assuming that all SRS channels would emit at the maximum unwanted emission level specified in Recommendation ITU-R SM.1541 irrespective of spectral separation from the HIBLEO-2 inter-satellite links. Several studies did not consider out-of-band compatibility any more as the obtained in-band margins of around 38 dB were so high that these studies concluded that the natural spectral roll-off, together with filtering to meet typical spectral masks, would further increase the margins in out-of-band situations.

One study also listed a number of mitigation techniques typically found in real systems and included interference apportionment for 3 services. This study concluded that the actually available margins are in the range 40-48 dB for the in-band case, and 78-91 dB for the out-of-band case.

Another study carried out a sensitivity analysis on the interference impact by varying operation angles of the SRS earth stations, latitude of the SRS earth stations, and earth station antenna sizes. Regarding operational angles, the study considered a scenario where SRS earth stations would transmit to a spacecraft at the highest elevation angle in a 3-earth station global network consistent with practical operations which showed an increase in the protection margins of up to 3 dB. The effect of latitude of the SRS earth station location on the protection margin for the victim ISS link showed a 5 dB increase in the protection margin as the SRS earth station latitude was moved from around 35° to 0°, and a 7 dB decrease in protection margin when the earth station was moved from 35° to 70°. However, it was recognized that there are operational disadvantages to locating an ES transmitting to the Moon or Lagrange points at high latitudes, so that this scenario is unlikely to occur. The same study also examined the effect of decreasing the SRS antenna size from 18 m to 10 m. This reduction in antenna size reduced the protection margin by 5.1 dB as the power was increased to compensate for the difference in antenna gain. However, due to the necessity of high gain antennas for downlinks for lunar or Lagrangian missions, it is unlikely that 10 m antennas will be used for the uplink for such missions.

4/1.11/4.2 Sharing with the fixed service (FS)

The separation distances required to protect a fixed wireless station were computed for the worst-case azimuth angle using the TVG method, from Recommendation ITU-R SM.1448, which is relevant for earth stations tracking non-GSO satellites. Assuming that the azimuth angle of the fixed wireless receiving antenna is uniformly distributed over 360°, the separation distance ranges from less than 10 km to about 54 km to satisfy both the long-term and short-term interference criteria. The latter distance is based on the combination of all worst-case considerations, and is considered to be the maximum hypothetical separation distance required for protection of the FS. Evaluation of sharing of transmitting fixed wireless systems with the receiving SRS satellites confirmed that sharing is feasible and there will not need to be any additional constraints on the FS to protect the receiving SRS satellites. It should be noted that the band 22.55-23.15 GHz is heavily used by the FS in many countries mainly as backhaul to mobile phone networks, with thousands of FS stations deployed per country. Sharing would therefore be considered feasible only if the number of SRS earth stations is as limited as it is nowadays and their locations remain in remote areas. Also, studies have shown that the SRS earth station emissions will meet the earth station e.i.r.p. limits in RR No. **21.8** intended to provide protection for terrestrial services.

Given the relatively small separation distance requirements, coordination of FS stations and SRS earth stations becomes a national matter for all currently known locations. To this effect, a separation distance between the location of the SRS earth station and the border of neighbouring administrations should be included in the RR. In addition, existing provisions within RR Article **21** ensure that FS systems will not be constrained beyond that with which they currently operate in the 22.55-23.55 GHz band in regards to other co-primary services. RR Nos. **21.2**, **21.3**, **21.5** and **21.5A** currently apply to the FS in the band 22.55-23.55 GHz with regard to the ISS. RR No. **21.2.4** provides that for frequency bands above 15 GHz (except 25.25-27.5 GHz), there is no restriction on the angular separation for transmitting stations of the FS or MS. Therefore, no pointing restrictions on FS apply in this band. The SRS is already included in RR Table **21-2** against this frequency band and therefore no change to the Radio Regulations would be needed for this provision to become effective if an allocation were to be made to the SRS within 22.55-23.15 GHz. Power restrictions in RR Nos. **21.3** and **21.5** are currently placed on the FS to ensure protection of other services and no further restrictions would be necessary with regard to SRS operations.

No change is being proposed on the sharing criteria that are currently applied to sharing between the FS and the ISS, and no additional constraints will be placed on the FS in this band or other bands under this agenda item.

4/1.11/4.3 Sharing with the mobile service (MS)

The band 22.55-23.15 GHz is not currently used by the MS and therefore no study was performed with regard to MS. However if the MS would use this band in the future, it is considered that the separation distances derived for the protection of the FS would be sufficient for the protection of the MS.

4/1.11/5 Method to satisfy the agenda item

Make a primary allocation to the SRS in the band 22.55-23.15 GHz in the Table of Frequency Allocations in RR Article **5**. In addition, a new footnote regarding the location of SRS earth stations is added to protect existing and future deployments of FS and MS systems in neighbouring administrations.

Consequential to the addition of the SRS uplink allocation, the band 22.55-23.15 GHz is added to Table **21-3** in RR Article **21** to ensure that the limits given in No. 21.8 would protect terrestrial services.

Advantages

– A new Earth-to-space allocation of 600 MHz would be usable by the SRS for near-Earth, lunar and Lagrangian missions.

– A new Earth-to-space allocation would provide the needed companion band to the existing SRS space-to-Earth allocation in the 25.5-27 GHz band.

– The operation and development of FS in the band 22.55-23.15 GHz would not be constrained due to the very low number of SRS earth stations in the world and their remote locations far away from the border of neighbouring countries.

Disadvantages

– None

4/1.11/6 Regulatory and procedural considerations

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

22-24.75 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
22.55-23.~~55~~15	FIXED INTER-SATELLITE 5.338A MOBILE SPACE RESEARCH (Earth-to-space) ADD 5.A111 5.149	
~~22.55~~23.15-23.55	FIXED INTER-SATELLITE 5.338A MOBILE ~~5.149~~	
...		

ADD

5.A111 The location of earth stations in the space research service shall maintain a separation distance of at least 54 km from the respective border(s) of neighbouring administrations to protect the existing and future deployment of fixed and mobile services unless a shorter distance is otherwise agreed between the corresponding administrations. Nos. **9.17** and **9.18** do not apply.

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section III – Power limits for earth stations

MOD

TABLE **21-3** (*end*) (WRC-~~03~~12)

Frequency band		Services
17.7-18.1 GHz		Fixed-satellite
22.55-23.15 GHz		Earth exploration-satellite
27.0-27.5 GHz[6]	(for Regions 2 and 3)	Mobile-satellite
27.5-29.5 GHz		Space research
31.0-31.3 GHz	(for the countries listed in No. **5.545**)	
34.2-35.2 GHz	(for the countries listed in No. **5.550** with respect to the countries listed in No. **5.549**)	

SUP

RESOLUTION 753 (WRC-07)

Use of the band 22.55-23.15 GHz by the space research service

[6] **21.12.1** The equality of right to operate when a band of frequencies is allocated in different Regions to different services of the same category is established in No. **4.8**. Therefore any limits concerning inter-Regional interference which may appear in ITU-R Recommendations should, as far as practicable, be observed by administrations.

AGENDA ITEM 1.12

1.12 to protect the primary services in the band 37-38 GHz from interference resulting from aeronautical mobile service operations, taking into account the results of ITU-R studies, in accordance with Resolution ***754 (WRC-07)****;*

Resolution **754 (WRC-07)**: *Consideration of modification of the aeronautical component of the mobile service allocation in the 37-38 GHz band for protection of other primary services in the band*

4/1.12/1 Executive summary

Sharing between systems in the SRS, FS, and FSS and the systems in the AMS in the 37-38 GHz band has been studied resulting in a number of ITU-R Reports. The results of these studies indicate that the emissions from AMS transmitters would, with high probability, cause harmful interference to receiving earth stations of the SRS and FSS. In addition, the transmissions from high-density fixed service systems would cause interference to the airborne receivers of currently defined AMS systems.

Two methods are proposed to satisfy the agenda item:

– Method A would exclude the AMS from the MS allocation in the 37-38 GHz band;

– Method B would apply, via a footnote to the Table of Frequency Allocations in RR Article **5**, a very stringent single pfd limit at the Earth's surface to emissions from the airborne stations of the MS in the 37-38 GHz band.

4/1.12/2 Background

The primary services allocated in the 37-38 GHz band include SRS, MS, and FS. In the 37.5-38 GHz band, FSS is also allocated on primary basis.

Administrations are implementing SRS earth station receivers in the band 37-38 GHz to support manned near-Earth missions and deep-space missions. Use of the wider bandwidth available in the 37-38 GHz band is necessary to support the increasing data requirements of these missions.

The band 37-38 GHz is identified through RR No. **5.547** for high density fixed service (HDFS) applications. The band 37.5-39.5 GHz is extensively used for a variety of point-to-point links, mostly forming part of telecommunication infrastructure (e.g. for public mobile networks), but also for multi-purpose radio relay links including temporary point-to-point video links. Several administrations have already deployed thousands of FS links in this band, in particular between cellular mobile base stations.

AMS systems are currently neither deployed nor planned in the band 37-38 GHz. However, the allocation to the MS does not exclude such systems to operate in the band, and the aviation community would like to investigate the possibility to use the band for applications such as wireless avionic intra-aircraft communications (WAIC) to support data, voice, and video communications between various systems within a single aircraft. They are not intended to provide air-to-ground, air-to-satellite, or air-to-air communication. They will, in general, include wireless sensors placed throughout the aircraft to monitor the aircraft structure and many of its critical systems and to communicate this information within the aircraft. To enable such WAIC systems, further consideration by a future competent conference may be necessary.

4/1.12/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R SA.1016 and ITU-R SA.1396.

New relevant ITU-R Reports: ITU-R SA.2190, ITU-R M.2197 and ITU-R M.2206.

The new Reports give the results of current sharing studies for the 37-38 GHz band, and the Recommendations give the SRS protection criteria and the results of previous studies for the 2 GHz, 8 GHz, 13 GHz, and 32 GHz bands.

Report ITU-R SA.2190 gives the results for frequency sharing between AMS and SRS systems. The cases analysed include narrow- and wideband AMS transmitter modes with different aircraft elevation angles and SRS earth station antenna gains, lunar missions, space very long baseline interferometry (VLBI) systems, and interference from multiple aircraft. It also gives a pfd mask developed independent of AMS systems characteristics for the emissions from an aeronautical mobile station the earth stations of the SRS.

Report ITU-R M.2197 contains the technical characteristics and operational objectives for wireless avionics intra-communications (WAIC) systems.

Report ITU-R M.2206 contains sharing studies between systems operating in the AMS and the FS. Simulations using the fractional degradation of performance (FDP) criterion were conducted in order to assess the aggregate interference that would be received by FS stations from aircraft stations flying over the territory of an administration and respecting the pfd mask given in RR Article **21** for non-GSO satellites for the frequency band 37-38 GHz. An FDP criterion of 10% was considered in those studies.

The impact of the deployment of HDFS stations on one aircraft station receiver flying over the territory of an administration was also assessed. Compliance with the FS short-term protection criterion has also been considered, together with the adequate protection of point-to-multipoint FS systems in the band.

4/1.12/4 Analysis of the results of studies

4/1.12/4.1 Sharing between the aeronautical mobile and space research services

Recommendation ITU-R SA.1396 gives the protection criteria for the SRS earth stations to be −217 dB(W/Hz) in the 37-38 GHz band, with the interference calculation based on weather statistics of 0.001% of the time for manned missions and 0.1% of the time for unmanned missions.

4/1.12/4.1.1 SRS station protection criterion

A protection criterion was developed that is independent of the AMS system characteristics.

Dynamic studies taking into account multiple aircraft stations based on a Monte Carlo methodology have also been performed. These studies show that in order to meet the protection criterion of the SRS earth station for manned mission, the aircraft station transmitter needs to meet the following power flux-density limits:

$$-174 - 10.6 \cdot \theta \quad \text{dB(W/(m}^2 \cdot \text{Hz))} \qquad \text{for} \quad \theta \leq 5°$$

$$-227 \quad \text{dB(W/(m}^2 \cdot \text{Hz))} \qquad \text{for} \quad 5° < \theta \leq 90°$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal plane).

4/1.12/4.1.2 Sharing with hypothetical high-power AMS system

Analyses of hypothetical high-power AMS systems were performed using the technical characteristics of AMS systems in other frequency bands for single-entry and multiple-entry interference scenarios. The power level used in these studies is significantly higher than the one proposed for use in the 37-38 GHz band.

Aeronautical mobile transmitter is assumed to have a narrow-band mode and a wideband mode. For the narrow-band mode, the aircraft transmit e.i.r.p. density is assumed to be 10 W/4 kHz, which is equivalent to −26 dB(W/Hz). For the wideband mode, the e.i.r.p. density is assumed to be 70 W/10 MHz, which is equivalent to −51.5 dB(W/Hz). For these both modes, the following two cases are considered:

Case 1: 12-km aircraft altitude, 0-deg elevation angle, 0 dBi transmit antenna gain towards the SRS earth station, and −10 dBi SRS antenna gain towards the aircraft (off-boresight angle greater than 48 degrees);

Case 2: 12-km aircraft altitude, 60-deg elevation angle, 0 dBi transmit antenna gain towards the SRS earth station, and 0 dBi SRS antenna gain towards the aircraft (off-boresight angle equals to 19 degrees).

Case 1 represents the minimum interference from AMS transmitter to the SRS earth station. Case 2 represents a more typical scenario of interference.

For the narrow-band mode, the results show that, in Case 1, the interference received by the SRS earth station would exceed the deep-space protection criterion by 5 dB, whereas in Case 2, the interference will exceed the protection criterion by 44 dB. In addition, the interference from the narrow-band aeronautical mobile transmitter to the space research earth station exceeds the SRS protection criteria for any elevation angle of the aircraft and any pointing direction of the earth station antenna. Therefore, the interference will exceed the protection criteria 100% of the time.

For the wideband mode, the results show that, in Case 1, the interference levels will be below the SRS protection criterion by 20.5 dB, but in Case 2, they will exceed the protection criterion by 18.5 dB. In the wideband mode, the interference will satisfy the protection criteria for low elevation angles of the aircraft (less than 19 degrees) and large off-boresight angles. However, if the aircraft elevation angle is greater than 19 degrees the interference would exceed the protection criterion for all pointing directions of the SRS earth station antenna. In this case, it is estimated that the expected interference will exceed the protection criteria 70% of the time.

Concerning the space-VLBI ASTRO-G satellite, the study result shows that the space-VLBI earth stations will suffer from harmful interference from the aeronautical mobile transmitter. This interference severely jeopardizes the space-VLBI observations.

A static and a dynamic analysis have been conducted for lunar missions, which show that the interference received at the SRS earth station can exceed the protection criterion when the e.i.r.p. of the aircraft station transmitter exceeds −150 dB(W/Hz).

4/1.12/4.1.3 Sharing with low-power AMS systems

WAIC will only be able to meet the pfd mask defined above for elevation angles from 3° to 5° depending on the type of WAIC and the altitude of the aircraft. As such systems are supposed to be operated at all altitudes from take-off to landing, all kinds of aircraft including helicopters, and all aircraft attitudes, it may be concluded that low-power applications such as WAIC are not compatible with the SRS in the band 37-38 GHz.

It should be noted that the pfd level of −227 dB((W/Hz)/m²) for high elevation angles corresponds to an e.i.r.p. level of −136 dB(W/Hz) at an altitude of 10 km. However, it reduces to

−140.4 dB(W/Hz) when considering an altitude of 6 km. Thus, AMS applications would need to radiate very low powers of −50 dBm/MHz to be able to meet this pfd limit.

4/1.12/4.2 Sharing between the aeronautical mobile and fixed services

Studies show that FS stations in the band 37-38 GHz would be protected from harmful interference that may occur from aircraft station transmitters operating under the MS in the same band using the pfd limit defined for non-GSO satellites in RR Article **21**:

-120	$\mathrm{dB(W/(m^2 \cdot MHz))}$	for	$\theta \le 5°$
$-120 + 0.75 \cdot (\theta - 5)$	$\mathrm{dB(W/(m^2 \cdot MHz))}$	for	$5° < \theta \le 25°$
-105	$\mathrm{dB(W/(m^2 \cdot MHz))}$	for	$25° < \theta \le 90°$

where θ is the angle of arrival of the radio wave above the horizontal plane.

The impact of the deployment of HDFS stations on one aircraft station receiver flying over the territory of an administration was also assessed. The FS stations were randomly deployed in hot spots themselves randomly spread over the territory. An actual elevation angle distribution was considered.

Any receiver associated with an AMS system that would operate in the band for links between the ground and the aircraft or between aircraft would suffer from harmful interference. At low altitudes of 1 000 m, such harmful interference would appear during long and frequent periods of time. Possible future AMS applications in the band 37-38 GHz would not be compatible with HDFS deployed in this band, if designed and operated like current AMS applications operating in other bands. However, further studies would be required with regard to wireless intra-aircraft communications (such as WAIC systems) to assess the impact of HDFS links on such applications, once the characteristics become available within ITU-R.

4/1.12/4.3 Sharing between systems in AMS and FSS

No sharing study between aeronautical mobile systems and FSS systems in the 37-38 GHz band has been provided to the ITU-R. However, the results of SRS sharing studies would be sufficient to protect FSS systems also.

4/1.12/4.4 Sharing between the aeronautical mobile and land and maritime mobile services

There is no indication of any land or maritime mobile system operating in the band 37-38 GHz.

4/1.12/5 Methods to satisfy the agenda item

4/1.12/5.1 Method A

Restrict the MS allocation in the band 37-38 GHz to land and maritime mobile systems only. It also proposes suppression of Resolution **754 (WRC-07)**.

Advantages

– The SRS, FS, and FSS systems could operate without being affected by interference from aeronautical mobile systems.

Disadvantages

– Aeronautical mobile systems would be excluded from operating in this band in the future.

4/1.12/5.2 Method B

Apply a single limit for the power-flux density at the Earth's surface produced by the emissions from the aircraft stations of the aeronautical mobile systems, which is sufficient to protect the SRS earth stations, FSS earth stations, and FS stations from interference. It also proposes suppression of Resolution **754 (WRC-07)**.

Advantages

– Aeronautical mobile systems may operate in the 37-38 GHz band if they satisfy the pfd spectral limit for the protection of SRS earth stations, FSS earth stations, and FS stations operating in this band.

Disadvantages

– The pfd limit required to protect the SRS earth stations, FSS earth stations, and FS stations will be very difficult to meet in practice, even by very low power AMS applications.

– WAIC applications using characteristics contained in Report ITU-R M.2197 will not be able to operate in this band.

– Current aircraft station receivers would suffer from harmful interference during long periods of time due to the high density of FS stations deployed in this band.

4/1.12/6 Regulatory and procedural considerations

4/1.12/6.1 Method A

Add "except aeronautical mobile" after the mobile service allocation in the bands 37-37.5 GHz and 37.5-38 GHz in the Table of Frequency Allocations in RR Article **5**.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

34.2-40 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
37-37.5	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.547	
37.5-38	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	
...		

SUP

RESOLUTION 754 (WRC-07)

Consideration of modification of the aeronautical component of the mobile service allocation in the 37-38 GHz band for protection of other primary services in the band

4/1.12/6.2 Method B

Add a new footnote in RR Article **5** attached to the MS in the bands 37-37.5 GHz and 37.5-38 GHz containing the pfd limit for the protection of the other primary services allocated in the band.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

34.2-40 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
37-37.5	FIXED MOBILE ADD 5.A112 SPACE RESEARCH (space-to-Earth) 5.547	
37.5-38	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE ADD 5.A112 SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	
...		

ADD

5.A112 In the band 37-38 GHz, the power flux-density at the Earth's surface produced by emissions from an aircraft station shall not exceed −227 dB(W/m^2) in any 1 Hz bandwidth, using free-space propagation conditions as applied from the exterior of the aircraft. In this band, aeronautical mobile stations of the mobile service shall not claim protection from, nor constrain the use and development of, stations of the fixed service. (WRC-12)

SUP

RESOLUTION 754 (WRC-07)

Consideration of modification of the aeronautical component of the mobile service allocation in the 37-38 GHz band for protection of other primary services in the band

AGENDA ITEM 1.16

1.16 to consider the needs of passive systems for lightning detection in the meteorological aids service, including the possibility of an allocation in the frequency range below 20 kHz, and to take appropriate action, in accordance with Resolution ***671 (WRC-07)****;*

Resolution **671 (WRC-07)**: *Recognition of systems in the meteorological aids service in the frequency range below 20 kHz*

4/1.16/1 Executive summary

WRC-12 Agenda item 1.16 deals with the review of suitable technical and regulatory provisions relative to existing and unrecognized MetAids lightning detection systems operating within the band below 20 kHz. This work has been made with a view that a suitable regulatory environment exists for ensuring recognition and protection is afforded to these existing lightning detection technologies/systems for the future.

Resolution **671 (WRC-07)** invites ITU-R to conduct the relevant studies without placing undue constraints on existing services operating in accordance with the Radio Regulations. These shall include sharing and compatibility studies with services already having allocations in potential spectrum for systems in the MetAids taking into account the needs of other services.

The only method proposed to satisfy WRC-12 Agenda item 1.16 supports the segmentation of the frequency band below 14 kHz into four frequency bands, namely below 8.3 kHz, 8.3-9 kHz, 9-11.3 kHz and 11.3-14 kHz. The band 8.3-9 kHz will be allocated on a primary basis to the MetAids together with a national footnote recognizing the use of this band for other services between 8.3 and 9 kHz. The band 9-11.3 kHz will be allocated on a primary basis to the MetAids collectively with the existing primary allocation to the RNS under some provisions to provide protection to existing RNS systems. The band 11.3-14 kHz will remain allocated on a primary basis to the RNS only. Studies required by Resolution **671 (WRC-07)** are completed and this Resolution should be suppressed.

4/1.16/2 Background

Long-range lightning detection using observations near 10 kHz has been performed since 1939, originally with a very manpower-intensive system measuring the direction from which signals were received, and then since 1987 with an automated arrival time difference system (ATD) using the time differences of signal received to derive stroke locations. A distributed network of ground-based sensors can locate the origin of the lightning stroke, using the time differences between the arrivals of the lightning emission at the individual sensor sites.

The maximum spectral emissions from lightning strokes centre between 9 to 20 kHz. At these frequencies the sky waves, reflected off the ionosphere, propagate for very large distances with relatively little attenuation. Thus, it is possible to receive the emissions from a lightning stroke at thousands of kilometres from the stroke location.

The optimal frequency for ATD spectral emission measurements is around 9.766 kHz. However, the frequency 13.733 kHz is successfully used by the existing ATD systems for measurements, with a reduction of existing system performance seen at 9.766 kHz of around 15%.

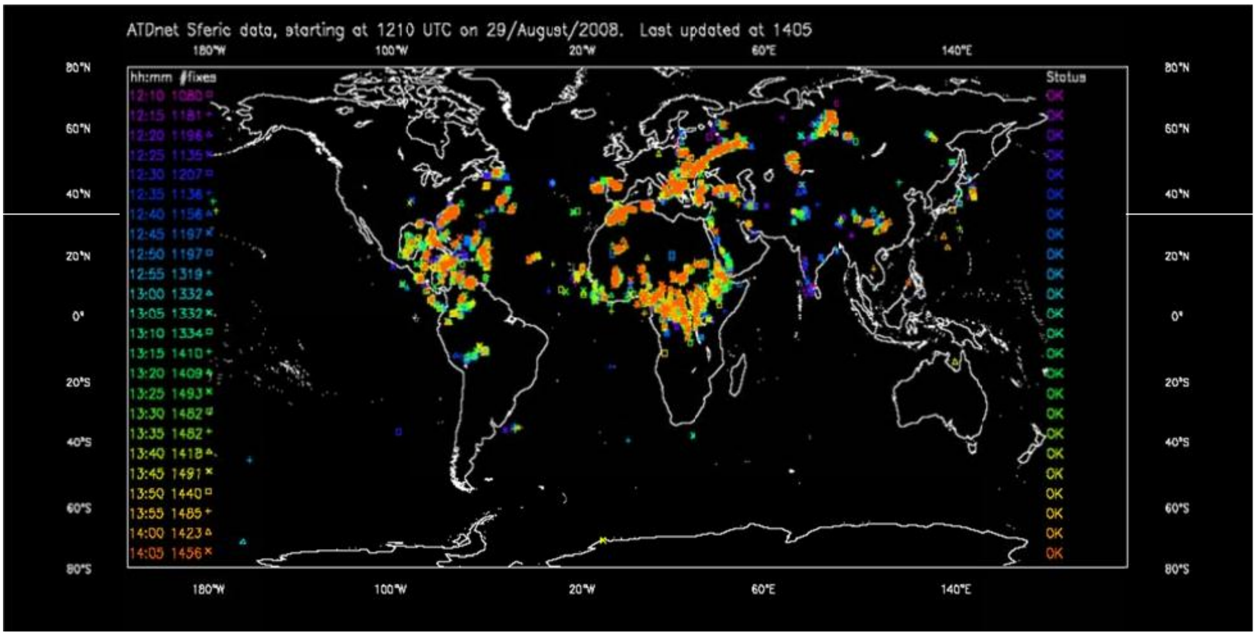
The data provided by the ATD system is used by meteorological organizations worldwide and contributes towards safety of life of the global community, both in terms of forecasting for public safety and safety in forecasting aviation operations, especially over the oceans, and large areas of land, where national lightning detection systems do not exist. As well as the dangers of the lightning strike itself, thunderstorms can result in intense precipitation with consequent flooding, severe icing, wind shear, turbulence and gusting winds.

As the ATD lightning detection system relies on naturally occurring emissions from ligh ning strokes it can be compromised by interference from other sources including man-made emissions. Due to the long-range propagation in this frequency band interference can affect many ATD stations simultaneously and this can seriously degrade system performance, including in some cases the total loss of data.

The output from the system is illustrated in Figure 1 where the lightning locations have been detected from a network of 10 sensors distributed across Europe, from Iceland to Cyprus, at a time of year when there are many thunderstorms in Europe.

FIGURE 1

Example of two hours' lightning detection output around the world from a long-range lightning detection system based in Europe, the numbers on the left show the number of lightning strokes detected in each 5 minutes, sensors operating at 13.733 kHz



Performance of ATD systems depends on the number of measuring stations and level of man-made interference at the ATD system receiver front end. The systems of the services already h ving allocations in the range below 20 kHz can be considered as the man-made interference sources. However through the implementation of mitigation methods such s notch filtering, the impact of constant and known man-made sources can be minimized to a certain extent.

Other national and regional lightning detection systems currently operate within this and higher frequency bands. Such systems require a higher number of receiver stations due to the substantial reduction in coverage area of each receiver. Detection with such systems over large areas of ocean and land mass where local infrastructure does not exist is normally difficult and highly costly to implement. Additionally coverage over large oceanic areas with these systems, such as the middle of the Atlantic, is not possible.

Additionally there are other types of lightning detection systems such as multi-component measuring systems operating in the range from 0.5 to 50 kHz.

4/1.16/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R P.368 and ITU-R P.684.

New relevant ITU-R Recommendations and Reports: Recommendation ITU-R RS.1881, Reports ITU-R RS.2184; ITU-R RS.2185 and ITU-R RS.2186.

4/1.16/4 Analysis of the results of studies

Coexistence and sharing between RNS systems and ATD sensors have been shown to be possible, not only from a theoretical basis as seen in studies but in practice also. Coexistence is achieved through the use of mitigation techniques employed by MetAids stations by means of notch filtering. Such notch filtering would be of the following order at 1 kHz offset (0.02 kHz), at 2 kHz (0.2 kHz) and at 3 kHz (0.2 kHz).

Assuming this mitigation is applied by MetAids stations, the results of sharing analysis indicated that the necessary separation distances were found to be of the order shown in Table 1 below.

TABLE 1

Necessary separation distances between radionavigation transmitters of assumed ERP of 40 dBW and ATD sensors of the MetAids service

Path dielectric	Frequency offset from ATD measurement frequency	Separation distance
Land good	1 kHz	1 500-2 850* km
Land poor	1 kHz	2 500-3 600*km
Sea (Westerly)	1 kHz	2 900-3 600* km
Sea (Easterly)	1 kHz	3 900-6 800* km
Land good	2 kHz	1 800-3 450* km
Land poor	2 kHz	1 250-3 150*km
Sea (Westerly)	2 kHz	2 500-3 600* km
Sea (Easterly)	2 kHz	3 500-4 700 km
Land good	3 kHz	100 km
Land poor	3 kHz	100 km
Sea (Westerly)	3 kHz	No information available
Sea (Easterly)	3 kHz	No information available

* NOTE – The above figures represent separation distances between radionavigation transmitters assuming transmit powers of 40 dBW. Additionally those upper distances marked “*” are worst case derived from dominate mode propagation theory and are unlikely to be fully representative of real-life sharing scenarios, which are likely to be lower.

From practical experience the two services have coexisted since 1989 with no impact to either service, even with a geographically dispersed ATD sensor network throughout the globe. In cases whereby close proximity between stations occurs, the effective implementation of notch filtering is sufficient to minimize the impact of interference to the meteorological aids system, even at 1 kHz frequency offset. Noting that historically with the Omega system, effective ATD sensor operations were possible on 9.766 kHz with transmissions on 10.2 kHz, at a separation distance of only 973 km over a sea path. This in part was possible due to short pulse widths of radionavigation transmissions (0.2 sec) and separation between pulses of 9 sec intervals.

It can be concluded, given the nature of RNS systems and ATD sensors operating in this frequency band, the low-density levels and static nature of station deployments, and this environment was to continue, that sharing between these services is possible.

In the future additional mitigation techniques which further reduce the impact of emissions of the existing services on the ATD system operation could be identified.

4/1.16/5 Method to satisfy the agenda item

This method proposes a new allocation to the MetAids on a primary basis within the 8.3-11.3 kHz frequency range under the following provisions.

Use of the 8.3-11.3 kHz frequency range by MetAids stations is limited to passive use only. In the band 9-11.3 kHz, the MetAids stations shall not claim protection from stations of the radionavigation service submitted for notification to the Bureau prior to the date of entry into force of the WRC-12 Final Acts.

The frequency band 9-11.3 kHz will include the additional allocation of the MetAids on a co-primary basis with the existing allocation to the RNS. The band 8.3-9 kHz will be allocated on a primary basis to the MetAids together with a national footnote recognizing the use of other services between 8.3 and 9 kHz. The frequency band 11.3-14 kHz remains allocated to the RNS only.

In addition new footnotes to cover these provisions in RR Article **5** Table of Frequency Allocations in reference to the band 8.3-11.3 kHz shall be added (see Section 4/1.16/6).

Taking into account that studies required by Resolution **671 (WRC-07)** have been completed, this resolution should be suppressed.

Advantages

– Provides long-term security and assurance of the global network allowing for the registration and protection of stations of lightning detection system of the MetAids, including protection from systems operating outside the Radio Regulations.

– No additional constraints are made to any future planned radionavigation systems in the frequency band 11.3-19.95 kHz.

– Retains the quality of meteorological aids data supporting safety of life services including public safety, aviation operations, especially over the oceans, and large areas of land and the possibility of disaster risk reduction.

Disadvantages

– Additional constraints placed on future radionavigation system deployments in the band 9-11.3 kHz.

4/1.16/6 Regulatory and procedural considerations

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

8.3~~9~~-110 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
Below 8.3~~9~~	(Not allocated) MOD 5.53 MOD 5.54	
8.3-9	METEOROLOGICAL AIDS ADD 5.A116 ADD 5.B116	
9-11.3~~14~~	METEOROLOGICAL AIDS RADIONAVIGATION ADD 5.A116	
11.3-14	RADIONAVIGATION	
...		

MOD

5.53 Administrations authorizing the use of frequencies below 8.39 kHz shall ensure that no harmful interference is caused ~~thereby~~ to ~~the~~ services to which the bands above ~~9~~8.3 kHz are allocated.

MOD

5.54 Administrations conducting scientific research using frequencies below 8.3~~9~~ kHz are urged to advise other administrations that may be concerned in order that such research may be afforded all practicable protection from harmful interference.

ADD

5.A116 Use of the band 8.3-11.3 kHz by the meteorological aids service is limited to passive use only. In the 9-11.3 kHz band meteorological aids stations shall not claim protection from stations of the radionavigation service submitted for notification to the Bureau prior to [the date of entry into force of WRC-12 Final Acts]. For sharing between stations of the meteorological aids service and stations in the radionavigation service submitted after this date the most recent version of Recommendation ITU-R RS.1881 should be applied.

ADD

5.B116 *Additional allocation:* in the Russian Federation, the frequency band 8.3-9 kHz is also allocated to the radionavigation, fixed and mobile services on a primary basis.

SUP

RESOLUTION 671 (WRC-07)

Recognition of systems in the meteorological aids service in the frequency range below 20 kHz

AGENDA ITEM 1.24

1.24 to consider the existing allocation to the meteorological-satellite service in the band 7 750-7 850 MHz with a view to extending this allocation to the band 7 850-7 900 MHz, limited to non-geostationary meteorological satellites in the space-to-Earth direction, in accordance with Resolution ***672 (WRC-07)****;*

Resolution **672 (WRC-07)**: *Extension of the allocation to the meteorological-satellite service of the band 7 750-7 850 MHz*

4/1.24/1 Executive summary

Resolution **672 (WRC-07)** calls for consideration of the studies between non-geostationary meteorological satellites operating in the space-to-Earth direction and the FS and MS in the band 7 850-7 900 MHz with a view to extending the current allocation in the space-to-Earth direction to this band in order to make appropriate modifications to the Table of Frequency Allocations in Article **5** of the Radio Regulations.

At WRC-97, a new worldwide primary allocation was made available to the MetSat in the band 7 750-7 850 MHz. Studies conducted prior to WRC-97 concluded that all the existing services involved would be protected from systems belonging to the MetSat with enough margin using the worst-case scenario.

In the meantime, the mission requirements for the next generation non-GSO MetSat systems (in terms of observations, instruments and user services) clearly show that there is a need to transmit significantly higher data rates as compared to current systems.

Studies have confirmed that applications in the MetSat and the FS have similar characteristics in both the 7 750-7 850 MHz and 7 850-7 900 MHz bands. Furthermore, studies between non-geostationary MetSat and the FS (including electronic news gathering and outside broadcasting (ENG/OB)) confirmed that sharing is feasible under the same regulatory conditions and using the same parameters as those currently applied in the band 7 750-7 850 MHz (i.e. using the pfd limits in the band 7 750-7 850 MHz as contained in Table **21-4** of RR Article **21** and applying the values of parameters in Table **8c** of RR Appendix **7** for this band).

Sharing with the MS systems could not be studied in details because there are no known systems operating in this band. However, it is expected that the sharing situation would not be significantly different than that for FS systems and that similar pfd limits that would be applied to the FS in the band 7 850-7 900 MHz could also be applied to the MS.

Taking into account the results of sharing studies, one method has been proposed to satisfy this agenda item. This method suggests an extension of the 7 750-7 850 MHz allocation for the MetSat up to 7 900 MHz for all Regions and relevant modifications to RR Article **5**, RR No. **5.461B**, Table **21-4** RR Article **21** and Table **8c** of RR Appendix **7**.

4/1.24/2 Background

Currently operational non-geostationary MetSat systems are using the band 7 750-7 850 MHz for the downlink of gathered instrument data to dedicated earth stations with a bandwidth of up to 63 MHz. The measurements and observations performed by those MetSat systems provide data used in the areas of operational meteorology, climate monitoring, and detection of global climatic changes, while having significantly improved operational meteorology, in particular with respect to Numerical Weather Prediction (NWP).

The next generation of non-geostationary MetSat systems will have to provide continuity to the measurements and observations performed by the current systems. Furthermore, these future systems will have to perform additional measurements and observations of meteorological and climate parameters with higher resolution, resulting in much higher data rates and bandwidth as compared to current systems.

The necessary bandwidth for the downlink of the raw instrument data for future non-geostationary MetSat systems that fulfil those requirements for further enhanced data in the area of operational meteorology and climatology would be up to 150 MHz.

4/1.24/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Reports: Recommendations ITU-R F.758, ITU-R F.1108, ITU-R F.1094, ITU-R F.1245, ITU-R F.1668, ITU-R F.1703, ITU-R SA.1026 and Report ITU-R SA.2164.

4/1.24/3.1 Sharing between non-GSO MetSat (space-to-Earth) systems and fixed service systems

The characteristics of MetSat systems that would use the band 7 850-7 900 MHz are similar to the characteristics of satellites already using the band 7 750-7 850 MHz, in particular with regard to the orbits used by these satellites. The only difference will be the operation at higher data rates, which may require parabolic satellite antennas rather than currently used cardioid satellite antennas; however, this would in general further improve the sharing situation.

The characteristics of FS systems in the band 7 750-7 850 MHz are the same through the whole band 7 725-8 275 MHz as shown in Tables 12 and 13 of Recommendation ITU-R F.758, as well as in Table 7 of its draft revision.

Compatibility between the MetSat and the FS was already demonstrated during the preparation for WRC-97 where the allocation to the MetSat in the band 7 750-7 850 MHz was originally added to the table of allocations in RR Article **5**. Compatibility studies with non-geostationary MetSat systems in preparation for WRC-12 as described in Report ITU-R SA.2164 confirmed that sharing is feasible without any constraints on either of the services using the same pfd limits as in the band 7 750-7 850 MHz.

A number of FS station locations have been investigated with respect to potential interference caused by low-Earth orbiting MetSat transmitting at the pfd limits applicable in the band 7 750-7 850 MHz (current and planned system usually operate well below the pfd limits) to a corresponding 10 m stored instrument data dump reception earth station at high northern latitudes or a 2 m direct read-out user stations operated e.g. by national weather services.

Minimum positive margins with respect to the fractional degradation of performance (FDP) FS interference criterion for all considered scenarios and FS station locations range typically between 25 and 30 dB. In worst-case locations, margins of 18 dB will still be available for 3 m FS antenna dishes and a mean FS elevation angle of 0°. Varying FS antenna diameters had an insignificant impact on the results. Worst-case FS antenna elevation angles between 1° and 2° result in a margin reduction by up to 4 dB, leaving a net margin in the worst case of 14 dB. FS antenna elevation angles greater than 5° result in an increase in the margin, as the crossing time through the FS beam becomes significantly shorter with increasing elevation angle and the antenna gain of the most critical cardioid antennas decreases with the angle of incidence. This subject is not clearly mentioned in Report ITU-R SA.2164. Therefore, in order to assure the protection of FS stations with elevation angles greater than 5°, it is required that the results of simulations for such FS stations be included in Report ITU-R SA.2164 prior to WRC-12. Cumulative interference from 3 satellite systems operating at the pfd limits results in a net margin of still 11 dB with respect to the FDP criterion. One administration will perform an additional study on this subject.

Regarding the potential of interference of transmitting FS stations into MetSat station receivers, separation distances for typical constellations are in the order of 5-20 km and are generally determined by the first obstacle in the line-of-sight transmission path.

Under worst-case assumptions, for the case of 10 m stored instrument data dump reception earth stations, based on hypothetical maximum FS equivalent isotropically radiated power (e.i.r.p.) densities of 42 dBW/MHz, direct pointing of the FS antenna (49 dBi antenna gain, 4.8 m antenna diameter) towards the MetSat earth station, pointing of the MetSat earth station with a minimum separation of 5° and line-of-sight interference, a maximum separation distance of around 50 km would be required. For 2 m meteorological direct read-out user stations under the same worst-case assumptions, a maximum separation distance of around 40 km would be required.

4/1.24/3.2 Sharing between non-GSO MetSat (space-to-Earth) systems and MS systems

Sharing with MS systems could not be studied in detail because there are no known systems operating in the band 7 850-7 900 MHz.

Consistently with the current situation pertaining to the 7 750-7 850 MHz band, it is assumed that similar pfd limits than for FS stations should apply. In addition, it can also be assumed that sharing between the MetSat and MS systems would require separation distances between mobile stations and MetSat earth stations smaller than, or similar to, those required for systems operating in FS.

Some countries may also operate ENG/OB systems in the 7 750-7 900 MHz band. Antennas of such systems are typically smaller than those of FS systems, which increase the visibility duration of a transmitting MetSat satellite. On the other hand, acceptable interference levels of such ENG/OB systems are higher, compensating the effect of increased visibility duration. Overall, the sharing situation is not expected to be significantly different to that for FS systems.

4/1.24/4 Analysis of the results of studies

Regarding the potential of interference into FS receivers, the compatibility studies with non-geostationary MetSat systems conclude that even under worst-case assumptions, a positive margin of 11 dB with respect to the FDP FS interference criterion exists.

Considering the potential of interference of transmitting FS stations into MetSat earth station receivers, separation distances for typical constellations are in the order of 5-20 km and are generally determined by the first obstacle in the line-of-sight transmission path. Only in a line-of-sight main beam-to-main beam scenario using maximum FS e.i.r.p. density levels as contained in Recommendation ITU-R F.758 and very worst-case constellations, the separation distance can extend up to around 40-50 km.

It can be concluded that the potential MetSat extension band 7 850-7 900 MHz can be shared under the same conditions as the current allocation in the band 7 750-7 850 MHz. The current pfd limits contained in Table **21-4** of RR Article **21** and values of parameters in Table **8c** of RR Appendix **7** for the band 7 750-7 850 MHz are adequate for proper operation of future meteorological-satellite systems as well as protection of FS systems.

Also for ENG/OB applications potentially operated in some countries, the sharing situation is not expected to be significantly different to that for FS systems.

4/1.24/5 Method to satisfy the agenda item

One method is proposed to satisfy this agenda item.

The proposed method is to add a global primary MetSat allocation (space-to-Earth) in the band 7 850-7 900 MHz, limited to non-geostationary meteorological satellites and to apply the pfd limits contained in Table **21-4** of RR Article **21** currently applicable to the band 7 250-7 850 MHz.

In order to apply the same parameters required for the determination of coordination distances for a receiving MetSat earth station as in the already allocated band 7 750-7 850 MHz, the frequency band in Table **8c** of RR Appendix **7** would have to be amended to also cover the band 7 850-7 900 MHz.

Also Resolution **672 (WRC-07)** should be suppressed.

Advantages

Provide adequate spectrum to satisfy the requirements of next-generation non-geostationary MetSat systems.

Disadvantages

None.

4/1.24/6 Regulatory and procedural considerations

To satisfy the proposed method, the following changes to the RR are required:

– Modification to the Table of Frequency Allocations (RR Article **5**) to extend the existing primary MetSat allocation on a worldwide basis by 50 MHz from 7 850 MHz to 7 900 MHz.

– Modification to the frequency band in RR No. **5.461B** as a consequential change.

– Modification to Table **21-4** of RR Article **21** to extend the existing pfd limits coverage (7 250-7 850 MHz) to the new extended band 7 850-7 900 MHz.

– Modification to Table **8c** of RR Appendix **7** in order to apply the same parameters required for the determination of coordination distances for a receiving MetSat earth station.

Examples of regulatory text are provided below.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD

7 250-8 500 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
7 750-7 ~~850~~900	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOD 5.461B MOBILE except aeronautical mobile	
~~**7 850-7 900**~~	~~FIXED~~ ~~MOBILE except aeronautical mobile~~	
...		

MOD

5.461B The use of the band 7 750-7 ~~850~~900 MHz by the meteorological-satellite service (space-to-Earth) is limited to non-geostationary satellite systems. (WRC-~~97~~12)

MOD

TABLE **21-4** (*continued*)

Frequency band	Service*	Limit in dB(W/m²) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
...	...	...	...	...	...
4 500-4 800 MHz 5 670-5 725 MHz (Nos. **5.453** and **5.455**) 7 250-7 ~~850~~900 MHz	Fixed-satellite (space-to-Earth) Meteorological-satellite (space-to-Earth) Mobile-satellite Space research	–152	$-152 + 0.5(\delta - 5)$	–142	4 kHz
...	...	...			...

MOD

APPENDIX 7 (Rev.WRC-~~07~~12)

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

MOD

TABLE 8c

Parameters required for the determination of coordination distance for a receiving earth station

Receiving space radiocommunication service designation		**Fixed-satellite**		**Fixed-satellite, radio-determination satellite**	**Fixed-satellite**	**Fixed-satellite**		**Meteoro-logical-satellite [7, 8]**	**Meteoro-logical-satellite [9]**	**Earth exploration-satellite [7]**	**Earth exploration-satellite [9]**	**Space research [10]**		**Fixed-satellite**		**Broadcasting-satellite**		**Fixed-satellite [9]**	**Broad-casting-satellite**	**Fixed-satellite [7]**
												Deep space								
Frequency bands (GHz)		4.500-4.800		5.150-5.216	6.700-7.075	7.250-7.750		7.450-7.550	7.750-7.~~850~~900	8.025-8.400	8.025-8.400	8.400-8.450	8.450-8.500	10.7-12.75		12.5-12.75 [12]		15.4-15.7	17.7-17.8	17.7-18.8 19.3-19.7
Transmitting terrestrial service designations		Fixed, mobile		Aeronautical radionavigation	Fixed, mobile	Fixed, mobile		Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile		Fixed, mobile		Fixed, mobile		Aeronau-tical radio-navigation	Fixed	Fixed, mobile
Method to be used		§ 2.1		§ 2.1	§ 2.2	§ 2.1		§ 2.1, § 2.2	§ 2.2	§ 2.1	§ 2.2	§ 2.2		§ 2.1, § 2.2		§ 1.4.5			§ 1.4.5	§ 2.1
Modulation at earth station [1]		A	N		N	A	N	N	N	N	N	N	N	A	N	A	N	–		N
Earth station interference parameters and criteria	p_0 (%)	0.03	0.005		0.005	0.03	0.005	0.002	0.001	0.083	0.011	0.001	0.1	0.03	0.003	0.03	0.003	0.003		0.003
	n	3	3		3	3	3	2	2	2	2	1	2	2	2	1	1	2		2
	p (%)	0.01	0.0017		0.0017	0.01	0.0017	0.001	0.0005	0.0415	0.0055	0.001	0.05	0.015	0.0015	0.03	0.003	0.0015		0.0015
	N_L (dB)	1	1		1	1	1	–	–	1	0	0	0	1	1	1	1	1		1
	M_s (dB)	7	2		2	7	2	–	–	2	4.7	0.5	1	7	4	7	4	4		6
	W (dB)	4	0		0	4	0	–	–	0	0	0	0	4	0	4	0	0		0
Terrestrial station parameters	E (dBW) in B [2] A	92 [3]	92 [3]		55	55	55	55	55	55	55	25 [5]	25 [5]	40	40	55	55			35
	E (dBW) in B [2] N	42 [4]	42 [4]		42	42	42	42	42	42	42	–18	–18	43	43	42	42		40	40
	P_t (dBW) in B A	40 [3]	40 [3]		13	13	13	13	13	13	13	–17 [5]	–17 [5]	–5	–5	10	10			–10
	P_t (dBW) in B N	0	0		0	0	0	0	0	0	0	–60	–60	–2	–2	–3	–3		–7	–5
	G_x (dBi)	52 [3, 4]	52 [3, 4]		42	42	42	42	42	42	42	42	42	45	45	45	45		47	45
Reference band-width [6]	B (Hz)	10^6	10^6		10^6	10^6	10^6	10^7	10^7	10^6	10^6	1	1	10^6	10^6	27×10^6	27×10^6			10^6
Permissible interference power	$P_r(p)$ (dBW) in B				–151.2			–125	–125	–154 [11]	–142	–220	–216			–131	–131			

SUP

RESOLUTION 672 (WRC-07)

Extension of the allocation to the meteorological-satellite service in the band 7 750-7 850 MHz

CHAPTER 5

Satellite issues

(Agenda items 1.7, 1.13, 1.18, 1.25, 7)

CONTENTS

AGENDA ITEM 1.7

1.7 to consider the results of ITU-R studies in accordance with Resolution ***222 (Rev.WRC-07)*** *in order to ensure long-term spectrum availability and access to spectrum necessary to meet requirements for the aeronautical mobile-satellite (R) service, and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz;*

Resolution **222 (Rev.WRC-07)**: *Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and studies to ensure long-term spectrum availability for the aeronautical mobile-satellite (R) service*

5/1.7/1 Executive summary

The spectrum requirements for the AMS(R)S vary depending on the geographical area or Region being considered, assumptions for the overall system design and the characteristics of each AMS(R)S system, the number of systems which will operate under such a service and the compatibility between each other.

The results of studies under this agenda item show that long-term AMS(R)S spectrum requirements up to the year 2025 are estimated to be less than the available 2 × 10 MHz and could be accommodated in the frequency bands defined by RR No. **5.357A**, however, some administrations believe the forecast spectrum requirements may lead to undue constraints on MSS systems, in particular, the existing ones.

There are four proposed methods to satisfy the agenda item. These are:

Method A – No change to RR Articles **5** and **9**.

Method B – No change to RR Articles **5** and **9**, modification to Resolution **222 (Rev.WRC-07)** to implement additional procedures supporting the provision of RR No. **5.357A** with two distinct types of meetings (consultation and coordination).

Method C – Use of a part of the existing AMS(R)S allocation in the band 5 091-5 150 MHz, for satisfying the long-term requirements of AMS(R)S only for communications with priority categories 1 to 6 in RR Article **44**.

Method D – No change to RR Articles **5** and **9**, modification to Resolution **222 (Rev.WRC-07)** identifying the coordination process used to ensure long-term spectrum availability and access for the AMS(R)S, with coordination meetings only.

5/1.7/2 Background

To allow flexibility in frequency coordination and to achieve spectrum efficiency, WRC-97 changed the allocation of the bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) into a generic MSS subject to the provision RR No. **5.357A** to prioritize access and protect AMS(R)S messages with priority 1 to 6 as per Article **44** of the Radio Regulations. For AMS(R)S priority access in the sub-bands 1 555-1 559 MHz and 1 656.5-1 660.5 MHz, see also RR No. **5.362A**.

WRC-2000 adopted Resolution **222 (WRC-2000)** resolving that, in frequency coordination of MSS systems in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, administrations shall ensure that the spectrum needed for AMS(R)S communications within priority categories 1 to 6 of RR Article **44** in the bands where RR No. **5.357A** applies is accommodated. Also administrations shall ensure the use of the latest technical advances, which may include prioritization and real-time pre-emptive access between MSS systems, where necessary and where feasible, in order to achieve the most flexible and practical use of the generic allocations. However, studies included in Report ITU-R M.2073 have concluded that prioritization and real-time inter-system pre-emption between different mobile-satellite systems is not practical and, without a significant advance in technology, is unlikely to be feasible for technical, operational and economical reasons.

WRC-07 revised Resolution **222** to remove the request for studies to determine the feasibility and practicality of prioritization and real-time pre-emptive access issues, and invited ITU-R to carry out a number of additional studies towards ensuring long-term spectrum availability for AMS(R)S.

Three systems are currently providing AMS(R)S communications in the 1 545-1 555 MHz and 1 646.5-1 656.5 MHz bands. Other such systems are planned.

In coordinating MSS systems under the procedure of RR Article **9**, the notifying administrations for MSS systems in the above bands have adopted two multilateral Memoranda of Understanding (MoU) to facilitate the coordination process: one MoU involves the administrations providing MSS over North America (i.e. ITU Region 2) and a second MoU involves administrations providing MSS over ITU Regions 1 and 3. Under these MoUs, assignments across the bands 1 525-1 559/1 626.5-1 660.5 MHz are coordinated and reviewed usually on an annual basis at so called Operator Review Meetings (ORM) so as to ensure fair and efficient use of the radio spectrum. This multilateral process recognizes the communication needs of the global maritime distress and safety system (GMDSS) and AMS(R)S and the resulting spectrum needed to accommodate the requirements of the systems offering these services, in accordance with the Radio Regulatory provisions. The current coordination process includes a validation process of requested spectrum assignments in order to justify the spectrum requirements and achieve efficient use of the spectrum. By adopting the MoUs, administrations have increased the efficiency and eased the coordination process and reduced the overall resources and cost from MSS and AMS(R)S operators. Additional coordination also takes place outside of the MoU process, where necessary.

It is noted that the details of the coordination meeting and the frequency assignments to MSS networks of operators participating at the meeting agreed under the provisions of the MoU are not available in the public domain. However, it should be noted that details of satellite coordination agreements, whether bilateral or multilateral, in other bands are not available in the public domain either, and are exclusively available to the concerned parties and their administrations. This is a concern to some administrations as they are of the view that the process is not transparent to all ITU Membership and this makes it very difficult for non-notifying administrations and potential AMS(R)S operators to develop long-term plans for spectrum access in order to serve their aviation safety communication needs. Other administrations are however of the view that since AMS(R)S operators and their administrations participate in the coordination process, they have full access to the coordination agreements, including spectrum assignments. Furthermore, any administration can obtain information about the provision of AMS(R)S services through their national air traffic control (ATC) service providers, who would be the organizations signing the service level agreements (SLA) with the satellite operators. Administrations can also obtain AMS(R)S spectrum assignment information through the AMS(R)S operators themselves, as they have the freedom and flexibility to disclose their own spectrum assignments and thus allow them to develop long-term plans for spectrum access.

One notifying administration of one AMS(R)S operator stated encountering difficulties since 2003 in satisfying its spectrum requirements through the MoU/ORM since this administration thinks that their spectrum requirements are treated on an equal basis with the other MSS operators, despite the priority stated in RR No. **5.357A**. In particular, this administration stated that in the framework of one Multilateral Meeting (MLM)/ORM group (Regions 1 and 3) no more than 76% of the spectrum requested by that operator was made available and, when then considering the additional constraints on spectrum reuse due to the other operators in Region 2, the overall resulting spectrum freely accessible for that AMS(R)S network was less than 50% of the requested amount. It is, however, worth noting that as per international public reports, the system of this AMS(R)S operator has been fully operational with 100% availability.

Due to the above statements, the view of some administrations is that the current provisions of Resolution **222 (Rev.WRC-07)** have not resulted in practice to achieve the objectives mentioned by RR No. **5.357A** and in order to resolve such matters, Agenda item 1.7 was adopted by WRC-07.

However, most of the notifying administrations of MSS operators (including AMS(R)S) of both the MoUs are of the view that neither the subject AMS(R)S operator, nor its sponsoring administration have invoked the provisions of RR No. **5.357A** within the ITU framework. These administrations are further questioning the statements of the notifying administration referred to two paragraphs above since no evidence has been presented to show that traffic demand has not been satisfied.

Some administrations also stated that the operator who stated encountering difficulties since 2003 has always signed the spectrum plan, which depicts its consent on the spectrum assignments that were made at the ORM meeting and in addition, the operator has not been able to provide traffic projections for its system based on actual traffic trend and terminal numbers. However, its spectrum requirements were always based on theoretical calculations. Some other administrations disagreed with this statement. The notifying administration of this operator stated that although the operator signed the Spectrum Sharing Arrangement which had not satisfied its justified and agreed spectrum requirements every year since 2003, to maintain the framework of the MSS MoU coordination for international cooperation, its dissatisfaction with the results and its expectation of improving the process in the ORM were stated in the summary record of the meeting[1].

Under the current provisions of the MoU (Regions 1 and 3), it is possible that, when there is no agreement in assigning the spectrum at ORM, the previous year's assignments would be retained. Some administrations are of the view that this may cause problems to new AMS(R)S systems joining the MOU process. However, in the past when one MSS operator did not sign the spectrum plan, this did not prevent assignment of additional spectrum to other MSS operators (including AMS(R)S operators), nor prevent the provision of AMS(R)S communication by MSS operators. This reflects the latest agreement of the MoU.

Some administrations asked for the current AMS(R)S spectrum usage to be provided, but such information was not received before the finalization of the CPM text.

Through the coordination process, administrations and operators agree on the appropriate interference criteria for each system and develop spectrum-sharing methods that ensure the compliance with these criteria. This approach enables operators, in most cases, to avoid unacceptable interference between the systems. If interference should nevertheless occur, operators and administrations work together to remove the interference. Over the many years that MSS systems have been in operation in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz and have been coordinated through the ORM process, some cases of interference have occurred, but they have been satisfactorily resolved.

[1] Moreover, the Administration of Japan stated that its operator has provided the best available information such as traffic statistics based on the airlines timetable requested by concerned participants at each ORM and its spectrum requirements for each year were agreed by all participants except at the 2009 ORM.

5/1.7/3 Summary of technical and operational studies and relevant ITU-R Recommendations

5/1.7/3.1 List of relevant ITU-R Recommendations and Reports

Relevant ITU-R Documents: Report ITU-R M.2073, Report ITU-R M.[AMS(R)S SPECTRUM ESTIMATE]

5/1.7/3.2 Long-term AMS(R)S spectrum requirements

Resolution **222 (Rev.WRC-07)** invites ITU-R to study, as a matter of urgency, and among other things, the existing and future spectrum requirements of the AMS(R)S. To that end, spectrum requirements have been estimated using various methodologies. The results are derived from the aviation needs as well as existing and future satellite systems characteristics.

5/1.7/3.2.1 Aviation needs

5/1.7/3.2.1.1 Flight movements

Information on flight movements is required to evaluate the number of aircraft located within a given airspace at any given time. The information can be based on the actual air traffic statistics, and/or on forecasts of future air traffic over a given airspace. Such statistics and trends are normally compiled by the relevant aviation authorities, e.g. by the International Civil Aviation Organization (ICAO), International Air Transport Association (IATA) for worldwide data and by Eurocontrol[2] for the European region (e.g. Eurocontrol compiles long-term statistics of flight movements for 20 years ahead).

5/1.7/3.2.1.2 Communication needs of a single aircraft

The AMS(R)S communication needs of a single aircraft generally depends on several factors, such as airspace, operational concept, air traffic services provided for each different aircraft flight phase and position.

The identification and quantitative characterization of these communication needs is a complex matter. The ICAO Aeronautical Communication Panel (ACP) has recommended as guidance for the assessment of future communication requirements the "*Communications operating concept and requirements for the future radio system*" (COCR, currently in Version 2[3]), developed by Eurocontrol and Federal Aviation Administration (FAA). The COCR describes in detail the aviation communication services required by single aircraft in each airspace domain and flight phase, and is a suitable basis for the purpose of the assessment of the needs of multiple aircraft.

The COCR does not however define some important elements of the system design and operation, for example whether the communication requirements are carried by satellite or terrestrial networks. Factors such as the determination of the communication requirements by satellite, whether point-to-multipoint transmission mode is used and the satellite system design will impact the spectrum requirements.

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[2] A copy of the Eurocontrol long-term forecast (2008-2030) is provided in the following link: Eurocontrol long-term forecast (2008-2030).

[3] A copy of this document can be found at the following link: Communications operating concept and requirements for the future radio system.

5/1.7/3.2.1.3 Communication needs of multiple aircraft

The cumulative communication needs over a given airspace and a given time-frame can be obtained by combining the information on flight movements in that area and time-frame with the information on the communication needs of a single aircraft.

Two methods were used for assessing AMS(R)S spectrum requirements using a combination of the above information. One method was based on a simulated statistical approach which first derives aviation communication requirements. The other method used a deterministic approach based on a Peak Instantaneous Aircraft Count (PIAC). These requirements were then adapted to satellite technologies.

The difference between these two procedures occurs at the level of derivation of aviation requirements inputs, i.e. one considers a flight by flight and time iterated simulation and the other relies on estimation of the maximum number of aircraft over a given airspace and the average communication information volume per aircraft. The statistical simulated model works at a more detailed level and should ensure that the specified message priority and latency of safety communication messages are taken into consideration.

5/1.7/3.2.2 Satellite system characteristics and methodology

In order to derive the spectrum requirements from the aviation needs, a set of satellite characteristics are needed for the calculation. Some of these are the beam configuration (number and size of beams), the service area configuration per beam, system frequency reuse capability, the capacity per carrier, the data delay, the carrier separation, the band efficiency, the access scheme, the protocol inefficiencies, modulation, the satellite/terrestrial split of avionics traffic and so on.

The methodology to estimate the spectrum requirement over an airspace is defined by four general steps as follows:

1) Gather the information on aircraft flight statistics and aviation communication needs for the chosen area and calculate from all aircraft the maximum communication needs in bits/second.
2) From 1) calculate for the chosen area the spectrum requirements for a satellite beam, taking into account the satellite characteristics (one beam may not cover the complete area).
3) Calculate the total spectrum requirement for the satellite system taking account of all beams over the chosen area, including intra-system frequency reuse consideration.
4) Calculate the global spectrum requirements using frequency reuse between the different satellite networks.

5/1.7/3.2.3 Result of the studies for long-term AMS(R)S spectrum requirements

It is noted that the estimation of AMS(R)S spectrum requirements can be performed separately for the satellite forward link (i.e. satellite to aircraft) and for the satellite return link (i.e. aircraft to satellite). The two components are in general different because of the different communication needs and protocols in both links.

The spectrum requirements for the AMS(R)S vary depending on the area being considered, assumptions for the overall system design (e.g. how much traffic is carried by terrestrial networks, and how much by satellite networks), the characteristics of each AMS(R)S system, the number of systems which will operate on a global scale under such a service and the compatibility between each other.

The various studies submitted to ITU-R presented different results of global AMS(R)S spectrum requirements due to the above-mentioned variation of assumptions. However, because studies have not determined precisely the number of operational systems that may share the same spectrum, there were no agreement on the specific value of the global AMS(R)S spectrum requirements, however an agreement was reached that they are less than 2 × 10 MHz.

Table 1 summarizes the estimated spectrum requirements based on separate various studies submitted to ITU-R. It should be noted that the sharing feasibility between the systems used in the different studies has not been fully assessed.

Due to lack of time and insufficient information, each and every study cannot be considered as agreed in details but the trend stemming from the overall consideration of the studies is agreed to provide a faithful overview of the long-term AMS(R)S spectrum requirements.

TABLE 1

Estimated AMS(R)S spectrum requirements in year 2025 based on separate various studies submitted to ITU-R

	No frequency reuse (kHz)	Frequency reuse (kHz)	50% satcom shared by 3 satellite networks and 100% AMS(R)S equipped aircraft (kHz)	100% satcom (kHz)	Assumption 1: multicast weather information (kHz)	Assumption 2: 1 + 20% TMA by satcom (kHz)	Assumption 3: 2 + 70% aircraft equipped (kHz)	Weather multicast and frequency reuse (kHz)	Weather unicast and frequency reuse (kHz)
Egypt study for Middle East Africa, and surrounding oceanic regions - NAVISAT planned satellite	Satcom and VHF (where coverage available) usage 2 000↓ 1 600↑	Satcom and VHF (where coverage available) usage 1 500↓ 1 200↑							
UAE study of North Atlantic Oceanic - Inmarsat-3				1 080↓					
Brazil study South Atlantic - Inmarsat-like				648↓ 715↑					
Japan study for Asia-Pacific - Special Global Beam			2 231↓						
Japan study of Asia-Pacific - I-4 like 250 beams/7 clusters			2 428↓						
UK study of European Inmarsat - 4 multiple beams				3 300↓ 800↑	800↓ 700↑	800↓ 700↑	500↓ 500↑		
ESA study of European-planned satellite - 6 beams								2 100↓ 1 300↑	3 300↓ 1 300↑
ESA worldwide study multi-GSO systems 9 airspace areas								2 600↓ 1 800↑	4 800↓ 1 800↑
Egypt global study for multi-GSO 9 airspace areas Navisat									4 800↓ 1 800↑
ESA worldwide study - multi-GSO systems 21 airspace areas with 21 beams								2 200↓ 1 400↑	3 400↓ 1 400↑
ESA worldwide - multi-GSO systems 21 airspace areas with 34 beams								2 100↓ 1 300↑	3 300↓ 1 300↑

NOTE – In the table, ↓ refers to the space-to-Earth direction and ↑ to the Earth-to-space direction.

5/1.7/3.2.4 Other considerations

Three additional elements may be noted in regard to ITU-R studies on long-term AMS(R)S spectrum requirements, these are:

– non-GSO systems in a part of the 1 610-1 626.5 MHz band may also deploy AMS(R)S services (subject to RR No. **9.21**);

– some administrations considered that the estimated spectrum requirements for AMS(R)S resulting from some of ITU-R studies did not take into account that most of the aeronautical communications within the priority categories 1 to 6 of RR Article **44** are currently carried out by terrestrial networks, which leads to the resultant spectrum requirements for AMS(R)S being overestimated. However, some other administrations stated that the future communication infrastructure for a continental/regional air traffic management system may require both satellite and terrestrial links to be available simultaneously and thus the studies carried out provide the long-term future spectrum requirements under such an assumption;

– some ITU-R studies which estimated global spectrum requirements for AMS(R)S did not take into account the latest technical advances that would maximize spectral efficiency, as required by Resolution **222 (Rev.WRC-07)**. Those studies would overestimate AMS(R)S spectrum requirements.

The studies regarding unmanned aircraft systems (UAS) spectrum requirements, under WRC-12 Agenda item 1.7 have assumed that UAS operating in civil airspace will fly and appear as normal aircraft when utilizing safety communications between air traffic control and pilot. The AMS(R)S communication requirements estimated in WRC-12 Agenda item 1.7 studies have included all communications from ATC centres to air vehicles, including those related to UASs. For other UAS communication needs, i.e. ATC relay, command and control, sense and avoid, the future spectrum requirements of UAS are discussed under WRC-12 Agenda item 1.3. If all these specific two-way UAS remote pilot and UAS link requirements[4] were to be provided within the bands given in RR No. **5.357A**, then the AMS(R)S total spectrum requirements could exceed the available 2 × 10 MHz.

5/1.7/4 Analysis of the results of studies

The various assessments of AMS(R)S spectrum requirements submitted to ITU-R have all concluded that they are foreseen to be less than 2 x 10 MHz up to the year 2025 (see Table 1 in section 5/1.7/3). It should also be noted that the existing spectrum requirements have not been provided; such information would be useful in better assessment of the trends of the estimated spectrum requirements provided in Table 1.

The results of studies under this agenda item show that long-term AMS(R)S spectrum requirements will range from 500 kHz (most optimistic scenario) to 4.8 MHz (most pessimistic scenario) in the space-to-Earth direction and from 500 kHz (most optimistic scenario) to 1.8 MHz (most pessimistic scenario) in the Earth-to-space direction, depending on the area being considered, assumptions for the overall system design and characteristics of AMS(R)S systems. It should be noted that the sharing feasibility between all the AMS(R)S systems used in the different studies has not been fully assessed.

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[4] Should WRC-12 agree to consider these communications as within priority categories 1 to 6 of RR Article **44**.

Nevertheless, some administrations questioned whether the studies may have underestimated the global spectrum requirements and therefore whether the forecast spectrum requirements may lead to undue constraints on existing MSS systems. However, other administrations have stated that, since some factors contributing to increase of spectral efficiency have not been taken into account in the worst-case studies, long-term AMS(R)S spectrum requirements may, on the counterpart, have been overestimated.

5/1.7/5 Methods to satisfy the agenda item

The various studies that have been performed within ITU-R under WRC-12 Agenda item 1.7 have led to the consideration of four methods to satisfy the agenda item, as described in sections 5/1.7/5/5.1 to 5/1.7/5/5.4 below. Due to the interrelationships between the various issues at stake, it was felt preferable to explain the rationale, advantages and disadvantages of each proposed method in an introductory text to this section.

The four different methods stem from a different assessment by administrations of the results of the studies performed under this agenda item (see sections 5/1.7/3 and 5/1.7/4). Two basic divergences arose in the consideration of these studies:

1) while the various assessments of AMS(R)S spectrum requirements submitted to ITU-R have all concluded that they are foreseen to be less than the available 2 × 10 MHz up to the year 2025, some administrations questioned whether the studies may have underestimated the global spectrum requirements and therefore whether the forecast spectrum requirements may lead to undue constraints on existing MSS systems;

2) some administrations considered that the current RR provisions are adequate to accommodate AMS(R)S spectrum requirements as they arise and that the existing coordination process has successfully satisfied the spectrum requirements of all AMS(R)S operators. On the other hand, some other administrations considered that, since one notifying administration of one AMS(R)S operator stated encountering difficulties since 2003 in satisfying its spectrum requirements through the existing coordination mechanisms and then considered that it would be very difficult to ensure spectrum for the AMS(R)S communications in the near future, the current provisions of Resolution **222 (Rev.WRC-07)** require some improvements in order to implement the objectives mentioned by RR No. **5.357A**. Some administrations also expressed the view that the current RR provisions are adequate for accommodating current AMS(R)S spectrum requirements but that there may be a lack of spectrum in the future, that will be unable to be solved by any procedure.

Administrations proposing methods A, B and D assume that, based on the studies conducted within ITU-R (see sections 5/1.7/3 and 5/1.7/4), the AMS(R)S spectrum requirements will be much less than 2 × 10 MHz up to the year 2025 and therefore they do not propose the consideration of other bands in accordance with *invites ITU-R* (iv) of Resolution **222 (Rev.WRC-07)**. Method C is proposed based on the belief that the AMS(R)S spectrum requirements up to year 2025 are not clearly identified or may cause undue constraints on the existing MSS systems in the bands 1 545-1 555 MHz/1 646.5-1 656.5 MHz and consequently other bands should be considered in accordance with the same *invites ITU-R*. However, several administrations disagreed on the basis that no such evidence was provided during the course of the studies under WRC-12 Agenda item 1.7, rendering the proposal questionable. In addition, it was noted that such a proposal may decrease the level of interoperability and global coverage and may increase complexity and costs to integrate aeronautical earth stations. However, this integration might not be needed as such a proposal might be practical for some future planned regional systems that will operate independently in certain regions or areas. Furthermore, when considering the detailed implementation of Method C, the proposed alternative band, that is already allocated to AMS(R)S, is considered for accommodating other applications (either operating within services already allocated or under consideration at WRC-12) and neither compatibility studies with regard to the proposed alternative band nor any consultation with other potentially concerned groups within ITU-R have been performed. Concerns were raised about the proposed regulatory implementation (i.e. removal of the requirement of RR No. **9.21** from AMS(R)S in the proposed sub-band) of Method C.

Assuming the AMS(R)S spectrum requirements to be much less than 2 × 10 MHz, administrations were of different views on whether the existing coordination process was adequate to implement RR No. **5.357A** and provide sufficient priority for future AMS(R)S requirements. This has led to the proposals contained in Methods A, B and D.

Method A was proposed by some administrations who hold the view that, since 1997, there is no evidence that any existing AMS(R)S system has failed to satisfy its traffic requirements within the spectrum assignments made in the satellite coordination process and that the existing Radio Regulation provisions (RR No. **5.357A**, RR Article **9** and Resolution **222 (Rev.WRC-07)**) provide the required priority for current and future AMS(R)S requirements. However, some administrations believe that additional guidelines are needed for administrations for the current regulatory procedures for accessing AMS(R)S spectrum for priority categories 1 through 6 communications. In addition, these administrations note that there is a need to have an agreed methodology in the form of an ITU-R Recommendation by which the amount of spectrum required for AMS(R)S for priority categories 1 through 6 can be determined. Another group of administrations were of the view that Method A does not solve the current difficulties under the current ORM frequency coordination process and that there is evidence that the current regulatory procedures are not sufficient to ensure the correct implementation of RR No. **5.357A**, in particular with respect to the validation of the AMS(R)S spectrum requirements the procedures to give priority to AMS(R)S networks, the coordination between various Regions and the transparency of the coordination process.

Method B proposes modifications to Resolution **222 (Rev.WRC-07)**. Administrations proposing this method believe that the necessary priority for AMS(R)S under RR No. **5.357A** is not a matter for negotiation in frequency coordination meetings. Method B addresses concerns of some administrations to ensure that the priority for validated AMS(R)S in the coordination process has transparency, in particular for future new operators of AMS(R)S, that there is visibility and knowledge of how the specific procedures in ORM (or other frequency coordination meetings) address the requirement that priority shall be given to accommodate the AMS(R)S spectrum requirements as stated in RR No. **5.357A**. Method B proponents believe that this method will be consistent with RR Article **9** and will appropriately satisfy the agenda item such that AMS(R)S spectrum requirements to be prioritized can be objectively determined, that determined spectrum requirements can be ensured and that compatibility among coordination groups can be achieved.

However, in addition to disagreeing on the above analysis of the situation, Method B was objected to by some other administrations, including the notifying administration of AMS(R)S networks, because they consider that the proposed solutions are impractical, and add additional burden on administrations, operators and organizations. These administrations are of the view that this adds complexity and cost to the coordination process while bringing little or no added value. Further, Method B requires a new (additional) consultation meeting as a prerequisite to RR Article **9** satellite frequency coordinations to determine short- and medium-term mandatory AMS(R)S spectrum requirements. Additionally, these administrations are of the view that it implicitly expands the scope and nature of RR Article **9** satellite coordination, and would be inconsistent with RR Article **9** since the consultation meeting would involve non-notifying administrations and ICAO without an interest or clearly defined role in the MSS frequency coordination process in the bands 1 525-

1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space). In this regard, in the view of these administrations expanding the scope of coordination matters beyond notifying administrations may set a precedent for other satellite bands which administrations and their satellite operators may later find undesirable. Moreover, the mandatory consultation meetings may not have access to specific MSS system and network data and technical characteristics, and may delay actual satellite coordinations.

Method D proposes to amend Resolution **222 (Rev.WRC-07)** to explicitly include the description of the coordination process that should be used, highlighting the regulatory provisions in place describing administrations' rights and obligations when seeking priority access to AMS(R)S spectrum as well as the process to be followed when validated AMS(R)S spectrum needs of a system are not fulfilled. In this regard, Method D calls for ITU-R to develop one or more ITU-R Recommendation(s) on a methodology to efficiently calculate near-term spectrum requirements for AMS(R)S within priority categories 1 to 6. Method D also highlights an administration's ability to disclose information about spectrum assignments to its AMS(R)S system, thereby providing transparency. With minimal changes to the Radio Regulations, this method is intended to provide guidance and a reference framework for all the administrations involved in the MSS coordination in order to ensure long-term priority access to spectrum for AMS(R)S systems in accordance with RR No. **5.357A**, while maintaining flexible and efficient use of the band without undue constraints on existing systems operating in the band. Because a portion of this Method is relying on existing procedures, some administrations considered that it does not address all the problems raised, and shares some of what they perceive to be the drawbacks of Method A.

5/1.7/5.1 Method A – No change to RR Articles 5 and 9

This method proposes to retain unchanged the current provisions of RR Article **5** (in particular the existing MSS allocations in the frequency range 1.5/1.6 GHz and RR No. **5.357A**), and RR Article **9**. Resolution **222 (Rev.WRC-07)** would be slightly modified to reflect that the requested studies have been completed.

5/1.7/5.2 Method B – No change to RR Articles 5 and 9, modification to Resolution 222 (Rev.WRC-07) to implement additional procedures supporting the provision of RR No. 5.357A with two distinct types of meetings (consultation and coordination)

This method proposes to retain unchanged RR Articles **5** and **9**. However, Resolution **222 (Rev.WRC-07)** is proposed to be modified to institute a prerequisite AMS(R)S consultation meeting (in addition to bilateral or multilateral frequency coordination between administrations identified in accordance with RR Article **9**) to assess and agree on AMS(R)S spectrum requirements of all MSS systems providing AMS(R)S, based on appropriate justifications. The details of attendance and decision-making are described in Annex B. In this method, two types of meeting will be held: consultation meeting(s) and subsequent frequency coordination meeting(s).

Resolution **222 (Rev.WRC-07)** would indicate that administrations would then be required to assign spectrum to AMS(R)S networks prior to other MSS networks at subsequent multilateral or bilateral frequency coordination meetings conducted as per the MoU.

Resolution **222 (Rev.WRC-07)** would finally include provisions that would require administrations to report to the Radiocommunication Bureau whether the AMS(R)S spectrum requirements have been accommodated, or not, by the multilateral or bilateral frequency coordination meetings. The Radiocommunication Bureau would publish this information.

5/1.7/5.3 Method C – Use of a part of the existing AMS(R)S allocation in the band 5 091-5 150 MHz, for satisfying the long-term requirements of AMS(R)S only for communications with priority categories 1 to 6 in RR Article 44

This method proposes to retain unchanged the existing MSS allocation in the frequency bands 1 545-1 555 MHz/1 646.5-1 656.5 MHz as well as RR No. **5.357A** and Article **9**. In addition, it proposes to use a sub-band within the existing AMS(R)S allocation in the band 5 091-5 150 MHz (through modifications to RR No. **5.367** and Resolution **222 (Rev.WRC-07)**) solely for satisfying the long-term requirements of AMS(R)S for communications with priority categories 1 to 6 in RR Article **44** (i.e. other types of AMS(R)S communications will not be possible within the selected sub-band). The selected sub-band may be divided into two separate sub-bands for up- and downlinks, if needed. The width of the sub-bands should be determined in light of the estimated long-term AMS(R)S spectrum requirements (see section 5/1.7/3). The selection of the sub-band(s) will be subject to the successful completion of compatibility studies.

5/1.7/5.4 Method D – No change to RR Articles 5 and 9, modification to Resolution 222 (Rev.WRC-07) identifying the coordination process used to ensure long-term spectrum availability and access for AMS(R)S, with coordination meetings only

This method proposes to retain unchanged RR Articles **5** and **9**. Resolution **222 (Rev.WRC-07)** is proposed to be modified to describe the regulatory provisions in place that can be utilized to ensure long-term spectrum availability and access for AMS(R)S. Modification to Resolution **222 (Rev.WRC-07)** would provide a clear description of the coordination process that should be used to ensure long-term spectrum availability and access for AMS(R)S while ensuring efficient use of the bands. This method provides the elements of the regulatory provisions in place for administrations seeking priority access to spectrum for AMS(R)S service. It also highlights an administration's ability to disclose information about spectrum assignments of its respective system. It further describes the process to be followed when validated AMS(R)S spectrum needs of a system are not fulfilled through the established coordination process. It adds a new Resolution **[SPECT.METHOD] (WRC-12)** to have ITU-R develop an agreed methodology to determine spectrum requirements of AMS(R)S communications within priority categories 1 to 6 of RR Article **44** that could be used for frequency coordination.

5/1.7/6 Regulatory and procedural considerations

Some regulatory considerations are common to three or four proposed methods and are consequently summarized at the beginning of this section.

Methods A, B and D propose to retain unchanged the Table of Frequency Allocations in RR Article **5**.

NOC

ARTICLE 5

All four methods propose to retain unchanged Article **9** of the Radio Regulations.

NOC

ARTICLE 9

The four methods also propose changes to Resolution **222 (Rev.WRC-07)**, whether substantial or not, so that, for each of the four methods, RR No. **5.357A** will have to be updated to reflect the amendments to this Resolution. An example of the updated provision RR No. **5.357A** is provided below:

NOC

5.362A

MOD

5.357A In applying the procedures of Section II of Article **9** to the mobile-satellite service in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz, priority shall be given to accommodating the spectrum requirements of the aeronautical mobile-satellite (R) service providing transmission of messages with priority 1 to 6 in Article **44**. Aeronautical mobile-satellite (R) service communications with priority 1 to 6 in Article **44** shall have priority access and immediate availability, by pre-emption if necessary, over all other mobile-satellite communications operating within a network. Mobile-satellite systems shall not cause unacceptable interference to, or claim protection from, aeronautical mobile-satellite (R) service communications with priority 1 to 6 in Article **44**. Account shall be taken of the priority of safety-related communications in the other mobile-satellite services. (The provisions of Resolution **222 (Rev.WRC-~~2000~~12)*** shall apply.) (WRC-2000)

Regulatory considerations that are specific to each of the proposed methods are given in the following sub-sections.

5/1.7/6.1 Method A

This method consists in:

– No change to RR Articles **5** and **9**.

– No modification to Resolution **222 (Rev.WRC-07)**, except the following:

  – Suppression of the reference to "*invites ITU-R*" in *resolves* 3 of Resolution **222 (Rev.WRC-07)**.

  – Suppression of the sections "*invites ITU-R*", "*invites WRC-11*" and "*invites*" in Resolution **222 (Rev.WRC-07)**.

A possible regulatory implementation of Method A is provided in Annex A.

5/1.7/6.2 Method B

This method consists in:

– No change to RR Articles **5** and **9**.

– Modification of Resolution **222 (Rev.WRC-07)** as per Annex B.

5/1.7/6.3 Method C

This method consists in:

– No change to RR No. **5.357A** and RR Article **9**.

– Modification to RR No. **5.367** to include explicit provisions to satisfy long-term AMS(R)S requirements in a part of the existing AMS(R)S allocation in the band 5 091-5 150 MHz. More precisely, in this portion of the band, the agreement-seeking procedure under RR No. **9.21** would be removed for AMS(R)S and its use by AMS(R)S

* ~~*Note by the Secretariat:* This Resolution was revised by WRC-07.~~

would be limited to systems operating in accordance with international aeronautical standards and to aeronautical communications with priority categories 1 to 6 in RR Article **44**.

– Modification to Resolution **222 (Rev.WRC-07)** as per Annex C.

5/1.7/6.4 Method D

This method consists of:

– No change to Articles **5** and **9** of the Radio Regulations.

– Modification to Resolution **222 (Rev.WRC-07)** as per Annex D.

– New Resolution **[A17-SPECT.METHOD] (WRC-12)** as per Annex D.

ANNEX A TO SECTION 5/1.7/6

MOD

Editorial Note: This corresponds to the modification of Resolution **222 (Rev.WRC-07)** as per Method A.

RESOLUTION 222 (Rev.WRC-~~07~~12)

Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and ~~studies~~ means to ensure long-term spectrum ~~availability~~ access for the global maritime distress and safety system (GMDSS) and the aeronautical mobile-satellite (R) service

Editorial Note: Under Method A, no change is proposed to the "*considering*", "*further considering*" and "*recognizing*" sections.

resolves

1 that, in frequency coordination of MSS in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, administrations shall ensure that the spectrum needed for distress, urgency and safety communications of GMDSS, as elaborated in Articles **32** and **33**, in the bands where No. **5.353A** applies, and for AMS(R)S communications within priority categories 1 to 6 of Article 44 in the bands where No. 5.357A applies is accommodated;

2 that administrations shall ensure the use of the latest technical advances, in order to achieve the most flexible and practical use of the generic allocations;

3 that administrations shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for distress, urgency and safety communication of GMDSS communications, as elaborated in Articles **32** and **33**, and for AMS(R)S communications within priority categories 1 to 6 of Article **44**; this could be achieved in advance through the coordination process in *resolves* 1~~, and, when necessary, through other means if such means are identified as a result of studies in *invites ITU-R*,~~.

~~*invites ITU-R*~~

~~to conduct, in time for consideration by WRC-11, the appropriate technical, operational and regulatory studies to ensure long-term spectrum availability for the aeronautical mobile-satellite (R) service (AMS(R)S) including:~~

~~(i) to study, as a matter of urgency, the existing and future spectrum requirements of the aeronautical mobile-satellite (R) service;~~

~~(ii) to assess whether the long-term requirements of the AMS(R)S can be met within the existing allocations with respect to No. **5.357A** while retaining unchanged the generic allocation for the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and without placing undue constraints on the existing systems operating in accordance with the Radio Regulations;~~

~~(iii) to complete studies to determine the feasibility and practicality of technical or regulatory means, other than the coordination process referred to in *resolves* 1 or the means considered in Report ITU-R M.2073, in order to ensure adequate access to spectrum to accommodate the AMS(R)S requirements as referenced in *resolves* 3 above, while taking into account the latest technical advances in order to maximize spectral efficiency;~~

~~(iv) if the assessment identified in *invites ITU-R* (i) and (ii) indicates that these requirements cannot be met, to study existing MSS allocations or possible, new allocations only for satisfying the requirements of the aeronautical mobile satellite (R) service for communications with priority categories 1 to 6 of Article **44**, for global and seamless operation of civil aviation taking into account the need to avoid undue constraints on existing systems and other services,~~

~~*invites WRC-11*~~

~~to consider the results of the above ITU-R studies and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz,~~

~~*invites*~~

~~the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Air Transport Association (IATA), administrations and other organizations concerned to participate in the studies identified in *invites ITU-R* above.~~

ANNEX B TO SECTION 5/1.7/6

MOD

Editorial Note: This corresponds to the modification of Resolution **222 (Rev.WRC-07)** as per Method B.

RESOLUTION 222 (Rev.WRC-~~07~~12)

Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and ~~studies~~ means to ensure long-term spectrum ~~availability~~ access for the aeronautical mobile-satellite (R) service

The World Radiocommunication Conference (Geneva, 20~~07~~12), *considering*

a) that prior to WRC-97, the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) were allocated to the maritime mobile-satellite service and the bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) were allocated on an exclusive basis to the aeronautical mobile-satellite (R) service (AMS(R)S) in most countries;

b) that WRC-97 allocated the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the mobile-satellite service (MSS) to facilitate the assignment of spectrum to multiple MSS systems in a flexible and efficient manner;

c) that WRC-97 adopted No. **5.353A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference distress, urgency and safety communications of the Global Maritime Distress and Safety System (GMDSS) in the bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz and No. **5.357A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference the AMS(R)S ~~providing transmission of messages with~~ communications as defined within priority categories 1 to 6 in Article **44** in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz;

d) that AMS(R)S is an essential element of ICAO CNS/ATM to provide safety and regularity of flight in the civil air transportation,

further considering

a) that coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and, in the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), coordination is partially assisted by regional multilateral meetings;

b) that, in these bands, geostationary satellite system operators currently use a capacity-planning approach at multilateral coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements;

c) that spectrum requirements for MSS networks, including the GMDSS and AMS(R)S, are currently accommodated through the capacity-planning approach and that, in the bands to which Nos. **5.353A** or **5.357A** apply, this approach supplemented by additional procedures~~,~~ ~~and other methods~~ may assist in accommodating the future expected increase of spectrum requirements for GMDSS and AMS(R)S;

d) that Report ITU-R M.2073 has concluded that prioritization and inter-system preemption between different mobile-satellite systems is not practical and, without a significant advance in technology, is unlikely to be feasible for technical, operational and economical reasons. It summarized that prioritization and intersystem real-time pre-emption would not necessarily increase the efficiency of spectrum use compared to the current situation, but it would certainly complicate substantially the coordination process and network structure;

e) that there is existing and increasing demand for spectrum for AMS(R)S and non-AMS(R)S by several mobile satellite systems in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and that the application of this Resolution may impact the provision of services by non-AMS(R)S systems in the mobile satellite service;

f) that future requirements for ~~AMS(R)S and~~ GMDSS spectrum may require additional allocations~~,~~;

g) that the long-term spectrum requirements for the AMS(R)S communications (within priority categories 1 to 6 of Article **44**) have been estimated to be less than the available 2 × 10 MHz identified by No. **5.357A**,

recognizing

a) that absolute priority to all telecommunications concerning safety of life at sea, on land, in air or in outer space is given by No. 191 of the ITU Constitution;

b) that the International Civil Aviation Organization (ICAO) has adopted ~~S~~standards and ~~R~~recommended ~~P~~practices (SARPs) addressing satellite communications with aircraft in accordance with the Convention on International Civil Aviation;

c) that all air traffic communications as defined in Annex 10 to the Convention on International Civil Aviation fall within priority categories 1 to 6 of Article **44**;

d) that Table 15-2 of Appendix **15** identifies the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) for distress and safety purposes in the maritime mobile-satellite service as well as for routine non-safety purposes~~,~~;

e) that ICAO has knowledge of aviation communication requirements,

resolves

1 that, in frequency coordination of MSS in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, notifying administrations of the MSS networks shall ensure that the spectrum needed for distress, urgency and safety communications of GMDSS, as elaborated in Articles **32** and **33**, in the bands where No. **5.353A** applies, and for the AMS(R)S communications (within priority categories 1 to 6 of Article **44**) in the bands where No. **5.357A** applies, is accommodated;

2 that notifying administrations of the MSS networks shall ensure the use of the latest technical advances, in order to achieve the most flexible, efficient and practical use of the generic allocations;

3 that notifying administrations of the MSS networks shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for distress, urgency and safety communication of GMDSS communications, as elaborated in Articles **32** and **33**, and for the AMS(R)S communications (within priority categories 1 to 6 of Article **44**);~~ this could be achieved in advance through the coordination process in *resolves* 1, and, when necessary, through other means if such means are identified as a result of studies in *invites ITU-R*,~~

4 that administrations operating or planning to operate AMS(R)S systems shall justify and agree collectively their spectrum requirements for the AMS(R)S communications (within priority categories 1 to 6 of Article **44**), taking into account *resolves* 2, through a consultation meeting held under the provisions contained in Annex 1 to this Resolution;

5 that, at frequency coordination meetings, priority shall be given when assigning frequencies to meet the AMS(R)S spectrum requirements that were justified and agreed as specified in *resolves* 4 above,

instructs the Secretary-General

1 to bring this Resolution to the attention of ICAO for any required action, as appropriate;

2 to assist the consultation meetings in *resolves* 4,

instructs the Director of the Radiocommunication Bureau

1 to participate, within the available budgetary resources, in the consultation meetings mentioned in *resolves* 4;

2 to publish the information referred to in Annex 1.

~~*invites ITU-R*~~

~~to conduct, in time for consideration by WRC-11, the appropriate technical, operational and regulatory studies to ensure long-term spectrum availability for the aeronautical mobile-satellite (R) service (AMS(R)S) including:~~

~~i) to study, as a matter of urgency, the existing and future spectrum requirements of the aeronautical mobile-satellite (R) service;~~

~~ii) to assess whether the long-term requirements of the AMS(R)S can be met within the existing allocations with respect to No. **5.357A** while retaining unchanged the generic allocation for the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and without placing undue constraints on the existing systems operating in accordance with the Radio Regulations;~~

~~iii) to complete studies to determine the feasibility and practicality of technical or regulatory means, other than the coordination process referred to in *resolves* 1 or the means considered in Report ITU-R M.2073, in order to ensure adequate access to spectrum to accommodate the AMS(R)S requirements as referenced in *resolves* 3 above, while taking into account the latest technical advances in order to maximize spectral efficiency;~~

~~iv) if the assessment identified in *invites ITU-R* i) and ii) indicates that these requirements cannot be met, to study existing MSS allocations or possible new allocations only for satisfying the requirements of the aeronautical mobile satellite (R) service for communications with priority categories 1 to 6 of Article **44**, for global and seamless operation of civil aviation taking into account the need to avoid undue constraints on existing systems and other services,~~

~~*invites WRC-11*~~

~~to consider the results of the above ITU-R studies and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz,~~

~~*invites*~~

~~the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Air Transport Association (IATA), administrations and other organizations concerned to participate in the studies identified in *invites ITU-R* above.~~

ANNEX 1 TO RESOLUTION 222 (Rev.WRC-12)

This Annex presents a procedure (described in the following steps) to ensure the accommodation of the spectrum requirements for the AMS(R)S communications (within priority categories 1 to 6 of Article **44**) specified in *resolves* 1, 3 and 4 of this Resolution. The steps are defined as follows:

Step 1: Consultation meeting (see *resolves* 4 of this Resolution)

This meeting will be global and independent from the ORMs and, attended by notifying administrations and their authorized operating agencies of MSS and AMS(R)S systems meeting the criteria set forth in Annex 2. All other interested administrations and ICAO may attend the meeting as observers (whose rights and obligations will be defined by the consultation meeting). At this meeting, decisions need to be taken by notifying administrations of MSS and AMS(R)S systems meeting the criteria set forth in Annex 2.

Working methods of the consultation meeting need to be defined by the consultation meeting (such as how to address an AMS(R)S operator that does not provide required input information as explained below).

The consultation meeting shall have inputs, a process of calculating AMS(R)S spectrum requirements and outputs, as described below.

– General information on input contributions:
  - the AMS(R)S communication (with priority categories 1 to 6 of Article **44**) needs derived by ICAO (e.g. in terms of information volume per given airspace), using a list of parameters developed by this consultation meeting;
  - other inputs (e.g. recognized AMS(R)S satellite system characteristics) from members of the consultation meeting;
  - inputs related to AMS(R)S systems complying with the milestones defined in Annex 2 and regarding the AMS(R)S spectrum requirements in respect of No. **5.357A** will be taken into account in the calculation of the spectrum requirements below.

– Calculations of spectrum requirements:
  - the consultation meeting converts aviation communication needs into spectrum requirements[1] per atellite network for AMS(R)S systems meeting the criteria set forth in Annex 2 using agreed methodology(ies) such as ITU-R Recommendations;
  - the spectrum requirements will generally be determined on a year-by-year basis and may be spanned on a medium-term plan of up to five years depending on how the consultation meeting decides;
  - during the calculation of AMS(R)S spectrum requirements, it shall be based on the service itself and not the systems, double counting between AMS(R)S satellites shall be avoided and the most spectrally efficient scenarios must be used.

– Outputs:
  - the consultation meeting develops a medium-term plan providing details of the AMS(R)S spectrum requirements per satellite system complying with the milestones defined in Annex 2 to this Resolution;
  - on an optional basis, the consultation meeting may also develop, to the extent possible, a yearly AMS(R)S recommended spectrum assignment plan to propose to the frequency coordination meetings in Step 3;
  - the report of the meeting.

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[1] Spectrum requirements: the amount of spectrum needed by each satellite system to meet the aviation communication needs with a given coverage, safety performance and quality of service.

The documentation and report of the meeting need be published by the Radiocommunication Bureau.

Step 2: Submission of documents to different frequency coordination meetings

The outputs of Step 1, as published by the Radiocommunication Bureau, become inputs to the different frequency coordination meetings. These meetings shall take into account the AMS(R)S spectrum requirements per satellite system, agreed by the consultation meeting.

Step 3: Frequency coordination meetings

These meetings consider the inputs from the consultation meeting of the AMS(R)S spectrum requirements plan as derived and agreed in Step 1 above. These meetings also consider the documents published by the Radiocommunication Bureau under Steps 1 and 4.

The frequency coordination meetings will consider spectrum requirements of AMS(R)S satellite networks that meet the milestones set forth in Annex 2 to this resolution and that are defined for the subsequent period of interest of the coordination meeting.

Frequency coordination meetings:

1) shall accommodate the spectrum requirements of the AMS(R)S networks of each operator as identified in Step 2 by:
   - i) making frequency assignments to the AMS(R)S networks prior to those of other networks[2];
   - ii) ensuring that the AMS(R)S assignments are compatible with AMS(R)S assignments made by frequency coordination meetings for other geographical area(s);
   - iii) ensuring that any MSS assignment shall be compatible to any AMS(R)S assignment of other geographical area(s);

2) shall take the necessary steps to ensure that notifying administrations of AMS(R)S networks identified under Article **9** of the Radio Regulations, the assignments of which are impacted in the geographical area of relevance for the coordination meeting, are able to participate;

3) consider the recommended spectrum assignment plan developed in Step 1, when accommodating spectrum requirements in the item below.

Step 4: Report of the frequency coordination meetings

4a) If the AMS(R)S spectrum requirements identified in Step 1 are satisfactorily accommodated by a frequency coordination meeting as described in Step 3, a report shall be sent, within [one] month, to the Radiocommunication Bureau, indicating:
   - i) that the spectrum requirements of each AMS(R)S network defined in Step 1 have been satisfactorily accommodated; and,
   - ii) the corresponding AMS(R)S assignments.

   The Bureau will publish the report within one month after its reception;

4b) otherwise, go to Step 5.

[2] General MSS networks may share the frequency range assigned to AMS(R)S if compatibility is confirmed.

Step 5: Meeting with the notifying administrations

Within three to perhaps four months, according to the case, a new frequency coordination meeting shall be held between the notifying administrations of the concerned MSS and AMS(R)S systems, to satisfy those AMS(R)S spectrum requirements that were submitted to the frequency coordination meeting in Step 3 and which were not met according to Step 4.

If the result of the latter frequency coordination meeting is successful, then follow Step 4a) above. Otherwise, go to Step 6.

Step 6: Seeking the assistance of the Radiocommunication Bureau

The notifying administrations of the AMS(R)S systems shall immediately inform the Radiocommunication Bureau and seek its assistance to resolve the issue with respect to the other concerned administrations involved in Step 5, with a view to a satisfactory resolution of the problem within three months. The Bureau may wish to consult reliable sources of information, e.g. ICAO.

ANNEX 2 TO RESOLUTION 222 (Rev.WRC-12)

Criteria for MSS and AMS(R)S systems to be considered in application of Annex 1 to Resolution 222 (Rev.WRC-12)

All the following milestones shall be met by all AMS(R)S systems seeking spectrum access under No. **5.357A** and by all MSS systems whose notifying administration has the right of decision in the consultation process referred to in Step 1 of Annex 1. All the information identified in the criteria given below shall be duly submitted to the consultation meeting.

1 Submission of appropriate coordination request information.

2 Entry into satellite manufacturing or procurement agreement, entry into earth station deployment or procurement agreement and entry into satellite launch agreement.

The satellite operators shall possess:

either

i) clear evidence of a binding agreement for the manufacture or procurement of its satellite(s); and

ii) clear evidence of a binding agreement of a launch of its satellite(s) stipulating a launch window of within one year,

or

clear evidence that its satellite(s) has(ve) been successfully launched.

The manufacturing or procurement agreement shall identify the contract milestones leading to the completion of manufacture or procurement of satellite(s) required for the service provision, and the launch agreement shall identify the launch window, launch site and launch service provider.

ANNEX C TO SECTION 5/1.7/6

MOD

5.367 Additional allocation: The bands 1 610-1 626.5 MHz and 5 000-5 150 MHz are also allocated to the aeronautical mobile-satellite (R) service on a primary basis~~, subject to agreement obtained under No. 9.21~~. The use of the frequency bands 1 610-1 626.5 MHz, 5 000-5 091 MHz, 5 091-XXXX MHz and YYYY-5 150 MHz by the aeronautical mobile-satellite (R) service is subject to agreement obtained under No. 9.21.

The use of the frequency band XXXX-YYYY[6] MHz by the aeronautical mobile-satellite (R) service is limited to:

- systems operating in accordance with international aeronautical standards;
- aeronautical communications with priority categories 1 to 6 in RR Article 44. See also Resolution 222 (Rev.WRC-12).

MOD

Editorial Note: This corresponds to the modification of Resolution **222 (Rev.WRC-07)** as per Method C.

RESOLUTION 222 (Rev.WRC-~~07~~12)

Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service~~,~~ and ~~studies to ensure long-term spectrum availability for~~ part(s) of the band 5 091-5 150 MHz* by the aeronautical mobile-satellite (R) service

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that prior to WRC-97, the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) were allocated to the maritime mobile-satellite service and the bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) were allocated on an exclusive basis to the aeronautical mobile-satellite (R) service (AMS(R)S) in most countries;

b) that WRC-97 allocated the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the mobile-satellite service (MSS) to facilitate the assignment of spectrum to multiple MSS systems in a flexible and efficient manner;

c) that WRC-97 adopted No. **5.353A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference distress, urgency and safety communications of the Global Maritime Distress and Safety System (GMDSS) in the bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz and No. **5.357A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference the AMS(R)S providing

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[6] The value of the band XXXX-YYYY MHz should be limited by [5] MHz. Also this band may be divided by two separate sub-bands for up- and downlinks, if needed.

* Depending on the position of the “parts”, compatibility with other services will be different.

transmission of messages with priority categories 1 to 6 in Article **44** in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz;

d) that AMS(R)S is an essential element of ICAO CNS/ATM to provide safety and regularity of flight in the civil air transportation~~,~~;

e) that it is necessary to ensure the long-term availability of the spectrum for AMS(R)S;

f) that it is necessary to retain unchanged the generic allocation for the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz without placing undue constraints on the existing systems operating in accordance with the Radio Regulations,

further considering

a) that coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and, in the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), coordination is partially assisted by regional multilateral meetings;

b) that, in these bands, geostationary satellite system operators currently use a capacity-planning approach at multilateral coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements;

~~*c)* that spectrum requirements for MSS networks, including the GMDSS and AMS(R)S, are currently accommodated through the capacity-planning approach and that, in the bands to which Nos. **5.353A** or **5.357A** apply, this approach, and other methods may assist in accommodating the expected increase of spectrum requirements for GMDSS and AMS(R)S;~~

~~d~~c) that Report ITU-R M.2073 has concluded that prioritization and inter-system preemption between different mobile-satellite systems is not practical and, without a significant advance in technology, is unlikely to be feasible for technical, operational and economical reasons. It summarized that prioritization and intersystem real-time pre-emption would not necessarily increase the efficiency of spectrum use compared to the current situation, but it would certainly complicate substantially the coordination process and network structure;

~~e~~d) that there is existing and increasing demand for spectrum for AMS(R)S and non-AMS(R)S by several mobile satellite systems in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and that the application of this Resolution may impact the provision of services by non-AMS(R)S systems in the mobile satellite service;

e) that Report ITU-R M.[AMS(R)S SPECTRUM ESTIMATE] indicates that the future global AMS(R)S spectrum requirements will be [XX MHz] in the “forward” link and [YY MHz] in the “return” link, accordingly;

f) that MSS networks, including AMS(R)S and GMDSS, have been able to access spectrum through the capacity-planning approach within the bands 1 525-1 559 MHz/1 626.5-1 660.5 MHz;that ~~future requirements for AMS(R)S and GMDSS spectrum may require additional allocations,~~

g) that the spectrum, both in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz and, in particular, in the bands 1 545-1 555 MHz/1 646.5-1 656.5 MHz, is extremely in demand by existing and future system operators, including AMS(R)S. Therefore, in practice, it may be difficult, if not impossible, to satisfy future spectrum requirements for all MSS systems, including AMS(R)S and GMDSS, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), *recognizing*

a) that absolute priority to all telecommunications concerning safety of life at sea, on land, in air or in outer space is given by No. 191 of the ITU Constitution;

b) that the International Civil Aviation Organization (ICAO) has adopted ~~S~~standards and ~~R~~recommended ~~P~~practices (SARPs) addressing satellite communications with aircraft in accordance with the Convention on International Civil Aviation;

c) that all air traffic communications as defined in Annex 10 to the Convention on International Civil Aviation fall within priority categories 1 to 6 of Article **44**;

d) that Table 15-2 of Appendix **15** identifies the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) for distress and safety purposes in the maritime mobile-satellite service as well as for routine non-safety purposes,

resolves

1 that, in frequency coordination of MSS in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, administrations shall ensure that the spectrum needed for distress, urgency and safety communications of GMDSS, as elaborated in Articles **32** and **33**, in the bands where No. **5.353A** applies, and the spectrum needed for AMS(R)S communications within priority categories 1 to 6 of Article **44** in the bands where No. **5.357A** applies, is accommodated;

2 that administrations shall, to the extent practicable, use the band XXXX-YYYY MHz, where No. **5.367** applies, for their long-term spectrum requirements of AMS(R)S communications with priority 1 to 6 as per Article **44**;

~~2~~3 that administrations shall ensure the use of the latest technical advances, in order to achieve the most flexible and practical use of the generic allocations;

~~3~~4 that administrations shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for distress, urgency and safety communication of GMDSS communications, as elaborated in Articles **32** and **33**, and for AMS(R)S communications within priority categories 1 to 6 of Article **44**; this could be achieved in advance through the coordination process in *resolves* 1~~, and, when necessary, through other means if such means are identified as a result of studies in *invites ITU-R*,~~

instructs the Director of the Radiocommunication Bureau

to report the results of the implementation of this resolution to the next world radiocommunication conference.

~~*invites ITU-R*~~

~~to conduct, in time for consideration by WRC-11, the appropriate technical, operational and regulatory studies to ensure long-term spectrum availability for the aeronautical mobile-satellite (R) service (AMS(R)S) including:~~

~~i) to study, as a matter of urgency, the existing and future spectrum requirements of the aeronautical mobile-satellite (R) service;~~

~~ii) to assess whether the long-term requirements of the AMS(R)S can be met within the existing allocations with respect to No. **5.357A** while retaining unchanged the generic allocation for the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and without placing undue constraints on the existing systems operating in accordance with the Radio Regulations;~~

~~iii) to complete studies to determine the feasibility and practicality of technical or regulatory means, other than the coordination process referred to in *resolves* 1 or the means considered in Report ITU-R M.2073, in order to ensure adequate access to spectrum to accommodate the AMS(R)S requirements as referenced in *resolves* 3 above, while taking into account the latest technical advances in order to maximize spectral efficiency;~~

~~iv) if the assessment identified in *invites ITU-R* i) and ii) indicates that these requirements cannot be met, to study existing MSS allocations or possible new allocations only for satisfying the requirements of the aeronautical mobile satellite (R) service for communications with priority categories 1 to 6 of Article **44**, for global and seamless operation of civil aviation taking into account the need to avoid undue constraints on existing systems and other services,~~

~~*invites WRC-11*~~

~~to consider the results of the above ITU-R studies and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz,~~

~~*invites*~~

~~the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Air Transport Association (IATA), administrations and other organizations concerned to participate in the studies identified in *invites ITU-R* above.~~

ANNEX D TO SECTION 5/1.7/6

MOD

Editorial Note: This corresponds to the modification of Resolution **222 (Rev.WRC-07)** as per Method D.

RESOLUTION 222 (Rev.WRC-~~07~~12)

Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and ~~studies~~ procedures to ensure long-term spectrum ~~availability~~ access for the aeronautical mobile-satellite (R) service

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that prior to WRC-97, the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) were allocated to the maritime mobile-satellite service and the bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) were allocated on an exclusive basis to the aeronautical mobile-satellite (R) service (AMS(R)S) in most countries;

b) that WRC-97 allocated the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the mobile-satellite service (MSS) to facilitate the assignment of spectrum to multiple MSS systems in a flexible and efficient manner;

c) that WRC-97 adopted No. **5.353A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference distress, urgency and safety communications of the Global Maritime Distress and Safety System (GMDSS) in the bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz and No. **5.357A** giving priority to accommodating spectrum requirements for and protecting from unacceptable interference the AMS(R)S providing transmission of messages with priority categories 1 to 6 in Article **44** in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz;

d) that AMS(R)S is an essential element of ICAO CNS/ATM to provide safety and regularity of flight in the civil air transportation~~,~~;

e) that currently some MSS systems provide distress, emergency and security communications under the mobile-satellite service allocations in the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space),

further considering

a) that coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and, in the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), coordination is partially assisted by regional multilateral meetings;

b) that, in these bands, geostationary mobile-satellite system operators currently use a capacity-planning approach at multilateral coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements;

c) that spectrum requirements for MSS networks, including the GMDSS and AMS(R)S, are currently accommodated through the capacity-planning approach and that, in the bands to which Nos. **5.353A** or **5.357A** apply, this approach, and other methods may assist in accommodating the ~~expected increase of~~long-term spectrum requirements for GMDSS and AMS(R)S;

d) that Report ITU-R M.2073 has concluded that prioritization and inter-system pre-emption between different mobile-satellite systems is not practical and, without a significant advance in technology, is unlikely to be feasible for technical, operational and economical reasons~~. It summarized that prioritization and intersystem real-time pre-emption would not necessarily increase the efficiency of spectrum use compared to the current situation, but it would certainly complicate substantially the coordination process and network structure~~;

e) that there is existing and increasing demand for spectrum for AMS(R)S and non-AMS(R)S by several mobile satellite systems in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz~~, and that the application of this Resolution may impact the provision of services by non-AMS(R)S systems in the mobile satellite service~~;

f) that future requirements for ~~AMS(R)S and~~ GMDSS spectrum may require additional allocations,

recognizing

a) that absolute priority to all telecommunications concerning safety of life at sea, on land, in air or in outer space is given by No. 191 of the ITU Constitution;

b) that the International Civil Aviation Organization (ICAO) has adopted Standards and Recommended Practices (SARPs) addressing satellite communications with aircraft in accordance with the Convention on International Civil Aviation;

c) that all air traffic communications as defined in Annex 10 to the Convention on International Civil Aviation fall within priority categories 1 to 6 of Article **44**;

d) that Table 15-2 of Appendix **15** identifies the bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) for distress and safety purposes in the maritime mobile-satellite service as well as for routine non-safety purposes~~,~~;

e) that any administration having difficulty in applying the procedures of Articles **9** and **11** with respect to No. **5.357A** and this Resolution may at any time request assistance of the Radiocommunication Bureau and the Board under the relevant provisions of the Radio Regulations, including Article **7**, the relevant provisions of Articles **9** and **11**, as well as Articles **13** and **14**,

noting

that, since spectrum resources are limited, there is a need to use them in the most efficient manner within and amongst various MSS systems,

resolves

1 that, in frequency coordination of MSS in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, the notifying administrations of mobile-satellite networks shall ensure that the spectrum needed for distress, urgency and safety communications of GMDSS, as elaborated in Articles **32** and **33**, in the bands where No. **5.353A** applies, and for AMS(R)S communications within priority categories 1 to 6 of Article **44** in the bands where No. **5.357A** applies, is ~~accommodated~~ met;

2 that the notifying administrations of mobile-satellite networks shall ensure the use of the latest technical advances in mobile-satellite systems, in order to achieve the most flexible, efficient and practical use of the generic MSS allocations;

3 that the notifying administrations of mobile-satellite networks shall ensure that, in the event that spectrum requirements of an MSS, including AMS(R)S, network are decreasing relative to the previous coordination meeting, the corresponding unused spectrum resources shall be released to facilitate efficient use of spectrum;

~~3~~4 that the notifying administrations of mobile-satellite networks shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for distress, urgency and safety communication of GMDSS communications, as elaborated in Articles 32 and 33, and for AMS(R)S communications within priority categories 1 to 6 of Article 44; this could be achieved in advance through the coordination process in *resolves* 1~~,~~ and the procedures contained in the Annex to this Resolution shall apply.~~and, when necessary, through other means if such means are identified as a result of studies in *invites ITU-R*,~~

~~*invites ITU-R*~~

~~to conduct, in time for consideration by WRC-11, the appropriate technical, operational and regulatory studies to ensure long-term spectrum availability for the aeronautical mobile-satellite (R) service (AMS(R)S) including:~~

~~i) to study, as a matter of urgency, the existing and future spectrum requirements of the aeronautical mobile-satellite (R) service;~~

~~ii) to assess whether the long-term requirements of the AMS(R)S can be met within the existing allocations with respect to No. **5.357A** while retaining unchanged the generic allocation for the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and without placing undue constraints on the existing systems operating in accordance with the Radio Regulations;~~

~~iii) to complete studies to determine the feasibility and practicality of technical or regulatory means, other than the coordination process referred to in *resolves* 1 or the means considered in Report ITU-R M.2073, in order to ensure adequate access to spectrum to accommodate the AMS(R)S requirements as referenced in *resolves* 3 above, while taking into account the latest technical advances in order to maximize spectral efficiency;~~

~~iv) if the assessment identified in *invites ITU-R* i) and ii) indicates that these requirements cannot be met, to study existing MSS allocations or possible new allocations only for satisfying the requirements of the aeronautical mobile satellite (R) service for communications with priority categories 1 to 6 of Article **44**, for global and seamless operation of civil aviation taking into account the need to avoid undue constraints on existing systems and other services,~~

~~*invites WRC-11*~~

~~to consider the results of the above ITU-R studies and to take appropriate action on this subject, while retaining unchanged the generic allocation to the mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz,~~

~~*invites*~~

~~the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Air Transport Association (IATA), administrations and other organizations concerned to participate in the studies identified in *invites ITU-R* above.~~

ANNEX TO RESOLUTION 222 (Rev.WRC-12)

Procedures to implement No. 5.357A and Resolution 222 (Rev.WRC-12)

1) The notifying administrations of planned MSS, including AMS(R)S, networks shall submit the required technical characteristics and other relevant information of their MSS networks in accordance with Appendix **4**. Coordination of these MSS networks with other affected satellite networks operating in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz shall proceed in accordance with Articles **9** and **11** and other relevant provisions of the Radio Regulations, as appropriate.

2) To further facilitate coordination under Articles **9** and **11**, the notifying administrations of MSS, including AMS(R)S, networks may authorize their respective MSS satellite operators, including AMS(R)S satellite operators, to enter into bilateral and multilateral coordination processes to secure operator agreements on access to spectrum for their satellite networks.

3) At frequency coordination meetings, including operator meetings referred to in 2), the notifying administration of each AMS(R)S network or its respective satellite operator shall present the spectrum requirements of each AMS(R)S network developed in accordance with an agreed methodology and accompanied with the information justifying such requirements. The participants to the frequency coordination meeting then collectively validate the requirements under agreed criteria. The notifying administrations and/or their MSS operators shall accommodate validated AMS(R)S spectrum requirements in accordance with No. **5.357A**.

4) The notifying administrations of MSS networks, including AMS(R)S, have responsibility to ensure that their respective assignments are compatible in the relevant bilateral or multilateral frequency coordination meetings (in particular when those networks span over various geographic area(s)). In the event an administration notifying an AMS(R)S network experiences

difficulty in accommodating its validated AMS(R)S spectrum requirements at these meetings, it should invoke No. **5.357A** (as per the procedures described in Items 5, 6 and 7 below).

5) In the event that a notifying AMS(R)S administration invokes No. **5.357A** based on the results of a bilateral or multilateral coordination operators' meeting, that administration shall ensure that its designated operator does not accept the spectrum-sharing arrangement developed at the operators' meeting, as acceptance indicates that the agreement satisfies requirements presented. That AMS(R)S administration shall inform the other administrations involved in the coordination process of its intention to invoke No. **5.357A**, with a copy to the Radiocommunication Bureau; it then calls for an administrations' frequency coordination meeting of all affected notifying administrations, which should be convened within six months. That notifying AMS(R)S administration shall seek the assistance of the Radiocommunication Bureau in accordance with Articles **7** and **13,** if any of the affected notifying administrations do not agree to meet to resolve the raised issues.

6) At the administrations' frequency coordination meeting, all affected notifying administrations shall review and validate the AMS(R)S requirements of the notifying administration referred to in 5) above. All affected notifying administrations shall cooperate toward accommodating any validated AMS(R)S requirements in accordance with No. **5.357A** and Resolution **222 (Rev.WRC-12)**. In this regard, notifying administrations shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for AMS(R)S communications with priority categories 1 to 6 of Article **44**.

7) If the matter remains unresolved at the administrations' frequency coordination meeting referred to in 6) above, the notifying AMS(R)S administration shall seek the assistance of the Radiocommunication Bureau pursuant to Articles **7** and **13** and notify the respective administrations indicating that its AMS(R)S requirements have not been satisfied. The Radiocommunication Bureau shall provide a report and assistance in accordance with No. **13.3**.

8) If the matter remains unresolved after the Bureau has communicated its conclusions to the notifying AMS(R)S administration involved, the notifying AMS(R)S administration may request a review of the decision of the Bureau in accordance with Article **14**.

9~~8~~) To facilitate the users' long-term planning, each MSS operator providing AMS(R)S service or its notifying administration may decide to disclose information regarding its coordinated AMS(R)S spectrum resource (e.g. to AMS(R)S users of such service).

ADD

DRAFT RESOLUTION [A17-SPECT.METHOD] (WRC-12)

Development of methodology to determine AMS(R)S spectrum requirements within the bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space)

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and, in the bands 1 525-1 559 MHz (space-to-Earth) and

1 626.5-1 660.5 MHz (Earth-to-space), coordination is partially assisted by regional multilateral meetings;

b) that, in these bands, geostationary mobile-satellite system operators currently use a capacity-planning approach at multilateral coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements, including AMS(R)S spectrum requirements;

c) that within ITU-R, there is no agreed methodology for computing AMS(R)S spectrum requirements related to the priority categories 1 to 6 of Article **44**;

d) that within ITU-R, some administrations have expressed a desire to develop an agreed methodology for computing AMS(R)S spectrum requirements on an ongoing basis for purposes of bilateral and multilateral MSS coordinations conducted pursuant to Article **9** of the Radio Regulations;

e) that, since spectrum resources are limited, there is a need to use them in the most efficient manner within and amongst various MSS networks,

recognizing

a) that WRC-97 allocated the bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the mobile-satellite service (MSS) to facilitate the assignment of spectrum to multiple MSS networks in a flexible and efficient manner;

b) that WRC-97 adopted No. 5.357A giving priority to accommodating spectrum requirements for and protecting from unacceptable interference the AMS(R)S providing transmission of messages with priority categories 1 to 6 in Article 44 in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz,

noting

that AMS(R)S is an essential element of ICAO CNS/ATM to provide safety and regularity of flight in the civil air transportation,

resolves

to invite ITU-R to conduct studies on and develop in one or more ITU-R Recommendations a methodology, including clear definitions of input parameters and assumptions to be used, to compute spectrum requirements for AMS(R)S communications related to the priority categories 1 to 6 of Article **44** and to take into account *considering b)* in conducting these studies,

invites

the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), administrations and other organizations concerned to participate in the studies identified in *resolves* above.

AGENDA ITEM 1.13

Annexed are suggested amendments to the draft CPM text in Document CPM11-2/1 on WRC-12 Agenda item 1.13. The suggested amendments are based on proposals in Documents CPM11-2/1+Corr.1, 2, 14, 47, 87, 88, 89, 98, 139, 143, 147 and 159 as well as discussions in Sub-Working Group 5b.

In reviewing the document, the text was restructured to follow a coherent format for the various issues and text was prepared for some previously blank sections. Furthermore, in relationship to intra-service issues, it was decided to recommend to present the previous “Method C” into two separate methods (for the time being called Method C and Method C1). Moreover, in relationship with the methods developed with regard to “Issue C, Inter-service issues”, introductory text and tables were prepared to ease the understanding of the various topics considered and the associated methods.

In relationship to this document, it was decided in Sub-Working Group 5b to recommend that the naming of Methods and Resolutions related to “Issue A, Intra-service sharing” in sections 5 and 6 should be editorially revised in preparing the final CPM Report to follow a coherent format (i.e. Title to Methods and Resolutions). Revised titles to Methods and Resolutions are shown in the table below. However, to ease the discussions during CPM11-2, it is recommended that this revision is conducted after the meeting.

Methods in respect of Issue A (Intra-service issues)	
Current title	Final title
Method A	Method A
Method B	Method B
Method C	Method G
Method C1	Method H
Method D	Method D
Method E	Method E
Method F	Method F
Method G	Method C
Draft New Resolutions associated with methods in respect of Issue A (Intra-service issues)	
Current title	Final title
RESOLUTION [A113-DUE DILIGENCE]	RESOLUTION [B113-DUE DILIGENCE]
RESOLUTION [B113-LIMIT SUBM]	RESOLUTION [G113-1-LIMIT SUBM]
RESOLUTION [C113-TECHN PARAMS]	RESOLUTION [G113-2-TECHN PARAMS]
RESOLUTION [BB113-LIMIT SUBM]	RESOLUTION [H113-1-LIMIT SUBM]
RESOLUTION [CC113-TECHN PARAMS]	RESOLUTION [H113-2-TECHN PARAMS]
RESOLUTION [D113-TECHNICAL COMPATIBILITY]	RESOLUTION [H113-3-TECHNICAL COMPATIBILITY]
RESOLUTION [E113-GUARANTEED ACCESS]	RESOLUTION [D113-GUARANTEED ACCESS]
RESOLUTION [F113-PRIORITY ACCESS]	RESOLUTION [E113-PRIORITY ACCESS]
RESOLUTION [G113-REVIEW SUBM]	RESOLUTION [F113-REVIEW SUBM]

Annex: 1

ANNEX

AGENDA ITEM 1.13

*1.13 to consider the results of ITU-R studies in accordance with Resolution **551 (WRC-07)** and decide on the spectrum usage of the 21.4-22 GHz band for the broadcasting-satellite service and the associated feeder-link bands in Regions 1 and 3;*

Resolution **551 (WRC-07)**: *Use of the band 21.4-22 GHz for broadcasting-satellite service and associated feeder-link bands in Regions 1 and 3*

5/1.13/1 Executive summary

WRC-12 Agenda item 1.13 addresses three main issues:

Issue A: Regulatory mechanisms for the use of the BSS in the frequency band 21.4-22 GHz (intra-service issues).

Issue B: The need or otherwise to allocate specific frequency band(s) for feeder links of the BSS in Regions 1 and 3 (feeder-link issues).

Issue C: Regulatory mechanisms for the protection of/sharing between BSS in Regions 1 and 3, on the one hand, and terrestrial services in Regions 1 and 3 as well as those of Region 2, on the other hand (inter-service issues).

On Issue A, eight methods were proposed. These methods have one main commonality in that they all propose that the regulatory mechanism currently in force, i.e. procedures contained in RR Articles **9**, **11** and **23** be applied for the use of the above-mentioned frequency band (concept/principle of first-come first-served) (Method A). However, Methods B to H propose additional measures with a view to enhance the equitable access to the orbit and spectrum resources in this band. This is further elaborated in sections 4 and 5 and the associated example regulatory text is contained in section 6.

On Issue B, two methods were proposed: a) allocation of the band 24.65-25.25 GHz in Region 1 and of the band 24.65-24.75 in Region 3 for feeder links for the BSS (21.4-22 GHz), and b) no allocation for the feeder link for the BSS (21.4-22 GHz).

On Issue C:

a) for the sharing between terrestrial services in Region 2 and BSS in Regions 1 and 3, these methods were proposed:

- Status quo/current regulatory mechanism, no change to the current Radio Regulations.
- Inclusion in RR Article **21** of a pfd (hard) limit to protect the Region 2 terrestrial services from BSS in Regions 1 and 3.
- Inclusion in RR Article **21** of a pfd (hard) limit to protect BSS receivers in Regions 1 and 3 from terrestrial services in Region 2.
- Inclusion of a pfd coordination threshold in RR Appendix **5** to require the coordination of the BSS in Regions 1 and 3 with terrestrial services in Region 2, if the threshold value is exceeded.
- Inclusion of a pfd coordination threshold in RR Appendix **5** to require the coordination of terrestrial services in Region 2 with BSS in Regions 1 and 3 if the threshold value is exceeded.

b) for the sharing between terrestrial services in Regions 1 and 3 and BSS in Regions 1 and 3, methods were proposed based on the following regulatory scenarios:

- Status quo/current regulatory mechanism, i.e. terrestrial services shall not cause harmful interference to nor claim protection from BSS in Regions 1 and 3.
- Equality of rights between terrestrial services and BSS in Regions 1 and 3.
- Equality of rights between terrestrial services and BSS in certain countries through a new footnote, while the status quo is maintained between terrestrial services and BSS in other countries of Regions 1 and 3.
- Inclusion in RR Article **21** of a pfd (hard) limit to protect the Regions 1 and 3 terrestrial services from BSS in Regions 1 and 3.
- Inclusion in RR of a pfd (hard) limit to protect BSS receivers in Regions 1 and 3 from terrestrial services in Regions 1 and 3.
- Inclusion of a pfd coordination threshold in RR Appendix **5** to require the coordination of the BSS in Regions 1 and 3 with terrestrial services in Regions 1 and 3, if the threshold value is exceeded.
- Inclusion of a pfd coordination threshold in RR Appendix 5 to require the coordination of terrestrial services in Regions 1 and 3 with BSS in Regions 1 and 3 if the threshold value is exceeded.
- Angular avoidance of the GSO by terrestrial systems.

In relationship with WRC-12 Agenda item 1.13, CPM11-2 received and reviewed several input documents and following discussions, made amendments to the CPM Report. It was noted that several of the methods identified under this agenda item had values to technical parameters and criteria that it was deemed required further study. Administrations are invited to contribute to the work of ITU-R to complete these studies in time for WRC-12 to make its decisions.

5/1.13/2 Background

WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the BSS to be implemented after 1 April 2007. The use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92** and **Rev.WRC-03**).

In the interim procedures of Resolution **525 (Rev.WRC-07)** it is indicated that after 1 April 2007 all services other than the BSS in the band 21.4-22.0 GHz in Regions 1 and 3 operating in accordance with the Table of Frequency Allocations may operate subject to not causing harmful interference to BSS (high-definition television (HDTV)) systems nor claiming protection from such systems.

Resolution **551** (**WRC-07**) resolves that ITU-R continue technical and regulatory studies on harmonization of spectrum usage, including planning methodologies, coordination procedures or other procedures, and BSS technologies, in preparation for WRC-12, in the 21.4-22 GHz band and the associated feeder-link bands in Regions 1 and 3, taking into account *considering h)* and *i).* Resolution **551** (**WRC-07**) also resolves that WRC-12 review the results of the studies and decide the usage of the 21.4-22 GHz band and the associated feeder-link bands in Regions 1 and 3.

The 21.4-22.0 GHz band has been recognized by ITU-R as one of the most favourable frequency bands in which advanced digital satellite broadcasting applications which require larger bandwidth capacity than ever before can be successfully implemented. Those applications include UHDTV (Ultra High Definition Television), 3DTV (Three Dimensional Television), VIS (Digital Multimedia Video Information System), Multi-channel HDTV, LSDI (Large Screen Digital

Imagery) and EHRI (Extremely High Resolution Imagery) which have been studied in Study Group 6 to enhance the broadcasting service.

5/1.13/3 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

The provisions relating to the use of the 21.4-22 GHz band to BSS networks in Regions 1 and 3 in the Radio Regulations, including applicable filing procedures, are described as follows:

– RR Articles **5**, **9**[7], **11** and **23;**

– Resolutions **33** (**Rev.WRC-03**), **507** (**Rev.WRC-03**), **525** (**Rev.WRC-03**), **525** (**Rev.WRC-07**), **526** (**WARC-92**), **551** (**WRC-07**) and **739** (**Rev.WRC-07**).

In preparation for WRC-12 Agenda item 1.13 in accordance with Resolution **551** (**WRC-07**), the ITU-R Recommendations and Reports listed in the following table have been reviewed to take into account the most recent data and information.

ITU-R Recommendations and Reports	Subject
Report ITU-R BO.2071	System parameters of BSS between 17.3 GHz and 42.5 GHz and associated feeder links
Recommendation ITU-R BO.1776	Reference power flux-density for the broadcasting-satellite service in th band 21.4-22.0 GHz in Regions 1 and 3
Recommendation ITU-R BO.1659	Mitigation techniques for rain attenuation for broadcasting-satellite service systems in frequency bands between 17.3 GHz and 42.5 GHz
Recommendation ITU-R BO.1785	Intra-service sharing criteria for GSO BSS systems in the band 21.4-22.0 GHz in Regions 1 and 3

NOTE – These Recommendations and Report are currently being processed for updating by ITU-R.

In addition, the following ITU-R Recommendations were considered in the preparations under WRC-12 Agenda item 1.13:

– Recommendation ITU-R S.524-9;

– Recommendations ITU-R P.618-10, ITU-R P.837-5 and ITU-R P.1623-1;

– Recommendations ITU-R BO.652-1, ITU-R BO.790, ITU-R BO.791, ITU-R BO.792, ITU-R BO.1212, ITU-R BO.1213-1, ITU-R BO.1293-2, ITU-R BO.1295, ITU-R BO.1408-1 and ITU-R BO.1516;

– Recommendation ITU-R F.760-1;

– Recommendation ITU-R SM.1633.

The information in this section is provided for guidance to administrations in preparations for WRC-12 Agenda item 1.13 only. This overview should in no way be interpreted to reflect all the provisions of the Radio Regulations relevant to BSS in the 21.4-22 GHz band, nor a complete list of all relevant ITU-R Recommendations and Reports.

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[7] In Regions 1 and 3, RR No. **9.11** shall not apply in accordance with the provisions of Resolution **525 (Rev.WRC-07)**.

5/1.13/4 Analysis of the results of studies

In analysing the results of the studies in preparation for WRC-12 Agenda item 1.13, the issues below were observed:

As of January 2011, for BSS networks in the 21.4-22 GHz band, there were 18 networks for which the information on Resolution **49 (Rev.WRC-07)** was received, 14 networks confirmed brought into use (includes seven networks for which clarification from administrations is awaited and one network suspended under RR No. **11.49**), 7 networks recorded in the Master Register, 20 networks at the stage of notification, 242 networks having sent coordination requests and 703 advance publication information submissions have been received by the Bureau. In 4 of the 7 networks in the MIFR, the mechanism in RR No. **11.41** was applied.

Review of the parameters/data elements relating to submissions received by the Bureau as of July 2010 under RR Articles **9** and **11** for the frequency band 21.4-22.0 GHz or described in relevant ITU-R Recommendations and Reports indicates that there are a wide range of differences between parameters submitted, e.g. space station e.i.r.p. density (14.3 to 80.6 dB(W/MHz)), receiving earth station antenna diameter (25 cm to 2.5 m) and required *C*/*N* (6 to 25 dB).

5/1.13/4.1 Approach to efficient and equitable use of the orbit/spectrum resources

In addressing WRC-12 Agenda item 1.13, as considered in Resolution **551 (WRC-07)**, *a priori* planning is not necessary and should be avoided because it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and developments. This was clearly described in *considering h)* and *i)* and in the *resolves* part of Resolution **551 (WRC-07)**. In other words, it is essential to ensure that existing and planned operations are not adversely affected and thus the flexible use of the spectrum/orbit resources in the band 21.4-22.0 GHz is ensured. On the other hand, the very principle of equitable access to the use of orbit/spectrum resources as stipulated in Article 44 of the ITU Constitution needs also to be fully observed.

5/1.13/4.2 Pfd value vs. availability

The relationship between the power flux-density (pfd) value at the Earth's surface produced by emissions from a space station for BSS and the availability depends mainly on the rain-rate intensity and due to the large variations within the ITU-R Regions, it is very difficult to define a unique pfd value for the entire Regions 1 and 3 area. In some cities with low rain rates (e.g. in Europe), a lower pfd value could be sufficient to ensure an adequate availability and no specific mitigation techniques for rain attenuation would need to be developed. However, variations in pfd towards different geographical locations will lead to an inhomogeneity in the interference levels between networks.

Inversely, in some cities with high rain rates (e.g. in equatorial areas and in Region 3), a higher pfd value would be necessary to achieve an adequate availability and some specific mitigation techniques could also be necessary.

5/1.13/4.3 Feeder links

5/1.13/4.3.1 Flexibility in choice of feeder-link band

To facilitate flexible and efficient spectrum utilization, it is desirable not to have any limitations on the FSS (Earth-to-space) bands which may be used for the associated feeder links. For these feeder links, availability of a continuous band of 600 MHz for this purpose would be highly desirable, without adversely impacting the spectrum resources used by current satellite systems.

5/1.13/4.3.2 Balance between uplink and downlink capacity

ITU-R studies have shown that at present, there is less uplink bandwidth than downlink bandwidth for FSS and BSS in Region 1 in the 15-40 GHz range. As a result, there is no capacity available in Region 1 that allows a 600 MHz band to be used for feeder links for the 21.4-22 GHz BSS while simultaneously being capable of efficiently providing feeder links to the other downlink bands. In Region 3, two blocks could potentially be used for feeder links for the 21.4-22 GHz band; these are 24.75-25.25 GHz and 27-27.5 GHz. However, both these bands are just 500 MHz wide, lacking 100 MHz to provide a 600 MHz feeder-link bandwidth.

In this respect, two options were proposed:

a) In order to ensure the balance between the uplink and downlink capacity in the 20/30 GHz frequency range, WRC-12 may ensure that there exist at least 600 MHz uplink capacity which can be used to feed the 21.4-22 GHz band without being to the detriment of the capability to efficiently feed other downlink frequency bands, preferably in one continuous block. To this effect, WRC-12 may consider the allocation of 600 MHz of FSS (Earth-to-space) capacity for Region 1 in the 15-40 GHz range, preferably in one continuous block. Moreover, WRC-12 may consider ensuring a 600 MHz of FSS (Earth-to-space) capacity for Region 3 in the 15-40 GHz range, either through an allocation expanding one of the above identified bands or through other new allocations.

b) In cases where WRC-12 would decide not to change the Radio Regulations, administrations would need to select uplink capacity for their satellite networks while observing the current situation regarding the availability of FSS uplink capacity.

5/1.13/4.3.2.1 Potential candidate bands

A review of the availability of a new continuous block of 600 MHz of FSS spectrum for providing BSS feeder links associated to the 21.4-22 GHz BSS band has shown that the band 24.65-25.25 GHz appears to be the best candidate band, in particular because the band 24.75-25.25 GHz is already allocated to FSS uplink and used in Region 2 and Region 3. And because FSS/FS compatibility study shows that, under worst-case assumptions (i.e. FS Rx station pointing towards the transmitting feeder-link station, and FSS station azimuth towards the FS Rx station), the separation distances from which the required protection criterion ($I/N = -10$ dB) is achieved, range from 27.7 km to 94.2 km, depending on the types of terrestrial and earth stations considered in the study. The order of magnitude of these separation distances and their variation according to the pointing azimuths of the FS and FSS stations suggest that sharing between FS and FSS is possible in the band 24.65-25.25 GHz.

One contribution to CPM11-2 (Document CPM11-2/88) has indicated that, taking into account the minimum level of restrictions on the FS laid down in the Radio Regulations in the proposed frequency band, interference from the FS to BSS feeder links is manageable under certain conditions. Further studies on this issue are required. In preparation for WRC-12 on this agenda item and in preparing contributions to ITU-R, administrations are invited to take note of this study and its results.

It was observed that feeder links for BSS are characterized by a relatively small number of large earth stations in known locations. Ensuring the frequency sharing situation of such earth stations with existing services would require the development of an associated regulatory provision. One possible solution could be that the antenna diameter shall be larger than a minimum value to be determined by WRC-12 (4.5 m has been suggested during the ITU-R studies).

5/1.13/4.4 Sharing between Regions 1 and 3 BSS networks (intra-service protection)

The interim procedures of Resolution **525 (Rev.WRC-07)** specifies that in coordination between Regions 1 and 3 BSS networks, the procedures of Articles **9** and **11** of the Radio Regulations shall be applied.

The two complementary criteria to determine coordination requirements currently in use are:

– a **coordination arc** (RR Appendix **5**, Table **5-1**, § 8) associated with RR No. **9.7**) which requires that administrations coordinate with all networks inside the arc (currently, the value of the coordination arc is ±16°);

– a **$\Delta T/T$ criterion** that allows administrations outside the arc, at their request, to be included in the coordination requirements, if the $\Delta T/T$ into an assignment of their own networks is demonstrated to exceed a certain limit (RR Nos. **9.41** and **9.42**), or to be excluded from the coordination process even if their networks are situated inside the arc, as the case may be. Currently, the $\Delta T/T$ is calculated by the Radiocommunication Bureau and published as a part of the coordination request and the value of the $\Delta T/T$ limit currently in force in this case is 6%.

It has not been proposed to change this existing mechanism. However, the appropriate value of the coordination arc has been the subject of several studies.

Some administrations are of the view that, based upon the results of studies carried out by ITU-R, the value of ±16° is overly conservative and that the coordination arc for geostationary BSS networks in the 21.4-22 GHz band can be reduced to a value of ±6°.

Some other administrations are of the view that the choice of coordination arc together with $\Delta T/T$ outside the arc or use of coordination arc and pfd (hard) limits outside the arc with a pfd mask to be used inside the arc is a matter to be carefully studied by ITU-R and the result is to be contained in an ITU-R Recommendation. Consequently, these administrations do not support the reduction of the coordination arc from ±16° to ±6°.

5/1.13/4.5 Other issues

Section II of Article 23 of the Radio Regulations

Proposals have been made to modify Section II of Article **23** of the Radio Regulations. However, since this issue has implications for frequency bands and services other than Regions 1 and 3 BSS in the 21.4-22 GHz band, this issue should be dealt with, if necessary, under WRC-12 Agenda item 7.

Improved due diligence information requirements for 21.4-22 GHz band BSS networks

It was recognized that submitted Resolution **49 (Rev.WRC-07)** information for networks that are not operational or have ceased operation, e.g. because the satellite has been moved to another orbit location, would place severe undue constraints on other administrations trying to coordinate networks. A method to improve this situation for BSS in the 21.4-22.0 GHz band was considered (see “Method B” in the following sections 5/1.13/5. 1.2.1 and 5/1.13/6.1.2.1).

It was furthermore recognized that any consideration of application of such a method beyond BSS for Regions 1 and 3 in the 21.4-22 GHz band would need to be addressed by the relevant groups under Resolution **86 (Rev.WRC-07)** (WRC-12 Agenda item 7).

5/1.13/5 Methods to satisfy the agenda item

This section identifies methods to satisfy Agenda item 1.13 on the three main issues:

Issue A: Section 5/1.13/5.1 Mechanisms for the use of the BSS in the frequency band 21.4-22 GHz (intra-service issues)

Issue B: Section 5/1.13/5.2 Feeder-link capacity

Issue C: Section 5/1.13/5.3 Coexistence between BSS in Regions 1 and 3 and terrestrial services in:

– Regions 2 (section 5/1.13/5.3.1);

– Regions 1 and 3 (section 5/1.13/5.3.2).

Views expressed related to Issue A (intra-service issues)

A1 When discussing intra-service methods to satisfy the agenda item, the issue of equitable access was raised and it was mentioned that Article 44 of the ITU Constitution provides amongst other things, that the orbit and spectrum are limited natural resources and must be used rationally, efficiently and economically, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries. It was agreed that *a priori* planning is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and technical developments. It was therefore agreed that coordination and notification procedures for Regions 1 and 3 BSS networks in the 21.4-22 GHz band should be based upon RR Articles **9**, **11** and **23**. However, as discussed below, some administrations proposed supplementary procedures and modifications to RR Articles **9, 11** and **23**.

A2 Some administrations were of the view that the number of BSS networks in the Radiocommunication Bureau’s databases in the band 21.4-22.0 GHz (see section 5/1.13/4) would impose serious difficulties on successful and timely completion of coordination of subsequent submissions. The more networks submitted, the more limitations for timely completion of coordination of subsequent submissions. For these reasons, several Methods (i.e. B, G, H, D, E, F and C) complementary to the general procedures (Method A) were proposed to solve these difficulties.

Some other administrations were of the view that since the number of satellite networks in other frequency bands was higher, the situation in this band does not require any special and additional procedures in this respect. The former administrations did not agree with such an argument in comparing the situation in other bands which are currently very extensively congested due to the extensive number of notified and brought into use filings and the matter has been subject of serious concerns in various ITU fora including the Bureau’s recent workshop. These former administrations were thus of the view that it is inappropriate to expect the same misuse of other bands in this frequency band.

A3 One restriction under Method D is that to make use of this procedure, the coverage of the satellite network would be limited to national coverage. Some administrations which are not in favour of such special measures, in particular the restriction to national coverage, were of the view that only geographically large countries can implement technically feasible and economically viable satellites under such proposed special procedures. Moreover, these administrations are of the view that the feasibility of such measures has not been investigated by ITU-R. Some other administrations did not share such an argument as these special measures are applicable to all countries of different geographical size, including those countries which could form satellite networks covering their combined territories. Moreover, these administrations are of the view that by such measures, the technical compatibility between BSS satellite networks in the 21.4-22 GHz band is improved.

A4 In respect of the application of the special procedures proposed in Methods D and E, some administrations were of the view that if an administration was party to one or more BSS submissions in the 21.4-22 GHz band by a named group of administrations (e.g. by a submission through an intergovernmental organization or through a multi-country agreement), this administration had already used its right to a submission in this frequency band and should not be entitled to further submissions under the special procedures. In the view of these administrations, it would not be reasonable to allow an administration that might already be party to a large number of multi-country submissions over its territory to have the privileges associated with these special procedures for subsequent submissions. Other administrations were of the view that this would discourage administrations from entering into multi-country cooperation and joining multi-country submissions or submissions by intergovernmental organizations. For these reasons, these administrations were of the view that administrations should be allowed to be party to up to [3][1][8] multi-country/intergovernmental submissions and still retain its rights to have its first national submission processed under these special procedures. An intergovernmental/subregional organization can only apply these procedures if the submission does not cover the territories of administrations member to that intergovernmental/subregional system, already having assignments in the MIFR.

A5 Some administrations believe that the supplementary measures to the general procedures (Method A) proposed under Methods B, G, H, D, E, F and C would improve the situation and preserve, to some extent, the equitable access to the orbital and spectrum resources as stipulated in Article 44 of the ITU Constitution. Nevertheless, since many submitted networks did not reflect real satellite projects, these administrations therefore proposed that ITU-R urges administrations to review their submissions for Regions 1 and 3 BSS networks in the 21.4-22 GHz band and, in order to facilitate equitable access of other countries which did not have any submissions in this frequency band, suppress submissions which, in the view of the administration concerned, cannot realistically be brought into use within the period of validity of the submission. The Conference may adopt a Resolution to this effect. Method F proposes wording for such a Resolution.

A6 Also, some administrations were of the view that many satellite networks in the Radiocommunication Bureau's databases did not represent real operational satellites. Under the current rules, as it is possible to inform the Radiocommunication Bureau that a satellite network was brought into use several years ago without updating this information if the operating satellite changes or regular operation of the satellite network is suspended, it is very difficult to verify such information. Furthermore, the current rules allow the submission of due diligence information years in advance of the actual bringing into use, without the requirement to update this information if the administration's plans have changed and a different satellite will ultimately operate under the satellite network filing in question. This could impose difficulties on successful coordination of subsequent submissions. For this reason, Method B proposes ways to resolve such difficulties by proposing new mechanisms to update due diligence information when required. The consequences of revising Resolution **49 (Rev.WRC-07)** needs to be reviewed.

A7 Views were expressed that a wide range of values for various data elements in submissions (see section 5/1.13/4) could cause difficulties in the allocation of spectrum/orbit resources. To obtain more homogenous technical parameters, Method G (and, for special

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[8] The number of the intergovernmental/subregional systems using this procedure ([1][3]) is to be decided by WRC-12 if Method D is chosen.

submissions only, Method D) proposes that a limited range of the permitted values of technical parameters (e.g. e.i.r.p. density radiated by the satellite or the receiving earth station antenna diameter) should be established. Here, there are no restrictions on the use of different signal transmission methods (modulation, coding) and any type of broadcasting content. Restrictions on the coverage area or the number of systems submitted by one administration could also be considered. Other views were expressed that this would lead to limited flexibility for administrations to choose technical parameters according to their applications and needs and would hinder flexibility to adapt to new technical parameters as applications and technology changes. Moreover, introducing such limitations would disadvantage future submissions compared to those networks already submitted. Furthermore, according to these views, in some countries in Regions 1 and 3 the limitation of e.i.r.p. will reduce the service availability due to the heavy rain attenuation and that the limitation of the required *C*/*N* would impact the choice of possible required bandwidth per channel and modulation types and will reduce the flexible use of the future applications such as ultra high-definition television, three-dimensional television, etc.

Views expressed related to Issue B (feeder-link issues)

B1 Some administrations were of the view that the band 24.65-25.25 GHz should be allocated to the FSS for providing BSS feeder links.

B2 Some administrations were of the view that the bands above 24 GHz were not appropriate since these bands have more rain attenuation than those in 18 GHz bands. Other administrations were of the view that there would be not much difference between the 18 GHz bands and the bands above 24 GHz.

B3 Some administrations were of the view that the 18.1-18.4 GHz band could be considered for feeder links for a portion of the 21.4-22 GHz BSS band. This band is allocated to FSS (Earth-to-space) in both Regions 1 and 3 and its use is limited to feeder links for BSS. However, other administrations were of the view that this band was not appropriate since this band is also allocated to FSS (space-to-Earth) in both Regions and cannot be implemented on the same satellite or in the same orbit location on co-located satellites due to intra-system interference.

B4 Some administrations were of the view that no new feeder-link allocations are needed, since there have not been ITU-R studies showing the usage of present allocations being extensively used or congested such that there would be a real need for additional spectrum for feeder links. However, other administrations were of the view that the need to allocate additional spectrum for feeder links is totally independent of the current usage of present uplink allocations. Without allocation of additional uplink spectrum, some downlink spectrum could not be physically operated due to lack of uplink spectrum available, which is not optimal from a spectrum usage efficiency point of view.

Views expressed related to Issue C (inter-service issues) in respect of the relationship between terrestrial services in Region 2 and BSS in Regions 1 and 3

C1 In the current Radio Regulations there are no clear indications on how Region 2 terrestrial services are to be protected (neither threshold level in RR Appendix **5** nor pfd (hard) limit in RR Article **21**). WRC-12 should therefore address the sharing conditions between Regions 1 and 3 BSS in the 21.4-22 GHz and terrestrial services in Region 2. Some administrations were of the view that there is no need to modify the current Radio Regulations in respect of terrestrial services in Region 2. Some other administrations were of the view that an appropriate regulatory mechanism (i.e. pfd (hard) limits or coordination thresholds) shall be implemented to protect terrestrial services in Region 2.

C2 Some administrations were of the view that the establishment of hard limits on BSS in Regions 1 and 3 would be required to protect the terrestrial services in Region 2. This would provide regulatory certainty and reduce the number of coordination cases and the burden on administrations. Other administrations were of the view that a coordination threshold would be preferable since this would increase the flexibility of using the BSS in Regions 1 and 3 while achieving the required protection for the terrestrial services in Region 2.

Views expressed related to Issue C (inter-service issues) in respect of the relationship between BSS and terrestrial services within Regions 1 and 3

C3 In addition to any method in respect of intra-service issues, some administrations were of the view that WRC-12 should also address the sharing conditions between Regions 1 and 3 BSS in the 21.4-22 GHz and terrestrial services in Regions 1 and 3. There is no agreement on the need or otherwise to address the sharing conditions between Regions 1 and 3 BSS and terrestrial networks in Regions 1 and 3.

C4 Since there was no discussion and no observation in WRC-2000, WRC-03, and WRC-07 regarding the usage of terrestrial services in the band 21.4-22.0 GHz, Resolution **525** was not changed by those Conferences regarding the regulatory status of the terrestrial services. Therefore, some administrations are of the view that the situation as of today should be retained, i.e. the use of the band 21.4-22 GHz by stations in services in Regions 1 and 3 other than BSS shall not cause harmful interference to nor claim protection from BSS stations operating in accordance with the Table of Frequency Allocations. As the design and construction of a BSS satellite system requires a long-term planning and as such systems are intend to accommodate small earth station antennas (e.g. 30/45 cm), such a change of status of terrestrial services, in the absence of special measures yet to be decided by the Conference, will have an impact on the usage and feasibility of BSS in the band 21.4-22 GHz for satellites currently in operation, under design and construction. Therefore, Resolution **525 (Rev.WRC-07)** specifies that RR No. **9.11** does not apply to the assignment for BSS. Since emissions from terrestrial services in a specific country have the potential to interfere with BSS earth stations, some administrations are of the opinion that giving equal rights to terrestrial services and BSS in Regions 1 and 3 may prevent deployment of BSS systems in neighbouring countries. Furthermore, a study conducted within ITU-R shows that more than 85% of the frequency range 18.1-30.0 GHz is already allocated to terrestrial services on a primary status (without considering the band 21.4-22.0 GHz), compared to the only 5% of this spectrum available for BSS service.

Some other administrations are of the view that reference to allocations between 18.1 and 30.0 GHz and its corresponding distribution between terrestrial and BSS is not a valid and sound argument not to review the status of allocations to BSS and terrestrial services at WRC-12, taking into account that the initial decision was taken at WARC-92.

C5 Some other administrations are of the opinion that terrestrial services of Regions 1 and 3 also need to be protected from BSS in these Regions because of the rapid development of terrestrial services in the later years. These administrations are of the view that the band 21.4-22 GHz is allocated on a primary basis to the BSS, FS and MS in Regions 1 and 3, whereby the conditions stipulated in Section I of the Annex to Resolution **525 (Rev.WRC-07)** did not come into force until 1 April 2007. These terrestrial services are widely used in some urban areas for many applications such as for backhauling wireless telephone traffic and for carrying business data and communications in corporate networks. These administrations were therefore of the view that, WRC-12 needs to review the situation and status of the terrestrial services in Regions 1 and 3 in order to confirm or otherwise the decision made about 20 years ago at WARC-92, taking into account the rapid development in technology of the use of terrestrial services and their application during the last 20 years and expected to be so in the future. At WARC-92, it was foreseen that there would be a Plan developed for BSS in the 21.4-22 GHz band. WRC-07 decided that planning should be avoided. Some administrations were of the view that the relationship between terrestrial services and BSS in Regions 1 and 3 having equal rights up to 1 April 2007 was decided by WARC-92 which did not specifically exclude planning of this band. Now that it is expected that there would be no planning at WRC-12, the relationship between terrestrial services and BSS in Regions 1 and 3 needs to be reviewed.

C6 Some other administrations were of the view that since WARC-92, it has never been foreseen that there would be a Plan for BSS in the 21.4-22.0 GHz band. And there is no relationship between BSS planning and the necessity of the protection of the terrestrial service in Regions 1 and 3. The current regulatory status between the services in Regions 1 and 3 in the band is clearly described in Resolution **525 (Rev.WRC-07)**.

Some other administrations are of the view that a Plan was foreseen in Resolution **507** (**Rev.WRC-03**) for all BSS services. Planning substantially helps for sharing between BSS and terrestrial services.

5/1.13/5.1 Issue A: Intra-service issues

In respect of issues between one Region 1 or 3 BSS network and other Region 1 and 3 BSS networks, 8 methods to satisfy the agenda item were identified. The Methods A-H, consist of one baseline method (Method A) and seven optional methods with additional measures to this method. Methods G and H are alternatives to each other. Similarly, Methods D and E are alternatives to each other. Methods G/H and D/E are independent of each other. Methods B, F and C are independent of each other as well as of Methods G/H and D/E and any combination of these methods is possible.

5/1.13/5.1.1 Method A (baseline method)

RR Articles **9** and **11** prescribe the procedures for use of spectrum resources of, amongst others, satellite networks (using the principle of "first-come first served"). These provisions are, with the exception of the bands subject to *a priori* Plans (RR Appendices **30**, **30A** and **30B**), applied for coordination and notification of satellite networks in all frequency bands. Method A provides an established procedure for the use of the band for implementation of BSS in the 21.4-22 GHz band in Regions 1 and 3. Submitted systems are protected against interference with the help of the coordination and notification procedures contained in RR Articles **9, 11** and **23**. Section 5/1.13/6.1.1 provides example regulatory text for Method A.

5/1.13/5.1.2 Supplementary methods

5/1.13/5.1.2.1 Method B

This method proposes measures to improve the due diligence requirements currently contained in Resolution **49 (Rev.WRC-07)** to obtain better coherence/consistency between networks recorded in the Master International Frequency Register (MIFR) and real satellites in operation. The main spirit of this, applicable only to Regions 1 and 3 BSS in the 21.4-22 GHz band, is to require that administrations inform the Radiocommunication Bureau immediately after each key event for a specific satellite network filing. The events referred to would include each time a different satellite operates under the specific satellite network filing, or when regular operation under a satellite network filing is suspended. This method proposes to also apply the principles of this method to all satellite networks in Regions 1 and 3 in the frequency band 21.4-22 GHz registered in the MIFR under RR Article **11** on [17 February 2012] (i.e. *resolves* 2 to 6 of draft Resolution **[B113-DUE DILIGENCE] (WRC-12)**.

The aim of this method is to enable identification of each satellite and tracing the orbit location of a satellite at any given time. This will permit easy verification of the information submitted by any administration and would avoid one satellite being registered as being operational in multiple orbit locations simultaneously.

This method may be implemented either by having a separate Resolution or by having a new annex to the existing Resolution **49 (Rev.WRC-07)**. In both cases, it will be necessary to review the relevant provisions of Articles **9** to **14** and other relevant Articles of the Radio Regulations in order to make appropriate cross references with respect to the new Resolution or the new annex to the current Resolution **49 (Rev.WRC-07)** for the band 21.4-22 GHz. In the example text in section 5/1.13/6.1.2.1, this method is shown as a separate conference Resolution.

5/1.13/5.1.2.2 Method G

Method G is supplementary to Method A, but with additional measures. Method G proposes restrictions on network parameters which might facilitate coordination of subsequent submissions.

One element of Method G could be to limit the number of submissions by one administration.

Another element could be that a limited range of the permitted values of technical parameters (e.g. coverage area, e.i.r.p. density radiated by the satellite, the receiving earth station antenna diameter and receiving earth station system noise temperature) is established. This would lead to more homogeneous submissions. Similar course of action has been taken when developing the BSS and FSS Plans. As an alternative, a required maximum generated interference level and a required minimum accepted interference level, possibly accompanied by a significantly reduced coordination arc, could be specified. Further studies are required to determine the appropriate levels for such an approach.

The above-mentioned course of actions described by Method G could be periodically reviewed depending on the actual usage of the orbit in the considered 21.4-22 GHz band (see section 5/1.13/6.3). Further studies are required to determine on what parameters to apply restrictions and what would be the appropriate range.

Some administrations were of the view that a study on technical parameters for this method has not been carried out in full by ITU-R. These technical parameters need to be confirmed by ITU-R before WRC-12.

5/1.13/5.1.2.3 Method H

Method H is supplementary to Methods A and B, but with additional measures. Method H proposes restrictions on network parameters which might facilitate coordination of subsequent submissions.

One element of Method H is to limit to four the number of submissions by one administration per year, either individually or as a member of a group of administrations.

Another element is the establishment of a limited range of the permitted values of technical parameters (e.g. e.i.r.p. density radiated by the satellite, receiving earth station antenna diameter and receiving earth station system noise temperature, etc.) to ensure technical compatibility for satellite networks separated by 4° or more. This would lead to more homogeneous submissions. A similar course of action has been taken when developing the BSS and FSS Plans. The 4° orbital separation would become the coordination arc for such satellite networks, whereas the coordination arc for non-conforming, more interference-producing satellites, would be larger. Further studies are required to determine the appropriate parameters for such an approach.

The above-mentioned course of actions described by Method H can be periodically reviewed depending on the actual usage of the orbit in the considered 21.4-22 GHz band (see section 5/1.13/6.1.2.3). Besides incorporating the elements of Methods A and B, Method H also calls for a resolution requiring administrations to review their submissions and suppress networks that cannot realistically be brought into use, with a view to reducing their number to the absolute minimum necessary.

Some administrations were of the view that a study on technical parameters for this method has not been carried out in full by ITU-R. These technical parameters need to be confirmed by ITU-R before WRC-12.

5/1.13/5.1.2.4 Method D

Method D is based on application (with the assistance of the Radiocommunication Bureau) of the procedure of guarantee orbit-frequency resource allocation (similar to Article **7** of RR Appendix **30B**) for the *special* submission, satisfying the following conditions:

– administration (or a group of named administrations) requesting for special submission should not have any assignments to BSS systems in the 21.4-22 GHz band either notified under RR Article **11** or recorded in the Master Register;

– service and coverage areas of the special BSS system submission should be limited to the national territory of the notifying administration (or to national territories of administrations that have joined the submission);

– all technical parameters including pfd, receiving earth station antennae size and availability correspond with the technical parameters described in Report ITU-R BO.2071 or with a set of parameters, agreed by Conference;

– to prevent paper submissions, the term of bringing into use of the special submission may be limited by [7] years from the date of receipt of the submission.

In case the submission meets the above-stated conditions, the administration obtains the right to have this request processed by the Bureau before all earlier submitted coordination and notification requests for BSS systems in the 21.4-22.0 GHz frequency band and in associated feeder-link band if such band is allocated by the Conference.

This concerns already examined notices under RR Article **9** or notices in the process of examination under RR Articles **9** and **11**.

Upon receipt of such *special* submission the Bureau identifies an appropriate orbital location for the submitted network and defines affected administrations. In selecting the location, BR must ensure compatibility with BSS systems that have completed notification under RR Article **11** or are recorded in the MIFR.

In case of any coordination difficulties of such a special submission with earlier submitted notices, it is suggested that affected administrations are invited to agree on some restrictions, e.g.:

– restriction of service and coverage areas only by countries which have given their explicit agreement to include their territory into the service area of the affected assignment;

– limiting the range of the technical parameters;

– application of the lowered interference criterion C/I.

In the event that the coordination of the network applying this special procedure during [X] months does not lead to a successful completion of the coordination, the affected administration(s) shall be deemed to have given its agreement to the network applying this special procedure. Following the successful notification under RR Article **11**, the Radiocommunication Bureau shall record the assignments in the MIFR.

Thus, in Method D, some of the specified restrictions will be applied only in case of need and only to those earlier submitted notices which will appear affected by the notice of the country which does not have any notified under RR Article **11** or recorded in MIFR assignments in the 21.4-22.0 GHz band and ready to bring into operation a BSS system within [7] years with national/group coverage and with the recommended parameters.

Draft new Resolution (see section 5/1.13/6.1.2.4) contains a possible procedure for the addition of an assignment for *special* BSS systems in the 21.4-22.0 GHz frequency band.

Some administrations were of the view that a study on technical parameters for this method has not been carried out in full by ITU-R. These technical parameters need to be confirmed by ITU-R before WRC-12.

5/1.13/5.1.2.5 Method E

This method proposes that the special measures described below can only be applied once by an individual administration or [1][3] times by an intergovernmental/subregional organization[9] to satisfy their national needs[10]. In both cases (an individual administration or an intergovernmental/subregional organization) can only apply this special procedure if that individual administration does not have or no member of that intergovernmental/subregional organization has a network in the MIFR nor notified under Article **11** nor coordinated or in the process of coordination under Article **9** of the Radio Regulations in this frequency band.

The general principle under this procedure on how to process the network of that administration or intergovernmental/subregional organization which has not submitted any national requirement in this frequency band at the time that submitting their first national or intergovernmental/subregional requirements is as follows:

The networks submitted by these administrations in the order of their receipt will be given top priority, in analogy with the principles contained in RR Appendix **30B** in case of new Member of the Union (in that Appendix all Member States have already obtained an allotment/assignment in the Plan).

The orbital location for networks applying the special procedure could either be specified by the notifying administration, preferably co-located with the orbital location position(s) of the national assignments in RR Appendices **30**, **30A** and/or **30B**, at the time of the submission or should be selected within a specified period (not more than 6 months) by the Radiocommunication Bureau pursuant to the request by the administration, within the arc specified at the time of submission of the responsible administration.

The order of priority will be implemented so as these submissions will be moved to the beginning of the Radiocommunication Bureau’s file waiting list behind all administrations which have already submitted complete information as per RR Appendix **4** data but with one single satellite network per administration which did not have any assignment/satellite network in this frequency band that were either recorded in the MIFR or notified and not yet brought into use, or coordinated or under coordination. The remaining networks submitted by other administrations waiting to be processed under section II of RR Article **9** by the Bureau will be moved to the end of the waiting list of the

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9 Intergovernmental/subregional organization in this context is understood to mean an organization which has networks submitted by an administration on behalf of a group of named administrations.

10 Coverage area should be limited to the national territory of the individual administration which applies the special measures (or the national territories of administrations associated with an intergovernmental/subregional organization). However, taking into account a country having small territory, the minimum half-power beamwidth for the coverage area should be defined.

administrations which have submitted only one network respecting their corresponding date of receipt.

Intergovernmental/subregional organizations could apply this procedure for [3 networks] [1 network] when all members of this subregional system do not have any assignments notified, recorded in the MIFR or in the process of coordination. However, each one of the countries member of that intergovernmental/subregional organization would retain its right to apply the special procedures only in the case where it is not part of an earlier intergovernmental system that have used this procedure and provided that this administration does not have any network neither in the MIFR nor notified under Article **11** nor coordinated or in the process of coordination under Article **9** of the Radio Regulations in this frequency band.

Editor's note: The choice of using this number by intergovernmental systems [3 networks] or [1 network] is to be determined by the Conference, if this Method is adopted.

The notifying administration applying these special procedures (Administration "B") then needs to effect necessary coordination with other administrations that are identified as affected (Administrations "A1", "A2" etc.). In this connection, should any of these latter administrations already have satellite networks in the subject frequency band in the Radiocommunication Bureau's coordination files and covering the national territory of Administration "B" (or the national territories of named administrations that have joined the submission), they shall apply the following course of action in respect of Administration "B" which has had no submission before and having the first submission in the same frequency band and covering its national territory (territories):

a) if the agreement of administrations "A1", "A2" and etc. is required following the application of relevant procedure of RR Article **9** by Administration "B", in order to protect the satellite networks of administrations "A1", "A2" and etc. by the Administration "B" from interference caused by the assignment proposed by the latter administration, the concerned administrations shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;

b) in case of continuing disagreement, and if the administrations of "A1", "A2" and etc. have not communicated to the Radiocommunication Bureau the valid information specified in Annex 2 to Resolution **49 (Rev.WRC-07)**, these administrations shall be deemed to have given their agreements to Administration "B" for recording in the Master Register.

Once the assignments of Administration "B" are recorded in the MIFR, that Administration shall bring the assignments into use within the regulatory time-limit specified in RR No. **11.44** and RR No. **11.48** together with submission of valid information specified in Annex 2 to Resolution **49 (Rev.WRC-07)** and confirmation of the date of bringing into use of the subject assignment**.** Otherwise, assignments in question shall be cancelled from the MIFR together with the associated coordination file(s) from the Radiocommunication Bureau's database.

Should Administration B submit at a later stage a new submission intending to use the above-mentioned procedures, such submission would not benefit from the priority arrangements enshrined in Method E.

In order to fully respect the applicable procedure of RR Article **9** in terms of respecting the date of receipt of submissions, irrespective of their class of station (FSS, MSS, etc.), there is a need that the Radiocommunication Bureau establish a separate processing queue (chain) for Regions 1 and 3 BSS submissions in the 21.4-22 GHz band and then apply the principles of Method E for this separate processing chain. This principle, together with the details of its application, needs to be included in a conference Resolution, e.g. Resolution **525 (Rev.WRC-12)** (see section 5/1.13/6.1.2.5).

Editor's Note: Detailed analysis is needed on the possible impact of these two separate processing queues (e.g. Special Section publication, cost recovery) for any submission which contains BSS frequency band 21.4-22 GHz and any other frequency bands.

5/1.13/5.1.2.6 Method F

Method F proposes measures to improve the access by administrations to orbit/spectrum resources. The key element is a conference Resolution which amongst others would prescribe that administrations:

i) reduce the number of submitted networks;

 – within a few months following the adoption of this Resolution, administrations review their submissions with a view to remove those that are no longer required;

ii) use more homogenous parameters of submitted networks to facilitate coordination by revising the technical parameters of submissions pending processing by the Radiocommunication Bureau at the time of WRC-12; this would not result in any change of the initial date of receipt;

iii) further facilitate coordination by urging administrations to make the utmost efforts to accommodate coordination of submissions by other administrations, especially submissions from administrations with a few submissions covering their own territory;

iv) include a review of the effect of this Resolution in the Report of the Director of the Radiocommunication Bureau to future World Radiocommunication Conferences.

Some administrations were of the view that a study on technical parameters for this method has not been carried out in full by ITU-R. These technical parameters need to be confirmed by ITU-R before WRC-12.

See section 5/1.13/6.1.2.6 for example text for the prospective new conference Resolution.

5/1.13/5.1.2.7 Method C

Without other changes to the criteria for protection between Regions 1 and 3 BSS networks; reduce the coordination arc from ±16° to ±6°. See section 5/1.13/6.1.2.7 for example regulatory text to implement this method.

5/1.13/5.2 Issue B: Feeder-link capacity

Two methods were proposed.

5/1.13/5.2.1 Method B1

No change in the Radio Regulations (NOC).

5/1.13/5.2.2 Method B2

A new allocation to the FSS (Earth-to-space) in the band 24.65-25.25 GHz in Region 1 and in the band 24.65-24.75 GHz in Region 3 together with appropriate regulatory mechanism aiming at limiting the number of earth stations deployed (see also section 5/1.13/4.3.2). See section 5/1.13/6.2.2 for example regulatory text for implementation of this method.

5/1.13/5.3 Issue C: Inter-service issues

5/1.13/5.3.1 Sharing between terrestrial services in Region 2 and Regions 1 and 3 BSS

The band 21.4-22 GHz is allocated to the FS in Region 2 on a primary basis and widely used in urban areas for many applications such as for backhauling wireless telephone traffic and for carrying business data and communications in corporate networks. Preliminary analysis based on one study on the potential for interference into Region 2 terrestrial receivers made by a Region 2 administration indicated that there is a potential for interference if no mitigation techniques are employed by the BSS or terrestrial services or both.

Possible methods are considered with respect to sharing of the 21.4-22 GHz band between BSS in Regions 1 and 3 and terrestrial services in Region 2:

5/1.13/5.3.1.1 Method C1

No modification of the current Radio Regulations in respect of terrestrial services in Region 2.

Should WRC-12 decide not to introduce any modifications of the Radio Regulations in respect of the relationship between BSS in Regions 1 and 3 and terrestrial services in Region 2, the situation between these services would remain unchanged.

5/1.13/5.3.1.2 Method C2

Regulatory mechanisms (i.e. hard limits or coordination thresholds) are implemented to ensure compatibility between BSS in Regions 1 and 3 and terrestrial services in Region 2.

Should WRC-12 so decide that regulatory mechanisms (i.e. hard limits or coordination thresholds) are needed between BSS in Regions 1 and 3 and terrestrial services in Region 2, then modifications to RR Article **21** or RR Appendix **5** would be required.

Two issues have been considered:

a) Protection of Region 2 terrestrial receivers from Region 1 and 3 transmitting BSS space stations.

b) Protection of Regions 1 and 3 receiving earth stations from Region 2 terrestrial transmitters.

For both issues, two principle protection mechanisms have been identified:

1) Use of pfd (hard) limits.

2) Use of pfd thresholds that trigger coordination.

The table below shows the different Methods developed in this respect.

		Protection of Region 2 terrestrial receivers	**Protection of Regions 1 and 3 receiving earth stations**
Regulatory situation remains unchanged		**Method C1** (Sections 5/1.13/5.3.1.1 and 5/1.13/6.3.1.1)	
Regulatory mechanisms implemented to ensure compatibility between terrestrial services in Region 2 and BSS in Regions 1 and 3	Pfd (hard) limits	**Method C2a** (Sections 5/1.13/5.3.1.2.1.1 and 5/1.13/6.3.1.2.1.1)	**Method C2c** (Sections 5/1.13/5.3.1.2.2.1 and 5/1.13/6.3.1.2.2.1)
	Pfd coordination triggers	**Method C2b** (Sections 5/1.13/5.3.1.2.1.2 and 5/1.13/6.3.1.2.1.2)	**Method C2d** (Sections 5/1.13/5.3.1.2.2.2 and 5/1.13/6.3.1.2.2.2)

It is understood that if the Conference was to select the approach of implementing regulatory mechanisms to ensure compatibility between the two services, one out of Methods C2a/C2b and one out of Methods C2c/C2d would be selected.

5/1.13/5.3.1.2.1 Interference from Regions 1 and 3 BSS transmitting space stations into Region 2 terrestrial receivers

Should WRC-12 conclude to protect Region 2 terrestrial services from Regions 1 and 3 BSS in the frequency band 21.4-22 GHz, irrespective of any intra-service method described above decided by the Conference, there should be appropriate regulatory procedure/mechanism to address that issue.

ITU-R studies on the potential for interference into terrestrial services indicated the potential for unacceptable levels of interference into the FS in the absence of any mitigation techniques applied for the FS.

One of these studies furthermore indicated that if appropriate mitigation techniques could be applied by the FS (in the form of 1.5° GSO avoidance), only a very small percentage (less than 1%) of FS receivers would suffer from excess interference (less than 3 dB above a long term I/N criteria of −10 dB) with an emission level of −115/−105 dB(W/m^2 · MHz) at 5°/25° degrees employed by BSS in Regions 1 and 3. Orbital avoidance is easier to achieve in the case of new FS stations.

Another ITU-R study shows that with pfd values of,

$$-115 \text{ dB}(\text{W}/(\text{m}^2 \cdot \text{MHz})) \text{ for } 0° \le \theta \le 5°$$

$$-115 + 0.5(\theta - 5) \text{ dB}(\text{W}/(\text{m}^2 \cdot \text{MHz})) \text{ for } 5° \le \theta \le 25°$$

$$-105 \text{ dB}(\text{W}/(\text{m}^2 \cdot \text{MHz})) \text{ for } \theta > 25°,$$

irrespective of the Region, the probability[11] of exceeding the interference levels are shown in the table below.

	Without FS station antenna GSO avoidance	**With FS station antenna GSO avoidance ≥ 1.5°**
Long-term interference criterion (I/N = −10 dB for 20% of time)	2.63 – 0.23%	1.00 – 0.011%
Short-term interference levels[12] ($I/N \le$ 14 dB for more than 0.01% of time and $I/N \le$ 18 dB for more than 0.0003% of time)	1.5 – 0.1%	0.26 – 1.9·10^{-5}%

In the case of higher (+14 dB and +18 dB) I/N levels, the calculation of the probabilities that these levels will be exceeded was done in a conservative manner whereby the portion of the transmission loss due to atmospheric gases was calculated in accordance with a worst-month (minimum) assumption. Given that the same conditions that exist during periods of higher surface water vapour density also exist when there is an enhancement effect due to the scintillation and multipath, the probabilities associated with exceeding these higher I/N values will be lower than those which have been calculated above when this correlation is taken into account.

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[11] % of FS stations with interference in excess of the long-term criterion or short-term levels indicated.

[12] There is no short-term interference criterion for protection of FS from GSO satellites and these values have been used just for the purpose of conducting the analyses.

Yet another ITU-R study on the impact on Regions 1 and 3 BSS if subject to a pfd service mask, concluded that this in most cases will present no practical constraints for Regions 1 and 3 BSS networks.

Methods to provide such protection are proposed in the following sections.

5/1.13/5.3.1.2.1.1 Method C2a

Pfd (hard) limits:

a1) to be contained in RR Article **21** and RR No. **9.11** does not apply or;

a2) to be contained in a conference Resolution, e.g. a revised Resolution **525 (Rev.WRC-07)**.

If the Conference decide to select pfd (hard) limits, it should be noted that for coordination under RR No. **9.19** (terrestrial stations coordinating with typical BSS receiving earth stations), the frequency bands to be considered in RR Appendix **5** are those identified under RR No. **9.11**. Selecting a pfd (hard) limit in RR Article **21** or in a new conference Resolution to protect terrestrial stations in Region 2 would mean that RR No. **9.11** (prescribing a coordination process) would not be applicable for the 21.4-22 GHz band. As a result, the 21.4-22 GHz band would be deleted from the list of frequency bands in RR Appendix **5** for RR No. **9.11** coordination. This in turn would mean that this frequency band would also disappear from the list of frequency bands for RR No. **9.19** and Regions 1 and 3 BSS receiving earth stations in the 21.4-22 GHz band would thus lose their protection from interference from Region 2 transmitting stations. Selection of pfd (hard) limits to be contained in RR Article **21** or in a new conference Resolution would therefore require listing the band 21.4-22.0 GHz in row dealing with RR No. **9.19** in Table **5-1** of RR Appendix **5** (see section 5/1.13/6.8.1.2).

A possible example of a regulatory procedure/mechanism could be as follows:

1) In the frequency band 21.4-22 GHz to apply pfd (hard) limits in RR Article **21** to BSS networks of Regions 1 and 3. The specified pfd (hard) limit would apply only on the territory of countries of Region 2.

2) Set these pfd (hard) limits to the following values on the territory of Region 2 countries, not to exceed:
   - -115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0° and 5° above the horizontal plane; or
   - -105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25° and 90° above the horizontal plane; or
   - values to be derived by linear interpolation between these limits for angles of arrival between 5° and 25° above the horizontal plane.

The specified pfd (hard) values are consistent with the values contained in Recommendation ITU-R BO.1776. It is also worth noting that Recommendation ITU-R BO.1776 is referenced in Resolutions **525 (Rev.WRC-07)** and **551 (WRC-07)**.

5/1.13/5.3.1.2.1.2 Method C2b

Pfd coordination threshold:

b1) RR No. **9.11** applies and a pfd coordination threshold is specified in Appendix **5** of the Radio Regulations or;

b2) contained in a conference Resolution (similar to former Resolution **77 (WRC-2000)**), e.g. a revised Resolution **525 (Rev.WRC-07)**.

The pfd mask can be used as coordination threshold. The coordination procedure would be triggered only if the pfd value at the Earth's surface on the territory of a Region 2 country is exceeded. A regulatory procedure/mechanism to provide protection of terrestrial networks of Region 2 through a coordination procedure would be based on:

1) application of RR Article **9** coordination procedures to Regions 1 and 3 BSS networks in the band 21.4-22 GHz vis-à-vis Region 2 terrestrial networks;

2) modification of the existing coordination threshold specified in the RR Appendix **5**.

5/1.13/5.3.1.2.2 Interference from Region 2 terrestrial transmitting stations into Regions 1 and 3 BSS receiving earth stations

An adequate mechanism should be developed to address the protection of BSS earth stations in Regions 1 and 3 from Region 2 terrestrial services.

The methods to provide such protection are proposed in the following sections. However, it should be noted that ITU-R has not conducted the relevant studies in this regard.

5/1.13/5.3.1.2.2.1 Method C2c

Pfd (hard) limits to be contained in RR Article **21** and RR No. **9.19** does not apply.

Pfd (hard) limits:

a1) to be contained in RR Article **21** and RR No. **9.19** does not apply or;

a2) to be contained in a conference Resolution, e.g. a revised Resolution **525 (Rev.WRC-07)**.

5/1.13/5.3.1.2.2.2 Method C2d

Pfd coordination threshold:

b1) RR No. **9.19** applies and a pfd coordination threshold is specified in Appendix **5** of the Radio Regulations or;

b2) contained in a conference Resolution (similar to former Resolution **77 (WRC-2000)**), e.g. a revised Resolution **525 (Rev.WRC-07)**.

In respect of b1) above, RR No. **9.19** applies in this situation together with criteria in RR Appendix **5**. However, the entry in RR Appendix **5** for RR No. **9.19** would need to be updated.
Such protection should be ensured through an adequate pfd mask derived with the same mechanism and principles contained in Annex 3 of RR Appendix **30**.

5/1.13/5.3.2 Sharing between terrestrial services and BSS in Regions 1 and 3

Possible methods based on the following regulatory scenarios are considered in respect of sharing of the 21.4-22 GHz band between BSS and terrestrial services of Regions 1 and 3:

– The current regulatory situation remains unchanged;

– BSS and terrestrial services have the same, co-primary, status;

– BSS and terrestrial services have the same, co-primary, status in a list of identified Regions 1 and 3 countries while the current regulatory situation remains unchanged for the other countries.

Two issues have been studied:

a) Protection of Regions 1 and 3 terrestrial receivers from Regions 1 and 3 transmitting BSS space stations.

b) Protection of Regions 1 and 3 receiving earth stations from Regions 1 and 3 terrestrial transmitters.

For both issues, two principle protection mechanisms have been identified:

1) Use of pfd (hard) limits.

2) Use of pfd thresholds that trigger coordination.

The table below shows the different methods developed in this respect.

		Protection of Regions 1 and 3 terrestrial receivers	Protection of Regions 1 and 3 receiving earth stations
Regulatory situation remains unchanged		**Method C3** (Sections 5/1.13/5.3.2.1 and 5/1.13/6.3.2.1)	
BSS and terrestrial services have same co-primary status	pfd (hard) limits	**Method C4a** (Sections 5/1.13/5.3.2.2.1.1 and 5/1.13/6.3.2.2.1.1)	**Method C4c** (Sections 5/1.13/5.3.2.2.2.1 and 5/1.13/6.3.2.2.2.1)
	pfd coordination triggers	**Method C4b** (Sections 5/1.13/5.3.2.2.1.2 and 5/1.13/6.3.2.2.1.2)	**Method C4d** (Sections 5/1.13/5.3.2.2.2.2 and 5/1.13/6.3.2.2.2.2)
BSS and terrestrial services have same co-primary status in a list of countries	pfd (hard) limits	**Method C5a** (Sections 5/1.13/5.3.2.3.1.1 and 5/1.13/6.3.2.3.1.1)	**Method C5c** (Sections 5/1.13/5.3.2.3.2.1 and 5/1.13/6.3.2.3.2.1)
	pfd coordination triggers	**Method C5b** (Sections 5/1.13/5.3.2.3.1.2 and 5/1.13/6.3.2.3.1.2)	**Method C5d** (Sections 5/1.13/5.3.2.3.2.2 and 5/1.13/6.3.2.3.2.2)

It is understood that if the Conference was to decide that terrestrial services and BSS in Regions 1 and 3 are to have the same co-primary status, one out of Methods C4a/C4b and one out of Methods C4c/C4d would be selected. Similarly, it is understood that if the Conference was to decide that terrestrial services and BSS in Regions 1 and 3 are to have the same co-primary status in a list of identified countries, one out of Methods C5a/C5b and one out of Methods C5c/C5d would be selected.

5/1.13/5.3.2.1 Method C3

The current regulatory situation between BSS and terrestrial services in Regions 1 and 3 remain unchanged.

Should WRC-12 decide to keep the regulatory situation between BSS and terrestrial services in Regions 1 and 3 unchanged, terrestrial services in these Regions would continue to operate subject to not causing harmful interference to nor claiming protection from stations in the BSS.

5/1.13/5.3.2.2 Method C4

BSS and terrestrial services in Regions 1 and 3 have the same, co-primary, status.

5/1.13/5.3.2.2.1 Interference from Regions 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers

Should WRC-12 decide to protect Regions 1 and 3 terrestrial networks from Regions 1 and 3 BSS networks with equal rights, the same considerations (hard limit, coordination threshold, conference Resolution) as in section 5/1.13/5.3.1.2.1 (including subsections) above would apply.

See also section 5/1.13/5.3.1.2.1 regarding ITU-R studies on interference from BSS transmitting space stations into terrestrial receivers.

Methods to provide such protection are proposed in the following sections.

5/1.13/5.3.2.2.1.1 Method C4a

Pfd (hard) limits.

See sections 5/1.13/5.3.1.2.1.1 and 5/1.13/6.3.2.2.1.1 for description and possible implementation.

5/1.13/5.3.2.2.1.2 Method C4b

Pfd coordination threshold.

See sections 5/1.13/5.3.1.2.1.2 and 5/1.13/6.3.2.2.1.2 for description and possible implementation.

5/1.13/5.3.2.2.2 Interference from Regions 1 and 3 terrestrial transmitting stations into Regions 1 and 3 BSS receiving earth stations

Should the Conference decide to associate the same status to Regions 1 and 3 terrestrial services as Regions 1 and 3 BSS (equal primary rights), protection criteria are needed. One possible method would be to require the terrestrial transmitting station of Regions 1 and 3 not to exceed certain pfd values in the service area of the BSS network (principles similar to those contained in Annex 3 of RR Appendix **30** could be used with a predetermined pfd value yet to be decided). Moreover, the entry in RR Appendix **5** for RR No. **9.19** would need to be updated. Such protection should be ensured through an adequate pfd mask derived with the same mechanism and principles contained in Annex 3 of RR Appendix **30**. Another method would be to implement pfd (hard) limit through a footnote to the Table of Frequency Allocations contained in RR Article **5** to protect the BSS earth stations from the terrestrial services.

However, it should be noted that ITU-R has not conducted the relevant studies to the issues above.

Methods to provide such protection are proposed in the following sections.

5/1.13/5.3.2.2.2.1 Method C4c

Pfd (hard) limits.

See sections 5/1.13/5.3.1.2.2.1 and 5/1.13/6.3.2.2.2.1 for description and possible implementation.

5/1.13/5.3.2.2.2.2 Method C4d

Pfd coordination thresholds.

See sections 5/1.13/5.3.1.2.2.2 and 5/1.13/6.3.2.2.2.2 for description and possible implementation.

5/1.13/5.3.2.3 Method C5

BSS and terrestrial services in a list of identified Regions 1 and 3 countries have the same, co-primary status.

Should the Conference decide to associate the use of the band 21.4-22 GHz by BSS and terrestrial services on co-primary basis with equal rights in a list of identified Regions 1 and 3 countries (through a footnote to the Table of Frequency Allocations contained in RR Article **5**), BSS and terrestrial services in these countries can be protected as outlined below.

5/1.13/5.3.2.3.1 Interference from Regions 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers

Protection of terrestrial services in the list of identified Region 1 and 3 countries could be provided by the methods in the following sections.

5/1.13/5.3.2.3.1.1 Method C5a

Pfd (hard) limits.

Power flux-density (hard) limit as contained in Table **21-4** of RR Article **21** is applicable to the list of identified Regions 1 and 3 countries in the footnote. See also sections 5/1.13/5.3.1.2.1.1 and 5/1.13/6.3.2.3.1.1 for further description and possible implementation.

5/1.13/5.3.2.3.1.2 Method C5b

Pfd coordination threshold.

RR No. **9.11** is applicable to the list of identified Regions 1 and 3 countries in the footnote if the power flux-density exceeds at any point on the territories of these administrations the coordination threshold level contained in RR Appendix **5**. See also sections 5/1.13/5.3.1.2.1.2 and 5/1.13/6.3.2.3.1.2 for further description and possible implementation.

5/1.13/5.3.2.3.2 Interference from Regions 1 and 3 terrestrial transmitting stations into Regions 1 and 3 BSS receiving earth stations

The same mechanisms as identified in section 5/1.13/5.3.2.2.2 above could be considered to protect BSS, but then limited to terrestrial services of those countries identified in the footnote.

Methods to provide such protection are proposed in the following sections.

5/1.13/5.3.2.3.2.1 Methods C5c

Pfd (hard) limits.

Contained in a footnote in RR Article **5** to protect the BSS earth stations from the terrestrial services and applicable to the list of identified Regions 1 and 3 countries in the footnote. See also sections 5/1.13/5.3.1.2.2.1 and 5/1.13/6.3.2.3.2.1 for further description and possible implementation.

5/1.13/5.3.2.3.2.2 Method C5d

Pfd coordination threshold.

RR No. **9.19** applies in this situation to the list of identified Regions 1 and 3 countries in the footnote. See also sections 5/1.13/5.3.1.2.2.2 and 5/1.13/6.3.2.3.2.2 for further description and possible implementation.

5/1.13/6 Regulatory and procedural considerations

5/1.13/6.1 Issue A: Intra-service issues

5/1.13/6.1.1 Method A (baseline method)

SUP

5.530

Reasons: The regulatory content of Resolution **525 (Rev.WRC-07)** is no longer required.

Editor's note: The proposal to suppress RR No. ***5.530*** *under Method A has to be consistent with the proposals in section 5/1.13/6.3.*

MOD

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[18] **11.37.2** When a frequency assignment to a space station in the broadcasting-satellite service in a non-planned band other than the 21.4-22 GHz band is recorded in the Master Register, a note shall be entered in the remarks column indicating that such recording does not prejudge in any way the decisions to be included in the agreements and associated plans referred to in Resolution **507**.

Reasons: Following a decision by WRC-12, the status of BSS in the 21.4-22 GHz band should not be subject to modifications in the near future. Therefore, Resolution **507 (Rev.WRC-03)** should not be applicable to the 21.4-22 GHz band.

MOD

RESOLUTION 507 (Rev.WRC-~~03~~12)

Establishment of agreements and associated plans for the broadcasting-satellite service[1]

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[1] This Resolution does not apply to the 21.4-22 GHz band.

Reasons: Following a decision by WRC-12, the status of BSS in the 21.4-22 GHz band should not be subject to modifications in the near future. Therefore, Resolution **507 (Rev.WRC-03)** should not be applicable to the 21.4-22 GHz band.

SUP

RESOLUTION 525 (Rev.WRC-07)

Introduction of high-definition television systems of the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3

Reasons: The regulatory content of the Resolution is no longer required.

SUP

RESOLUTION 551 (WRC-07)

Use of the band 21.4-22 GHz for broadcasting-satellite service and associated feeder-link bands in Regions 1 and 3

Reasons: Resolution no longer needed in case Method A is adopted by WRC-12.

5/1.13/6.1.2 Supplementary Methods

5/1.13/6.1.2.1 Method B

MOD

ARTICLE 9

Procedure for effecting coordination with or obtaining agreement of other administrations[1, 2, 3, 4, 5, 6, 7, 8] (WRC-07)

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4 **A.9.4** Resolution **49 (Rev.WRC-~~2000~~12)**[**] and Resolution **[B113-DUE DILIGENCE] (WRC-12)** shall also be applied with respect to those satellite networks and satellite systems that are subject to it. (WRC-12~~000~~)

~~** *Note by the Secretariat:* This Resolution was revised by WRC-07.~~

Reasons: Due diligence requirements for BSS networks in the 21.4-22 GHz band will be under the new Resolution.

MOD

ARTICLE 11

Notification and recording of frequency assignments[1, 2, 3, 4, 5, 6, 7]

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2 **A.11.2** Resolution **49 (Rev.WRC-~~2000~~12)~~**~~** and Resolution **[B113-DUE DILIGENCE] (WRC-12)** shall also be applied with respect to those satellite networks and satellite systems that are subject to it.

~~** Note by the Secretariat: This Resolution was revised by WRC-07.~~

11.44 The notified date[20] of bringing into use of any assignment to a space station of a satellite network shall be not later than seven years following the date of receipt by the Bureau of the relevant complete information under No. **9.1** or **9.2**, as appropriate. Any frequency assignment not brought into use within the required period shall be cancelled by the Bureau after having informed the administration at least three months before the expiry of this period.

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20 **11.44.1** In the case of space station frequency assignments that are brought into use prior to the completion of the coordination process, and for which the Resolution **49 (Rev.WRC-~~03~~12)~~*~~** data or Resolution **[B113-DUE DILIGENCE] (WRC-12)** data, as appropriate, have been submitted to the Bureau, the assignment shall continue to be taken into consideration for a maximum period of seven years from the date of receipt of the relevant information under No. **9.1**. If the first notice for recording of the assignments in question under No. **11.15** has not been received by the Bureau by the end of this seven-year period, the assignments shall no longer be taken into account by the Bureau and administrations. The Bureau shall inform the notifying administration of its pending actions three months in advance.

In the case of satellite networks for which relevant advance publication information has been received prior to 22 November 1997, the corresponding period will be nine years from the date of publication of this information. (WRC-2000)

~~* *Note by the Secretariat:* This Resolution was revised by WRC-07.~~

Reasons: Due diligence requirements for BSS networks in the 21.4-22 GHz band will be under the new Resolution.

MOD

RESOLUTION 49 (Rev.WRC-~~07~~12)

Administrative due diligence applicable to some satellite radiocommunication services

resolves

1 that the administrative due diligence procedure contained in Annex 1 to this Resolution shall be applied as from 22 November 1997 for a satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service, except the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3, for which the advance publication information under No. **9.2B**, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *b)* of Appendices 30 and 30A that involve the addition of new frequencies or orbit positions, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *a)* of Appendices 30 and 30A that extend the service area to another country or countries in addition to the existing service area, or for which the request for additional uses in Regions 1 and 3 under § 4.1 of Article 4 of Appendices 30 and 30A, or for which the submission of information under supplementary provisions applicable to additional uses in the planned bands as defined in Article 2 of Appendix 30B (Section III of Article 6) has been received by the Bureau from 22 November 1997, or for which submission under Article 6 of Appendix **30B (Rev.WRC-07)** is received on or after 17 November 2007, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[1] for inclusion in the Appendix **30B** Plan;

ANNEX 1 TO RESOLUTION 49 (Rev.WRC-~~07~~12)

1 Any satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service with frequency assignments that are subject to coordination under Nos. **9.7**, **9.11**, **9.12**, **9.12A** and **9.13** and Resolution **33 (Rev.WRC-03)**, with the exception of broadcasting-satellite service submissions in the band 21.4-22.0 GHz in Regions 1 and 3, shall be subject to these procedures.

Reasons: Due diligence requirements for BSS networks in the 21.4-22 GHz band will be under the new Resolution. Consequently, Resolution **49 (Rev.WRC-12)** will no longer be applicable for BSS networks in this band.

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[1] See § 2.3 of Appendix **30B (Rev.WRC-07)**.

ADD

DRAFT RESOLUTION [B113-DUE DILIGENCE] (WRC-12)

Long-term access to and development in the band 21.4-22.0 GHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92**, **Rev.WRC-03** and **Rev.WRC-07**);

c) that Resolution **551** (**WRC-07**) instructs ITU-R to continue technical and regulatory studies on harmonization of spectrum usage, coordination procedures or other procedures, and BSS technologies, in preparation for WRC-12, in the 21.4-22 GHz band and the associated feeder-link bands in Regions 1 and 3;

d) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

resolves

1 that the administrative due diligence procedures contained in the Annexes to this Resolution shall be applied as from 17 February 2012 to satellite networks of the broadcasting-satellite service in the 21.4-22.0 GHz band, for which notification or confirmation of the date of bringing into use under the provisions of No. **11.44** or **11.47**, as appropriate, was not received by the Bureau before 17 February 2012; Resolution **49 (Rev.WRC-12)** shall not apply to such satellite networks;

2 that for a satellite network of the broadcasting-satellite service in the 21.4-22.0 GHz band, for which notification or the confirmation of the date of bringing into use under the provisions of No. **11.44** or **11.47** was received by the Bureau before 17 February 2012, the responsible administration shall submit to the Bureau not later than 17 April 2012 the complete due diligence information in accordance with Annex 2 to this Resolution;

3 that the information to be submitted in accordance with *resolves* 2 above shall be signed by an authorized official of the notifying administration or of an administration that is acting on behalf of a group of named administrations, an authorized official of the spacecraft manufacturer and an authorized official of the launch services provider;

4 that if the due diligence information specified in *resolves* 2 above is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information within 30 days;

5 that if the due diligence information specified in *resolves* 2 above is not received by the Bureau before the expiry date specified in *resolves* 2 or 4 above, as appropriate, the frequency assignments in the satellite network of the broadcasting-satellite service in the 21.4-22.0 GHz band shall no longer be taken into account by the Bureau and administrations and shall be cancelled by the Bureau. The Bureau shall publish this information in the BR IFIC;

6 that for satellite networks covered under *resolves* 2 above, the provisions of §§ 9 to 15 of Annex 1 to this Resolution may also apply, as applicable, after the original submission of information in accordance with Annex 2 to this Resolution on 17 April 2012,

further resolves

that the procedures in this Resolution are in addition to Articles **9** or **11** of the Radio Regulations and associated provisions, as applicable,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

ANNEX 1 TO DRAFT RESOLUTION [B113-DUE DILIGENCE] (WRC-12)

1 Any satellite network of the broadcasting-satellite service in the 21.4-22.0 GHz band for which notification or confirmation of the date of bringing into use under the provisions of No. **11.44** or **11.47** was not received by the Bureau before 17 February 2012 shall be subject to these procedures.

2 Within [30/45] days after the actual date of bringing into use, as of 17 February 2012, of a satellite network of the broadcasting-satellite service in the 21.4-22.0 GHz band, the notifying administration shall send to the Bureau the confirmation of the date of bringing into use. The notifying administration shall send to the Bureau the complete due diligence information for the network specified in Annex 2 to this Resolution before the expiry of the period for bringing the satellite network into use as specified in No. **11.44**.

3 The information to be submitted in accordance with § 2 above shall be signed by an authorized official of the notifying administration or of an administration that is acting on behalf of a group of named administrations.

4 If the spacecraft is used for the first time under this Resolution, the due diligence information to be submitted in accordance with § 2 above shall be additionally signed by an authorized official of the spacecraft manufacturer and an authorized official of the launch services provider.

5 On receipt of the due diligence information under § 2 above, the Bureau shall publish the "as received" information on its website within 15 days.

6 On receipt of the due diligence information under § 2 above, the Bureau shall promptly examine that information for completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within not more than two months.

7 If the information is found to be incomplete, the Bureau shall request the administration to submit the missing information within 30 days.

8 A minimum of [X] days after the receipt of the complete due diligence information under § 2 above, the responsible notifying administration or administration that is acting on behalf of a group of named administrations could apply appropriate measures under § 9, if required.

9 The due diligence information submitted in accordance with § 2 and *resolves* 2 above shall be updated and resubmitted to the Bureau by the responsible notifying administration or administration that is acting on behalf of a group of named administrations not later than [30] days

after the end of life or the relocation of the spacecraft associated with the notification under § 2 above.

10 In case of end of life of a spacecraft already used under this Resolution, the responsible notifying administration or administration that is acting on behalf of a group of named administrations shall inform the Bureau within [30] days after the event such the Bureau will take appropriate action to delete the corresponding ITU number associated to such spacecraft.

11 On receipt of the due diligence information under § 9 above, the Bureau shall publish the "as received" information on its website within 15 days.

12 On receipt of the due diligence information under § 9 above, the Bureau shall promptly examine that information for completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within not more than two months.

13 If the information is found to be incomplete, the Bureau shall request the administration to submit the missing information within 30 days.

14 If the complete due diligence information specified in § 9 above is not received by the Bureau in the time-limits specified in this Resolution under §§ 9 and 13 above, as appropriate, the due diligence information and the confirmation of the date of bringing into use shall be considered as invalid and the Bureau shall immediately inform the administration and take the appropriate measures under § 15, if required.

15 After the end of the seven-year period from the date of receipt of the relevant information under No. **9.1**, if the confirmation of the date of bringing into use or the complete due diligence information for satellite network frequency assignments are not received by the Bureau, or if the due diligence information or the confirmation of the date of bringing into use of satellite network frequency assignments are considered as invalid under § 14, the frequency assignments shall no longer be taken into account by the Bureau and administrations and shall be cancelled by the Bureau. The Bureau shall publish this information in the BR IFIC.

ANNEX 2 TO DRAFT RESOLUTION [B113-DUE DILIGENCE] (WRC-12)

Due diligence information

1) Identity of the satellite network

- a) Identity of the satellite network
- b) Name of the administration
- c) Country symbol
- d) Orbital characteristics
- e) Reference to the advance publication information
- f) Reference to the request for coordination
- g) Frequency band(s) included on the satellite network filing
- h) First date of bringing into use in accordance with § 1 of Annex 1
- i) Regulatory status *(tick box)*
  - – Satellite network under operation (only § 2 data should be provided)

  or

– Satellite network suspended (only § 3 data should be provided)

2) Identity of the spacecraft[2] (if satellite network filing is under operation)

a) ITU ID number

or

a) Spacecraft manufacturer

– Name of the spacecraft manufacturer
– Date of execution of the contract
– Delivery date

b) Launch services provider

– Name of the launch vehicle provider
– Date of execution of the contract
– Launch date
– Name of the launch vehicle
– Name and location of the launch facility

c) Frequency band(s) present on board the spacecraft within the band 21.4-22 GHz

3) Suspension information (if satellite network filing is suspended)

a) Date of suspension

b) Planned date of bringing back into regular use.

5/1.13/6.1.2.2 Method G[12]

ADD

DRAFT RESOLUTION [G113-1-LIMIT SUBM] (WRC-12)

Additional regulatory provisions for BSS networks in the band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this band

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92**, **Rev.WRC-03** and **Rev.WRC-07**);

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[2] If the spacecraft is used for the first time under this Resolution, fields “Spacecraft manufacturer”, “Launch services provider” and “Frequency band(s) present on-board on the spacecraft” shall be supplied. Otherwise, if the spacecraft was already used under this Resolution associated to another satellite network, the ID number given by the Bureau at that time shall be indicated.

[12] See section 5/1.13/5.1.2.2.

c) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

further considering

a) that *a priori* planning for BSS networks in the band 21.4-22.0 GHz in Regions 1 and 3 is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and technical developments;

b) that interim arrangements for the use of the bands are on a first-come first-served basis,

recognizing

a) that the number of filings made by some administrations in this band is extremely large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

b) that the number of filings (242 coordination requests received by the Bureau as of January 2011), including those referred to in *recognizing a)* above, is limiting the possibility of coordination of BSS systems submitted by other administrations,

resolves

1 that administrations, in compliance with Article 44 of the ITU Constitution, review their submissions in the band 21.4-22.0 GHz received before 18 February 2012 but not yet processed by the Bureau, with a view to reducing their number of submissions to the absolute minimum necessary, and to indicate to the Bureau the networks, before 30 June 2012, which are no longer required to be considered and processed under Articles **9** and **11** by the Bureau and administrations;

2 that, for submissions received before 18 February 2012 but not yet processed by the Bureau, administrations may modify, without any change in their initial date of receipt, the characteristics within the range of the technical parameters by values commensurate with those adopted by WRC-12[1] for the harmonization of the use of the band 21.4-22.0 GHz and supply new values before the Bureau's examination under Article **9** or **11**;

3 that administrations shall limit the number of new submissions under the provisions of No. **9.6** to [X[2]] for satellite networks for the broadcasting-satellite service in the 21.4-22.0 GHz band submitted to the Bureau,

Editor's note: The issue whether or not to apply the [X] to the submissions of regional organizations is yet to be addressed.

urges administrations

to make its utmost efforts to accommodate submissions received from other administrations with a few filings, especially covering their own territories,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

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[1] See the Annex to Resolution [G113-2-TECHN PARAMS] (WRC-12).

[2] E.g. 4, the appropriate number to be confirmed by the Conference if this Method is chosen.

ADD

DRAFT RESOLUTION [G113-2-TECHN PARAMS] (WRC-12)

Technical parameters of BSS systems in the band 21.4-22.0 GHz

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and the geostationary-satellite orbit and other satellite orbits for these services;

b) that, under Resolution **2 (Rev.WRC-03)**, the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries;

c) that accordingly, a country or a group of countries having registered with the Bureau frequencies for their space radiocommunication services need to take all practicable measures to facilitate the use of new space systems by other countries or groups of countries;

d) that under No. **23.13**, in devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries,

taking into account

a) that WARC-92 allocated the frequency band 21.4-22.0 GHz to BSS in Regions 1 and 3;

b) that in accordance with the interim procedures which were in force until WRC-12, the Radiocommunication Bureau has received from a limited number of countries a great number of submissions which may not be implemented within the available GSO capacity;

c) that in that way applying only the procedures of Articles **9** and **11** may not guarantee equal rights and equitable access to spectrum-orbit resource in the 21.4-22.0 GHz frequency band for all ITU Member States,

noting

that in the existing circumstances the development of a regional Plan of frequency and positions allocation for BSS systems in the 21.4-22.0 GHz frequency band is not practicable,

resolves

1 to impose the boundary conditions on parameters of BSS systems in the frequency band 21.4-22 GHz, according to Annex 1 to this Resolution, to any submissions received by the Bureau under Article **9** after [the date to be determined by WRC-12], provided that such imposition improves the compatibility situation;

2 to impose the same limit as referred to in *resolves* 1 above to any submission received by the Bureau under Article **11** after [the date to be determined by WRC-12], which is not covered under *resolves* 1 above. The Bureau needs to establish the requirements of coordination for other networks received after these submissions for which the limit has been applied, provided that such imposition improves the compatibility situation,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

ANNEX 1 TO DRAFT RESOLUTION [G113-2-TECHN PARAMS] (WRC-12)

Technical parameters of BSS systems submitted in the frequency band 21.4-22.0 GHz

− The coverage area is limited to the national territory of the notifying country; the coverage area is determined by the minimum satellite antenna beam (elliptic or shaped) covering the national territory (or its part) normally at −3 dB level. The coverage area of joint notice from a group of countries should not exceed the limits of the minimum elliptical or shaped beam (normally at −3 dB level) covering the national territory of the group of countries (multiple beams if the countries of the group have no mutual boundary). For countries with a small geographical area, the minimum −3 dB beam size is [X]°.

− The receiving earth station antenna diameter is 45-90 cm. The radiation pattern of the receiving terminal antenna should comply with Recommendation [ITU-R BO.1213-1] or appropriate latest Recommendations. The receiving earth station diameter may be smaller than 45 cm, provided that its radiation pattern is better than or identical to that for 45 cm.

Editor's note: In its final version, reference to either a revised Recommendation ITU-R BO.1213 or a new Recommendation with reference patterns for receiving earth station antennas in the 21.4-22 GHz band will be specified.

− Noise temperature of the receiving earth station is 145-200 K. Noise temperature of the receiving earth station may be smaller than 145 K, provided that more protection than that for 145 K is not required.

– The space station maximum e.i.r.p. should be in the range from 43.2 dBW/MHz to 58.2 dBW/MHz.

− pfd at the Earth's surface under free-space conditions generated by the BSS system shall not exceed:

-115 dBW/MHz/m^2 within elevation angles δ between 0° and 5°,

$-115 + 0.5(\delta - 5)$ dBW/MHz/m^2 within elevation angles δ between 5° and 25°,

-105 dBW/MHz/m^2 at elevation angles above 25° (see Recommendation ITU-R F.760-1).

− The criterion of single permissible interference from other BSS systems should comply with Recommendation [ITU-R BO.1785] or appropriate latest Recommendations.

Editor's note: In its final version, reference to either a revised Recommendation ITU-R BO.1785 or a new Recommendation with reference permissible interference levels will be specified.

Editor's note: During the course of discussions on this Annex, it was agreed that the boundary limits intended to be included in this Annex may be expressed in a more general form e.g. as e.i.r.p. masks and pfd masks.

5/1.13/6.1.2.3 Method H

ADD

DRAFT RESOLUTION [H113-1-LIMIT SUBM] (WRC-12)

Additional regulatory provisions for BSS networks in the band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this band

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92**, **Rev.WRC-03** and **Rev.WRC-07**);

c) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

further considering

a) that *a priori* planning for BSS networks in the band 21.4-22.0 GHz in Regions 1 and 3 is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and technical developments;

b) that interim arrangements for the use of the bands are on a first-come first-served basis,

recognizing

a) that the number of filings made by some administrations in this band is extremely large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

b) that the number of filings (242 coordination requests received by the Bureau as of January 2011), including those referred to in *recognizing a)* above, is limiting the possibility of coordination of BSS systems submitted by other administrations,

resolves

1 that administrations, in compliance with Article 44 of the ITU Constitution, review their submissions in the band 21.4-22.0 GHz received before 18 February 2012 but not yet processed by the Bureau, with a view to reducing their number of submissions to the absolute minimum necessary, and indicate to the Bureau, before 30 June 2012, the networks which are no longer required to be considered and processed under Articles **9** and **11** by the Bureau and administrations;

2 that, for submissions received before 18 February 2012 but not yet processed by the Bureau, administrations may replace, without any change in their initial date of receipt, technical characteristics which do not conform to the range of parameters adopted by WRC-12[1] for the

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[1] See the Annex to Resolution [H113-2-TECHN PARAMS] (WRC-12).

harmonization of the use of the band 21.4-22.0 GHz by conforming characteristics, and supply the new values to the Bureau for examination under Article **9** or **11**;

3 that administrations, either individually or as members of a group of administrations, shall limit the number of new submissions under the provisions of No. **9.6** to four for satellite networks for the broadcasting-satellite service in the 21.4-22.0 GHz band submitted each calendar year to the Bureau,

urges administrations

to make its utmost efforts to accommodate submissions received from other administrations with a few filings, especially covering their own territories,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

ADD

DRAFT RESOLUTION [H113-2-TECHN PARAMS] (WRC-12)

Technical parameters of BSS systems in the band 21.4-22.0 GHz

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and the geostationary-satellite orbit and other satellite orbits for these services;

b) that, under Resolution **2 (Rev.WRC-03)**, the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries;

c) that accordingly, a country or a group of countries having registered with the Bureau frequencies for their space radiocommunication services need to take all practicable measures to facilitate the use of new space systems by other countries or groups of countries;

d) that under No. **23.13**, in devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries,

taking into account

a) that WARC-92 allocated the frequency band 21.4-22.0 GHz to BSS in Regions 1 and 3;

b) that in accordance with the interim procedures which were in force till WRC-12, the Radiocommunication Bureau has received from a limited number of countries a great number of submissions which may not be implemented within the available GSO capacity;

c) that application of the procedures of Articles **9** and **11** alone may not guarantee equal rights and equitable access to spectrum-orbit resources in the 21.4-22.0 GHz frequency band for all ITU Member States,

noting

that in the existing circumstances the development of a regional Plan of frequency and position allocation for BSS systems in the 21.4-22.0 GHz frequency band is not practicable,

resolves

1 to establish a set of technical parameters that will facilitate the harmonization of the use of the frequency band 21.4-22 GHz by BSS satellite networks according to Annex 1 to this Resolution;

2 that any submissions received by the Bureau under Article **9** after [the date to be determined by WRC-12] and which conforms to the set of parameters contained in Annex 1 shall be deemed to be technically compatible with similar submissions received for satellite networks separated by at least 4°;

3 that any submission received by the Bureau under Article **11** after [the date to be determined by WRC-12], which is not covered under *resolves* 2 above, and which conforms to the set of parameters contained in Annex 1, shall be deemed to be technically compatible with similar submissions received for satellite networks separated by at least 4°;

4 that submissions which do not conform with the set of parameters contained in Annex 1 shall not require additional protection from the conforming satellite network or from any future conforming satellite network located at the extremes of a ±4° arc centred at the filed orbital location, and shall coordinate with all identified and confirmed administrations under Article **9** according to the requirements of Appendix **5**;

5 that submissions which do not conform with the set of parameters contained in Annex 1 but were able to complete coordination with all identified and confirmed administrations under Article **9** shall accommodate new conforming networks having a nominal orbital separation of 4° or less;

6 that submissions which conform with the set of parameters contained in Annex 1 but do not meet the 4° orbital separation criterion with respect to earlier satellite networks that conform to the set of parameters contained in Annex 1 shall be deemed to be technically compatible with earlier submissions for satellite networks that are separated by less than 4° provided that the parameters of the new submissions are modified such that these new submissions do not cause more interference to previously submitted networks than that created by a network separated by 4°. These new submissions that do not comply with the 4° orbital separation criterion shall not be afforded additional protection from earlier conforming submissions beyond what is normally afforded to conforming networks separated by 4°;

7 that administrations with satellite networks recorded in the MIFR before 17 February 2012 that are non-conforming (whether by being more sensitive or more interfering), shall be protected but only to the extent of the actual parameters of the implemented network (i.e. coverage, specific frequency segments used, and polarization). Nonetheless, these networks shall to the extent possible accommodate and protect new satellite networks that conform with the technical parameters in this Resolution,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

ANNEX 1 TO DRAFT RESOLUTION [H113-2-TECHN PARAMS] (WRC-12)

Technical parameters of BSS systems submitted in the frequency band 21.4-22.0 GHz

– The service area of the satellite network must be well defined (i.e. using ellipses or shaped beams). However, global beams are not allowed.
– The coverage area should be limited to a defined geographical area.
– The receive earth station antenna diameter is [TBD].
– Noise temperature of the receiving earth station is [TBD].
– The carrier-to-noise ratio at the input of the receive earth station demodulator, C/N = [TBD] in the frequency band 21.4-22.0 GHz.
– pfd mask at the Earth’s surface generated by the BSS system is limited to [TBD].
– The criterion of single permissible interference from other BSS systems should comply with Recommendation [ITU-R BO.1785] or appropriate latest Recommendations.

Editor’s note: In its final version, reference to either a revised Recommendation ITU-R BO.1785 or a new Recommendation with reference permissible interference levels will be specified.

ADD

DRAFT RESOLUTION [H113-3-TECHNICAL COMPATIBILITY] (WRC-12)

Criteria for ensuring technical compatibility of BSS satellite networks in the band 21.4-22.0 GHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92**, **Rev.WRC-03** and **Rev.WRC-07**);

c) that WRC-12 established the definitive procedures to regulate the use of the band 21.4-22.0 GHz for the BSS service in Regions 1 and 3;

d) that Article **9** provides the flexibility to coordinate satellite networks that do not comply with the coordination threshold defined in Appendix **5**;

e) that homogenous technical parameters for satellite networks operating the 21-4-22 GHz can simplify coexistence between satellite networks,

recognizing

that Table **5-1** of Appendix **5** (**Rev.WRC-12**) defines the coordination threshold that ensures the technical compatibility of BSS satellite networks operating in the band 21.4-22.0 GHz in Regions 1 and 3,

resolves

1 that the power flux-density produced at any point on the Earth's surface within Regions 1 and 3 by any BSS satellite network operating in the 21.4-22.0 GHz band shall not exceed [TBD] dB(W/(m^2 · MHz)) under free-space propagation conditions;

2 that administrations that have submitted coordination notices under Article **9** or notification notices under Article **11** for satellite networks in the 21.4-22 GHz band before 17 February 2012 but have not brought these satellite networks into use shall comply with the limits defined in *resolves* 1.

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

TABLE 5-1 (WRC-~~07~~12)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.7** GSO/GSO (*cont.*)		7) 21.4-22 GHz (Regions 1 and 3)	i) Bandwidth overlap; and ii) any network in the BSS and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of ±4° of the nominal orbital position of a proposed network in the BSS conforming to Resolution **[H113-2-TECHN PARAMS]**; or, iii) any network in the BSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the BSS not conforming to Resolution **[H113-2-TECHN PARAMS]**		i) Draft Resolution **[H113-3-TECHNICAL COMPATIBILITY] (WRC-12)** applies. ii) No. **9.41** does not apply. iii) No. **11.41** does not apply to non-conforming satellite networks.

5/1.13/6.1.2.4 Method D

ADD

DRAFT RESOLUTION [D113-GUARANTEED ACCESS] (WRC-12)

Special procedure for coordination and notification of assignments for BSS systems in the 21.4-22.0 GHz frequency band

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and geostationary-satellite orbit and other satellite orbits for these services;

b) that, under Resolution **2 (Rev.WRC-03)**, the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems of other countries;

c) that accordingly, a country or a group of countries having frequency assignments for the broadcasting-satellite service in the 21.4-22.0 GHz band need to take all practical measures to facilitate the use of new space systems by other countries or groups of countries;

d) that according to No. **23.13**, in devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries,

taking into account

a) that WARC-92 allocated the 21.4-22.0 GHz band in Regions 1 and 3 to the broadcasting-satellite service to be implemented after April 2007;

b) that in accordance with the interim procedure in force till WRC-12, the Radiocommunication Bureau has received submissions from a limited number of countries;

c) that in that way, application of only Article **9** and **11** procedures may not guarantee equal rights and equitable access to spectrum-orbit resources in the 21.4-22.0 GHz frequency band,

noting

that in the existing circumstances, the development of a regional Plan of frequency and positions allocation for BSS systems in the 21.4-22.0 GHz frequency band is not practicable,

resolves

to apply the special procedure for coordination and notification of assignments for BSS systems in the 21.4-22.0 GHz frequency band (see the Attachment to this Resolution), granting advantages to submissions from the administrations not having assignments in the 21.4-22.0 GHz frequency band;

ANNEX 1 TO
DRAFT RESOLUTION [D113-GUARANTEED ACCESS] (WRC-12)

Special procedure to be applied for an assignment for a BSS system in the 21.4-22.0 GHz frequency band in Regions 1 and 3

1 The administration of a Member State which does not have any assignments for BSS systems in the 21.4-22 GHz band notified under Article **11** or recorded in the MIFR may apply this special procedure for coordination and notification to a national assignment for a single[1] BSS network or system. The submission under this special procedure shall be considered as an objection under No. **23.13C** that its territory remains in the service area of BSS systems recorded in the MIFR in the 21.4-22 GHz band.

The submission under this special procedure can also be made by a group of ITU Member States each of which meets the requirements of this item.

2 The administration shall submit its request for an assignment to the Bureau, with the following information:

a) the geographical coordinates of no more than 20 test points for determining the minimal beam (elliptical or shape) covering its national territory (or part of it) with −3 dB gain contour;

b) the height above sea level of each of its test points;

c) any special requirement which is to be taken into account to the extent practicable;

d) technical parameters in accordance with specification, based on Report ITU-R BO.2071, given in Annex 1 to this Resolution;

e) an obligation to put the system into operation no later than [7] years from the date of submission for the assignment under this special procedure.

3 Upon receipt of the submission in accordance with § 2, the Bureau shall expeditiously, and ahead of submissions for which the examination under Articles **9**, **11** has not yet started, process the request with respect to its conformity with the Table of Frequency Allocations and the other provisions of the Radio Regulations as well as with the provisions of §§ 1 and 2 of this Resolution.

4 If the submission meets the requirements of §§ 1, 2 and 3 above, the administration obtains the right to have a priority for processing before all earlier submitted coordination and notification requests for BSS systems in the 21.4-22.0 GHz frequency band [and in associated feeder-link band if such band is allocated by the Conference]. The Bureau shall expeditiously, and ahead of submissions for which the examination under Articles **9**, **11** has not yet started, identify appropriate orbital locations and satellite antenna beam parameters for the prospective assignment at which compatibility with notified or recorded in MIFR assignments in given frequency band is provided, and as well as appears minimum possible number of affected [using the criterion *C*/*I*] [*T*/*T*] administrations and systems which have been submitted earlier under Articles **9** and **11**. The Bureau should send the examination results to the requesting administration.

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[1] In case the territory of the requesting administration cannot be covered with the necessary elevation angle from a single GSO position or by a single beam, a submission can consist of more than one position and/or a single beam.

NOTE 1– In case that submitted under this special procedure system has also networks in other frequency bands or networks of other services then these networks are examined by the Bureau according to the relevant provisions of the Radio Regulations concerning these frequency bands and services.

NOTE 2 – In case the request under this special procedure is submitted by a group of countries then each country participating in the group should be in conformity with the provisions of §§ 1, 2 and 3 of this Resolution. The coverage area of group submission should not spread outside the limits of the minimal elliptic beam (by the −3 dB level) covering the national territory of the countries-participants of this group request. Participation of the administration in the group submission according to procedure under draft Resolution **[D113-GUARANTEED ACCESS] (WRC-12)** means that given administration has exhausted the right to use the special procedure.

5 Upon receipt of the Bureau's response under § 4, the requesting administration shall, within thirty days, indicate which of the proposed orbital locations with the associated technical parameters as identified by the Bureau has been selected. During this period, the requesting administration may at any time seek the assistance of the Bureau.

6 If a selection of orbital location for an assignment under § 4 has not been received by the Bureau within the specified time-limit in § 5 above, the Bureau will resume examination of the subsequent submissions under this Resolution or the submissions under Articles **9** and **11**, as appropriate, and inform the requesting administration that its request will be reprocessed under § 4 when the Bureau receives information about the selected orbital location by the administration.

7 Upon receipt of a reply of the requesting administration under § 5, the Bureau should send examination results for the selected position to affected administrations and publish them in a Special Section of its International Frequency Information Circular (BR IFIC). The Bureau shall also specify proposals for modifying parameters of submitted special system and of affected systems necessary for achieving compatibility.

These measures may include: the exclusion of the national territory of the administration requesting an assignment under this special procedure from the coverage areas of the affected networks, limiting the range of the declared technical parameters of these networks (pfd, ES antenna size and so on) with a view to those recommended in the Annex to this Resolution or application of a lowered *C*/*I* criterion.

The Bureau shall send these proposals to achieving compatibility to the affected administrations whose networks are at the stage of coordination or have not been examined yet under Articles **9** and **11**, and to the administration requesting assignment under this special procedure. The above-mentioned affected networks should obtain coordination with the assignment under this special procedure.

If necessary, trilateral or multilateral consultations are carried out, with the assistance of the Bureau, between the administration which has made an application under this special procedure and administrations whose networks are affected.

8 When the proposals under § 7 are agreed by the affected administrations, the Bureau shall notify the special assignment for BSS system and register it in the MIFR provisionally, the entry shall be changed from provisional to definitive after the receipt by BR of the complete due diligence information (Resolution **49 (Rev.WRC-07)**) and publication of the characteristics of the assignment concerned and the result of its examination.

9 In the event that the Bureau's proposals under § 7 during [1] month do not lead to a favourable finding, the Bureau shall notify and record the special submission in the Master Register

provisionally; the entry shall be changed from provisional to definitive after receipt by the Bureau of the complete due diligence information (Resolution **49 (Rev.WRC-07)**).

Administrations whose networks were identified as affected under § 4 should complete coordination in valid common order including coordination with above-mentioned submission under this special procedure.

10 Examination of the following request under this special procedure is carried out in a sequential order: the Bureau starts examination of the next request, if any, immediately after having completed the examination and registration procedure of the previous request under this special procedure.

11 If the system submitted under this special procedure is not brought into use in time, determined by item 2*e)* above, the entry in the MIFR shall be cancelled by the Bureau.

ANNEX 2 TO DRAFT RESOLUTION [D113-GUARANTEED ACCESS] (WRC-12)

Mandatory technical parameters for BSS systems submitted under the special procedure described in Annex 1 above in the 21.4-22.0 GHz frequency band

– The service area is limited by national territory (test points – within national borders) of the notifying country; the coverage area is determined by the minimum satellite antenna beam (elliptic or shaped) covering the national territory (or its part) at −3 dB level. The coverage area of joint submission from a group of countries should not exceed the limits of the minimum elliptic or shaped beam (at −3 dB level) covering the national territory of the group of countries (multiple beams if the countries of the group have no mutual boundary).

– Earth station receiving antenna diameter: 60 cm [45 cm].

– Earth station receive noise temperature: 170 K.

– Carrier-to-noise ratio at the input of the receiving earth station demodulator C/N = 10.7 dB [7.5 dB] in necessary bandwidth of the 21.4-22.0 GHz frequency band.

– The space station maximum e.i.r.p. should be in the range from 43.2 dBW/MHz to 58.2 dBW/MHz:

  − pfd at the Earth's surface generated by the BSS system shall not exceed: −115 dBW/MHz/m^2 within elevation angles δ between 0° and 5°;

  – −115 + 0.5(δ-5) dBW/MHz/m^2 within elevation angles δ between 5° and 20°; −105 dBW/MHz/m^2 at elevation angles above 25° (see Recommendation ITU-R F.760-1) under free-space conditions.

– The reference receiving earth station antenna pattern should correspond to Recommendation [ITU-R BO.1213] or appropriate latest Recommendations.

  Editor's note: In its final version, reference to either a revised Recommendation ITU-R BO.1213 or a new Recommendation with reference patterns for receiving earth station antennas in the 21.4-22 GHz band will be specified.

– The criterion for permissible single-entry interference from other BSS systems should be according to Recommendation [ITU-R BO.1785] or appropriate latest Recommendations.

Editor's note: In its final version, reference to either a revised Recommendation ITU-R BO.1785 or a new Recommendation with reference permissible interference levels will be specified.

5/1.13/6.1.2.5 Method E

ADD

DRAFT RESOLUTION [E113-PRIORITY ACCESS] (WRC-12)

Additional regulatory provisions for BSS networks in the band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this band

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92** and **Rev.WRC-03**);

c) that Resolution **551** (**WRC-07**) instructs ITU-R to continue technical and regulatory studies on harmonization of spectrum usage, coordination procedures or other procedures, and BSS technologies, in the 21.4-22 GHz band and the associated feeder-link bands in Regions 1 and 3;

d) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

considering further

a) that *a priori* planning for BSS networks in the band 21.4-22.0 GHz in Regions 1 and 3 is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real-world demand and technical developments;

b) that interim arrangements for the use of the bands are on a first-come first-served basis;

c) that Articles 12 and 44 of the ITU Constitution lay down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits;

d) that those principles have been included in the Radio Regulations;

e) that Article I of the Agreement between the United Nations and the International Telecommunication Union provides that "the United Nations recognizes the International Telecommunication Union (hereinafter called "the Union") as the specialized agency responsible for taking such action as may be appropriate under its basic instrument for the accomplishment of the purposes set forth therein";

f) that, in accordance with Nos. **11.30**, **11.31** and **11.31.2**, notices shall be examined with respect to the provisions of the Radio Regulations, including the provision relating to the basic principles, appropriate rules of procedure being developed for the purpose,

noting

a) that, in accordance with the provisions of No. 127 of the ITU Convention, the Conference may give instructions to the Sectors of the Union;

b) the RRB report to WRC-2000 and WRC-03 on the application/implementation of Resolution **80** initially adopted by WRC-97;

c) that some of the issues identified in the report referred to in *noting b)* have been considered by WRC-07,

recognizing

a) that the “first-come first-served” concept restricts and sometimes prevents access to and use of certain frequency bands and orbit positions;

b) the relative disadvantage for developing countries in coordination negotiations due to various reasons such as a lack of resources and expertise;

c) the perceived differences in consistency of application of the Radio Regulations;

d) that the submission of “paper” satellites restricts access options;

e) that the considerable processing delays in the Radiocommunication Bureau are due to the very complex procedures required and the large number of filings submitted; these delays contribute to a coordination backlog of [X (number)] months which could extend to three years and creates uncertain regulatory situations, additional delay in the coordination process that cannot be overcome by administrations, and the possible loss of the assignment because the allotted time is exceeded,

recognizing further

a) that at its July 2010 meeting, Working Party 4A received from the Bureau an update of its survey from the March 2010 meeting of Working Party 4A of the various submissions received by the Bureau which include BSS for Regions 1 or 3 for the 21.4-22 GHz band. This survey provides important information for the discussions under WRC-12 Agenda item 1.13;

b) that attached is the information provided by the Bureau, based upon the Bureau databases as of 5 March 2010 with links to the detailed information for each submission.

The table below and the figures summarize the data provided by the Bureau and show the variations for the number of networks at the various stages:

	Advance publication information	**Coordination request**	**Notification submission**	**Networks in MIFR**	**Resolution 49**	**Confirmed brought into use**
October 2008	605	115	21	2	18	
September 2009	599	158	24	9	22	18
March 2010	558	199	22	11	20	19
June 2010	664	229	22	12	23	19
January 2011	703	242	20	7	18	14*

* Includes seven networks for which clarification from administration is awaited and one network suspended under No. **11.49**.

Editorial note: The two above further recognizings should be reviewed by WRC-12.

c) that the number of filings made by some administrations as contained in the above table in this band is extremely large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

d) that the number of filings (242 coordination requests received by the Bureau as of January 2011), including those referred to in *recognizing a)* above, is limiting the possibility of coordination of BSS systems submitted by other administrations,

Editor's note: The above "recognizing further, a) and b)" needs to be amended to indicate the latest statistics on the submitted networks at the time this Resolution is considered by WRC-12.

resolves

1 that administrations, in compliance with Article 44 of the ITU Constitution, review their submissions in the band 21.4-22.0 GHz received before 18 February 2012 but not yet processed by the Bureau, with a view to reducing their number of submissions, and to indicate to the Bureau the networks, before 30 June 2012, which are no longer required to be considered and processed under Articles **9** and **11**;

2 that, for submissions received before [WRC-12] but not yet processed by the Bureau, administrations shall:

2.1 seriously review their files already submitted and reduce them to the minimum absolutely necessary in order to comply with relevant provisions of the Radio Regulations and the principle enshrined in Article 44 of the ITU Constitution;

2.2 for the remaining number of reasonable filings, without any change to the initial date of receipt, modify the characteristics confirming to the range of the technical parameters by values recommended in Report [ITU-R BO.2071] and supply new values before the Bureau's examination under Article **9** or **11**;

3 that the course of actions outlined in the Annex to this Resolution shall apply as a measure to provide the minimum degree of equitable access to those administrations which did not submit any satellite network in the band 21.4-22 GHz pursuant to the relevant provisions of the Radio Regulations and the principles enshrined in Article 44 of the ITU Constitution.

ANNEX TO
DRAFT RESOLUTION [E113-PRIORITY ACCESS] (WRC-12)

1 The special procedures described in this Annex can only be applied by an administration or intergovernmental/subregional organization[1] which does not have any network in the MIFR nor notified under Article **11** nor coordinated or in the process of coordination under Article **9** of the Radio Regulations in the band 21.4-22.0 GHz.

2 The general principle under this procedure on how to process the network of that administration or intergovernmental/subregional organization which has not submitted any national requirement in this frequency band at the time that submitting their first national or intergovernmental/subregional requirements is as follows:

3 The networks submitted by these administrations in the order of their receipt will be given top priority, in analogy with the principles contained in Appendix **30B** in case of new

[1] Intergovernmental/subregional organization in this context is understood to mean an organization which has networks submitted by an administration on behalf of a group of named administrations.

Member of the Union (in that Appendix all Member States have already obtained an allotment/assignment in the Plan).

4 The orbital location for networks applying the special procedure could either be specified by the notifying administration, preferably co-located with the orbital location position(s) of the national assignments in Appendices **30**, **30A** and/or **30B**, at the time of the submission or should be selected within a specified period (not more than 6 months) by the Bureau pursuant to the request by the administration, within the arc specified at the time of submission of the responsible administration.

5 The order of priority will be implemented so as these submissions will be moved to the beginning of the Bureau's file waiting list behind all administrations which have already submitted complete information as per RR Appendix **4** data but with one single satellite network per administration which did not have any assignment/satellite network in this frequency band that were either recorded in the MIFR or notified and not yet brought into use, or coordinated or under coordination. The remaining networks submitted by other administrations waiting to be processed under Section II of Article **9** by the Bureau will be moved to the end of the waiting list of the administrations which have submitted only one network respecting their corresponding date of receipt.

6 Intergovernmental/subregional organizations could apply this procedure for [3 networks] [1 network] when all members of this subregional system do not have any assignments notified, recorded in the MIFR or in the process of coordination. However, each one of the countries member of that intergovernmental/subregional organization would retain its right to apply the special procedures only in the case where it is not part of an earlier intergovernmental system that have used this procedure and provided that this administration does not have any network neither in the MIFR nor notified under Article **11** nor coordinated or in the process of coordination under Article **9** of the Radio Regulations in this frequency band.

Editor's note: The choice of using this number by intergovernmental systems [3 networks] or [1 network] is to be determined by the Conference, if this Method is adopted.

7 The notifying administration applying these special procedures (Administration "B") then needs to effect necessary coordination with other administrations that are identified as affected (Administrations "A1", "A2", etc.). In this connection, should any of these latter administrations already have satellite networks in the subject frequency band in the Bureau's coordination files and covering the national territory of Administration "B" (or national territories of named administrations that have joined the submission), they shall apply the following course of action in respect of Administration "B" which has had no submission before and having the first submission in the same frequency band and covering its national territory (territories):

a) if the agreement of administrations "A1", "A2", etc. is required following the application of relevant procedure of Article **9** by Administration "B", in order to protect the satellite networks of administrations "A1", "A2", etc. by the Administration "B" from interference caused by the assignment proposed by the latter administration, the concerned administrations shall make every possible effort to resolve the difficulties by means of mutually acceptable adjustments to their networks;

b) in case of continuing disagreement, and if the administrations of "A1", "A2", etc. have not communicated to the Bureau the valid information specified in Annex 2 to Resolution **49 (Rev.WRC-07)**, these administrations shall be deemed to have given their agreements to Administration "B" for recording in the Master Register.

8 Once the assignments of Administration "B" are recorded in the MIFR, that Administration shall bring the assignments into use within the regulatory time-limit specified in

No. **11.44** and No. **11.48** together with submission of valid information specified in Annex 2 to Resolution **49 (Rev.WRC-07)** and confirmation of the date of bringing into use of the subject assignment. Otherwise assignments in question shall be cancelled from the MIFR together with the associated coordination file(s) from the Bureau's database.

9 Should Administration "B" submit at a later stage a new submission intending to use the above-mentioned procedures, such submission would not benefit from the priority arrangements enshrined in Method E.

5/1.13/6.1.2.6 Method F

ADD

DRAFT RESOLUTION [F113-REVIEW SUBM] (WRC-12)

Additional regulatory provisions for BSS networks in the band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this band

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the band since 1992 was subject to an interim procedure in accordance with Resolution **525** (**WARC-92** and **Rev.WRC-03**);

c) that Resolution **551** (**WRC-07**) instructs ITU-R to continue technical and regulatory studies on harmonization of spectrum usage, coordination procedures or other procedures, and BSS technologies, in the 21.4-22 GHz band and the associated feeder-link bands in Regions 1 and 3;

d) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

further considering

a) that *a priori* planning is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real-world demand and technical developments;

b) that interim arrangements for the use of the bands are on a first-come first-served basis,

recognizing

a) that the number of filings made by some administrations in this band is extremely large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

b) that the number of filings (229 coordination requests received by the Bureau as of 14.06.2010), including those referred to in *recognizing a)* above, is limiting the possibility of coordination of BSS systems submitted by other administrations,

resolves

1 that administrations, in compliance with Article 44 of the ITU Constitution, review their submissions in the band 21.4-22.0 GHz received before 18 February 2012 but not yet processed by the Bureau, with a view to reducing the number of their submissions, and to indicate to the Bureau the networks, before 30 June 2012, which are no longer required to be considered and processed under Articles **9** and **11**;

2 that, for submissions received before 18 February 2012 but not yet processed by the Bureau, administrations may modify, without any change in their initial date of receipt, the characteristics confirming to the range of the technical parameters by values recommended in Report ITU-R BO.2071 and supply new values before the Bureau's examination under Article **9** or **11**. Such action should not give rise to a second payment of cost-recovery fees;

3 to urge administrations to make utmost efforts to accommodate submissions received from other administrations with few filings, especially covering their own territories,

Editor's note: The action proposed in resolves 2 should not lead to a second payment of cost recovery-fees since this is intended to improve the overall situation for all administrations.

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

5/1.13/6.1.2.7 Method C

MOD

TABLE 5-1 (WRC-07)

Technical conditions for coordination
(see Article **9**)

TABLE 5-1 (*continued*) (WRC-07)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.7** GSO/GSO (*cont.*)	A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radiocommunication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission	7) 21.4-22 GHz in Regions 1 and 3 8~~7~~) Bands above 17.3 GHz, except those defined in § 3), 6) and 7~~6~~) 9~~8~~) Bands above 17.3 GHz except those defined in § 4), 5) and 7~~5~~)	i) Bandwidth overlap, and ii) any network in the BSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±6° of the nominal orbital position of a proposed network in the BSS i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS (see also Resolution **901 (Rev.WRC-07)**) i) Bandwidth overlap, and ii) any network in the FSS or BSS, not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±16° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan, except in the case of a network in the FSS with respect to a network in the FSS (see also Resolution **901 (Rev.WRC-07)**)		With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5), 6), 7), 8) and 9~~8~~), an administration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of *T/T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix 8 exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix 8 shall be used

TABLE 5-1 (*continued*) (WRC-07)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.7** GSO/GSO (*cont.*)		10~~9~~) All frequency bands, other than those in 1), 2), 3), 4), 5), 6), 7), 8) and 9~~8~~), allocated to a space service, and the bands in 1), 2), 3), 4), 5), 6), 7), 8) and 9~~8~~) where the radio service of the proposed network or affected networks is other than the space services listed in the threshold/ condition column, or in the case of coordination of space stations operating in the opposite direction of transmission	i) Bandwidth overlap, and ii) Value of T/T exceeds 6%	Appendix **8**	In application of Article 2A of Appendix **30** for the space operation functions using the guardbands defined in § 3.9 of Annex 5 of Appendix **30**, the threshold/condition specified for the FSS in the bands in 2) applies. In application of Article 2A of Appendix **30A** for the space operation functions using the guardbands defined in § 3.1 and 4.1 of Annex 3 of Appendix **30A**, the threshold/condition specified for the FSS in the bands in 7) applies

5/1.13/6.2 Issue B: Feeder-link capacity

Two methods are proposed in section 5/1.13/5.2:

5/1.13/6.2.1 Method B1

No change in the Radio Regulations (NOC).

5/1.13/6.2.2 Method B2

The following extract of RR Article **5** gives an example of possible regulatory text if WRC-12 should decide to provide additional capacity for feeder links for BSS in Regions 1 and/or 3. The example is given for the 24.65-25.25 GHz (Region 1) and 24.65-24.75 GHz (Region 3) bands, but similar regulatory solutions could be implemented for other bands if so desired.

ARTICLE 5

Frequency allocations

MOD

22-24.75 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
24.65-24.75 FIXED FIXED-SATELLITE (Earth-to-space) MOD 5.535 ADD 5.A113 INTER-SATELLITE	**24.65-24.75** INTER-SATELLITE RADIOLOCATION- SATELLITE (Earth-to-space)	**24.65-24.75** FIXED FIXED-SATELLITE (Earth-to-space) MOD 5.535 ADD 5.A113 INTER-SATELLITE MOBILE 5.533

MOD

24.75-29.9 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) MOD 5.535 ADD 5.A113	**24.75-25.25** FIXED-SATELLITE (Earth-to-space) MOD 5.535	**24.75-25.25** FIXED FIXED-SATELLITE (Earth-to-space) MOD 5.535 MOBILE
. . .		

MOD

5.535 In the band 24.75-25.25 GHz in Region 2 and in the band 24.65-25.25 GHz in Regions 1 and 3, feeder links to stations of the broadcasting-satellite service shall have priority over other uses in the fixed-satellite service (Earth-to-space). Such other uses shall protect and shall not claim protection from existing and future operating feeder-link networks to such broadcasting satellite stations.

ADD

5.A113 Use of the band 24.65-25.25 GHz in Region 1 and 24.65-24.75 GHz in Region 3 by the fixed-satellite service (Earth-to-space) is limited to earth stations using a minimum antenna diameter of [4.5] m.

Editor's note: Additional studies are required to determine the appropriate minimum antenna diameter.

5/1.13/6.3 Issue C: Inter-service sharing

Editor's note: At the Conference, RR No. 5.530 should cover the protection situation in respect of terrestrial services in Regions 1 and 3 as well as in Region 2 based on the ways selected by the Conference.

5/1.13/6.3.1 Sharing between terrestrial services in Region 2 and Regions 1 and 3 BSS

5/1.13/6.3.1.1 Method C1

No changes to the Radio Regulations in respect of the relationship between terrestrial services in Region 2 and BSS in Regions 1 and 3.

5/1.13/6.3.1.2 Method C2

Modifications of the current Radio Regulations in respect of terrestrial services in Region 2.

5/1.13/6.3.1.2.1 Interference from Regions 1 and 3 BSS transmitting space stations into Region 2 terrestrial receivers

5/1.13/6.3.1.2.1.1 Method C2a

Pfd (hard) limits.

The example regulatory text shows possible implementation of the method by including pfd (hard) limits in RR Article **21**.

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section V – Limits of power flux-density from space stations

TABLE **21-4** (Rev.WRC-~~07~~12)

Frequency band	**Service***	**Limit in dB(W/m^2) for angles of arrival (δ) above the horizontal plane**			**Reference bandwidth**
		0°-5°	**5°-25°**	**25°-90°**	
In Regions 1 and 3: ~~21.4-22.0 GHz~~	Broadcasting-satellite	−115[1]	−115 + 0.5(δ − 5)[1]	−105[1]	1 MHz

[1] These limits apply only to Regions 1 and 3 BSS emissions on territories of Region 2.

5/1.13/6.3.1.2.1.2 Method C2b

Pfd coordination threshold.

The example regulatory text shows possible implementation of the method by including a pfd coordination threshold in RR Appendix **5** and amending RR Article **5**.

RR No. **9.11** shall apply to the BSS in Regions 1 and 3 with respect to the terrestrial services in Region 2.

Editor's note: See sections 5/1.13/6.3.2.1, 6.3.2.2 and 6.3.2.3 with relevant subsections.

Editor's note: The choice of pfd (hard) limit or pfd coordination threshold to be decided by WRC-12.

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*continued*) (WRC-~~07~~12)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.11** GSO, non-GSO/ terrestrial	A space station in the BSS in any band shared on an equal primary basis with terrestrial services and where the BSS is not subject to a Plan, in respect of terrestrial services	620-790 MHz 1 452-1 492 MHz 2 310-2 360 MHz 2 535-2 655 MHz (Nos. **5.417A** and **5.418**) 12.5-12.75 GHz (Region 3) 17.3-17.8 GHz (Region 2) ~~21.4-22 GHz (Regions 1 and 3)~~ 74-76 GHz	Bandwidths overlap: The detailed conditions for the application of No. **9.11** in the bands 2 630-2 655 MHz and 2 605-2 630 MHz are provided in Resolution **539 (Rev.WRC-03)** for non-GSO BSS (sound) systems pursuant to Nos. **5.417A** and **5.418**, and in Nos. **5.417A** and **5.418** for GSO BSS (sound) networks pursuant to those provisions. Resolution **549 (WRC-07)** applies in the band 620-790 MHz	Check by using the assigned frequencies and bandwidths	
No. **9.11** GSO, non-GSO/ terrestrial	A space station in the BSS in the 21.4-22 GHz band in respect to terrestrial services of Region 2 only	21.4-22 GHz (Regions 1 and 3)	1) Bandwidth overlap; and 2) The pfd produced on the territory of the country of Region 2 exceeding: -115 dB(W/(m^2 · MHz)) for $0° \leq \theta \leq 5°$ $-115 + 0.5(\theta - 5)$ dB(W/(m^2 · MHz)) for $5° \leq \theta \leq 25°$ -105 dB(W/(m^2 · MHz)) for $\theta > 25°$ where θ is the angle of arrival of the incident wave above the horizontal plane (degrees).		

5/1.13/6.3.1.2.2 Interference from Region 2 terrestrial transmitting stations into Regions 1 and 3 BSS receiving earth stations

5/1.13/6.3.1.2.2.1 Method C2c

Pfd (hard) limits.

The example regulatory text shows possible implementation of the method by including pfd (hard) limits in RR Article **5**.

MOD

18.4-22 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~	**21.4-22** FIXED MOBILE ADD 5.XXX	**21.4-22** FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ 5.531

ADD

5.XXX Before an administration brings into use transmitting stations of the fixed and mobile services in this band it shall ensure that the power flux-density (pfd) produced at [3] m above ground does not exceed −XXX.X dB(W/(m^2 **[**1 MHz**][4** kHz])) for more than [0.01%] of time at the border of the territory of any administration in Regions 1 and 3. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile and fixed services in the band 21.4-22 GHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations.

5/1.13/6.3.1.2.2.2 Method C2d

Pfd coordination threshold.

The example regulatory text shows possible implementation of the method by including a pfd coordination threshold in RR Appendix **5**.

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*end*) (WRC-~~07~~12)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.19** Terrestrial, GSO, non-GSO/ GSO, non-GSO	Any transmitting station of a terrestrial service or a transmitting earth station in the FSS (Earth-to-space) in a frequency band shared on an equal primary basis with the BSS, with respect to typical earth stations included in the service area of a space station in the BSS	Bands listed in No. **9.11**, the band 2 520-2 670 MHz, ~~and~~ the band 11.7-12.7 GHz and the band 21.4-22 GHz	i) Necessary bandwidths overlap; and ii) the power flux-density (pfd) of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix **30** and [TBD] *Editor's note: an adequate pfd mask should be derived with the same mechanism and principles contained in Annex 3 of RR Appendix **30***
…	…	…	…	…	…

5/1.13/6.3.2 Sharing between terrestrial services and BSS in Regions 1 and 3

5/1.13/6.3.2.1 Method C3

The regulatory situation between BSS and terrestrial services in Regions 1 and 3 remain unchanged.

The following gives an example of possible regulatory text if WRC-12 decides to leave unchanged the status of terrestrial services and transfer the relevant Resolution **525 (Rev.WRC-07)** provision to RR No. **5.530**.

MOD

18.4-22 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ 5.530	**21.4-22** FIXED MOBILE	**21.4-22** FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ 5.530 5.531

5.530 In Regions 1 and 3, the use of the band 21.4-22 GHz by ~~the broadcasting-satellite service is subject to the provisions of Resolution~~ ~~**525 (Rev.WRC-07)**~~stations in services other than the broadcasting-satellite service shall not cause harmful interference to nor claim protection from stations in the broadcasting-satellite service operating in accordance with the Table of Frequency Allocations. (WRC-07)

Reasons: Clarify directly in RR Article **5** the regulatory situation of the 21.4-22 GHz band which is set by Resolution **525 (Rev.WRC-07)**.

SUP

RESOLUTION 525 (Rev.WRC-07)

Introduction of high-definition television systems of the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3

Reasons: The regulatory content of the Resolution is transferred to RR No. **5.530**.

5/1.13/6.3.2.2 Method C4

BSS and terrestrial services in Regions 1 and 3 have the same, co-primary, status.

SUP

RESOLUTION 525 (Rev.WRC-07)

Introduction of high-definition television systems of the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3

SUP

5.530

5/1.13/6.3.2.2.1 Interference from Regions 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers

Terrestrial services in these Regions shall be protected either by applying a power flux-density (hard) limit or a coordination threshold for BSS space stations on the territory of Regions 1 and 3 and also by angular separation of antenna pointing of stations in the (FS) terrestrial services with respect to the direction of the GSO, in accordance with Table **21-1** of RR Article **21**.

In respect of regulation of interference from Region 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers when these share the same co-primary status, the below modifications to the Radio Regulations could be applied both in the case pfd (hard) limits or coordination thresholds are used to provide protection of Regions 1 and 3 terrestrial receivers (see sections 5/1.13/6.3.2.2.1.1 (Method C4a) and 5/1.13/6.3.2.2.1.2 (Method C4b) respectively).

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

MOD

21.2 § 2 1) As far as practicable, sites for transmitting[1, 3] stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power (e.i.r.p.) exceeding the values given in Table **21-1** in the frequency bands indicated or receive stations, should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit by at least the angle in degrees shown in the Table, taking into account the effect of atmospheric refraction[2]:

TABLE **21-1** (Rev.WRC-12)

Frequency band (GHz)	**e.i.r.p. value (dBW) (see also Nos. 21.2 and 21.4)**	**Minimum separation angle with respect to geostationary-satellite orbit (degrees)**
1-10	+35	2
10-15	+45	1.5
21.4-22.0	+55	1.5
25.25-27.5	+24 (in any 1 MHz band)	1.5
Other bands above 15 GHz	+55	No limit[3]

---

[1] **21.2.1** For their own protection receiving stations in the fixed or mobile service operating in bands shared with space radiocommunication services (space-to-Earth) should also avoid directing their antennas towards the geostationary-satellite orbit if their sensitivity is sufficiently high that interference from space station transmissions may be significant.

[2] **21.2.2** Information on this subject is given in the most recent version of Recommendation ITU-R SF.765 (see Resolution **27** (**Rev.WRC-03**)[*]).

21.2.3 Not used.

[3] **MOD**
21.2.4 For frequency bands above 15 GHz (except 21.4-22.0 GHz and 25.25-27.5 GHz), there is no restriction on the angular separation for transmitting stations of the fixed or mobile service. This matter is being studied in ITU-R.

[*] *Note by the Secretariat:* This Resolution was revised by WRC-07.

5/1.13/6.3.2.2.1.1 Method C4a

Pfd (hard) limits.

The example regulatory text shows possible implementation of the method by including pfd (hard) limits in RR Article **21** and RR No. **9.11** does not apply.

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

TABLE **21-4** (*continued*) (Rev.WRC-~~07~~12)

Frequency band	Service*	Limit in dB(W/m²) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
19.3-19.7 GHz 22.55-23.55 GHz 24.45-24.75 GHz 25.25-27.5 GHz 27.500-27.501 GHz	Fixed-satellite (space-to-Earth) Earth exploration-satellite (space-to-Earth) Inter-satellite Space research (space-to-Earth)	–115 [13A]	–115 + 0.5(δ – 5) [13A]	–105 [13A]	1 MHz
21.4-22.0 GHz	Broadcasting-satellite	−115	−115 + 0.5(δ − 5)	−105	1 MHz
...	...	...	...	...	...

5/1.13/6.3.2.2.1.2 Method C4b

Pfd coordination threshold.

The example regulatory text shows possible implementation of the method by including a pfd coordination threshold in RR Appendix **5** and amending RR Article **5**.

To implement the protection of Region 1 and 3 terrestrial services using the pfd mask as coordination threshold approach, amendments to RR Article **5** and Appendix **5** would be necessary. Moreover, RR No. **9.11** shall apply to the BSS in Regions 1 and 3 with respect to the terrestrial services in Region 1 and 3 (see section 5/1.13/6.3.1.2 for corresponding regulatory solutions in respect of terrestrial services in Region 2).

Editorial note: The choice of pfd (hard) limit or coordination threshold to be decided by WRC-12.

5/1.13/6.3.2.2.2 Interference from terrestrial transmitting stations into BSS receiving earth stations

5/1.13/6.3.2.2.2.1 Method C4c

Pfd (hard) limits.

The example regulatory text shows possible implementation of the method by including pfd (hard) limits in RR Article **5**.

To implement the protection of Regions 1 and 3 BSS earth station from terrestrial services, the following footnote on pfd (hard) limits is necessary. Adequate pfd values need to be developed.

MOD

18.4-22 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ ADD 5.XXY	**21.4-22** FIXED MOBILE	**21.4-22** FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ 5.531 ADD 5.XXY

ADD

5.XXY Before an administration brings into use transmitting stations of the fixed and mobile services in this band it shall ensure that the power flux-density (pfd) produced at [3] m above ground does not exceed −XXX.X dB(W/(m^2 [1 MHz][**4** kHz])) for more than [0.01%] of time at the border of the territory of any other administration. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of any other administration is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile and fixed services in the band 21.4-22 GHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations.

5/1.13/6.3.2.2.2.2 Method C4d

Pfd coordination thresholds.

The example regulatory text shows possible implementation of the method by including pfd coordination thresholds in in RR Appendix **5**.

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*end*) (WRC-~~07~~12)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.19** Terrestrial, GSO, non-GSO/ GSO, non-GSO	Any transmitting station of a terrestrial service or a transmitting earth station in the FSS (Earth-to-space) in a frequency band shared on an equal primary basis with the BSS, with respect to typical earth stations included in the service area of a space station in the BSS	Bands listed in No. **9.11**, the band 2 520-2 670 MHz,~~ and~~ the band 11.7-12.7 GHz and the band 21.4-22 GHz	i) Necessary bandwidths overlap; and ii) the power flux-density (pfd) of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix **30** and [TBD] *Editor's note: an adequate pfd mask should be derived with the same mechanism and principles contained in Annex 3 of RR Appendix* ***30***
…	…	…	…	…	…

5/1.13/6.3.2.3 Method C5

BSS and terrestrial services have the same, co-primary, status in a list of identified Regions 1 and 3 countries.

5/1.13/6.3.2.3.1 Interference from Regions 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers

Terrestrial services in these countries shall be protected either by applying a power flux-density (hard) limit or a pfd coordination threshold for BSS space stations on the territory of countries identified in the list and also by angular separation of antenna pointing of stations in the (FS) terrestrial services of countries in the list with respect to the direction of the GSO, in accordance with Table **21-1** of RR Article **21**.

In respect of regulation of interference from Region 1 and 3 BSS transmitting space stations into Regions 1 and 3 terrestrial receivers when these share the same co-primary status in a list of identified Regions 1 and 3 countries, the below modifications to the Radio Regulations could be applied both in the case pfd (hard) limits or coordination thresholds are used to provide protection of Regions 1 and 3 terrestrial receivers (see sections 5/1.13/6.3.2.3.1.1 (Method C5a) and 5/1.13/6.3.2.3.1.2 (Method C5b) respectively).

MOD

21.2 § 2 1) As far as practicable, sites for transmitting[1, 3] stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power (e.i.r.p.) exceeding the values given in Table **21-1** in the frequency bands indicated <u>or receive stations</u>, should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit by at least the angle in degrees shown in the Table, taking into account the effect of atmospheric refraction[2]:

---

[1] **21.2.1** For their own protection receiving stations in the fixed or mobile service operating in bands shared with space radiocommunication services (space-to-Earth) should also avoid directing their antennas towards the geostationary-satellite orbit if their sensitivity is sufficiently high that interference from space station transmissions may be significant.

[2] **21.2.2** Information on this subject is given in the most recent version of Recommendation ITU-R SF.765 (see Resolution **27** (**Rev.WRC-03**)*).

21.2.3 Not used.

[3] **MOD**
21.2.4 For frequency bands above 15 GHz (except <u>21.4-22.0 GHz and</u> 25.25-27.5 GHz), there is no restriction on the angular separation for transmitting stations of the fixed or mobile service. This matter is being studied in ITU-R.

* *Note by the Secretariat:* This Resolution was revised by WRC-07.

TABLE **21-1** (Rev.WRC-12)

Frequency band (GHz)	**e.i.r.p. value (dBW) (see also Nos. 21.2 and 21.4)**	**Minimum separation angle with respect to geostationary-satellite orbit (degrees)**
1-10	+35	2
10-15	+45	1.5
21.4-22.0	+55	1.5
25.25-27.5	+24 (in any 1 MHz band)	1.5
Other bands above 15 GHz	+55	No limit[3]

5/1.13/6.3.2.3.1.1 Method C5a

Pfd (hard) limits.

The example regulatory text shows possible implementation of the method by including pfd (hard) limits in RR Article **21** in respect of a list of countries where terrestrial services have the same co-primary status. In respect of other Regions 1 and 3 countries, the current situation would remain (i.e. terrestrial services operate on a non-protected, non-interference basis).

To further modify RR No. **5.530** as mentioned above to exclude those countries which intend to use the terrestrial services and BSS in their territories on co-primary basis and with equality of rights as indicated below:

MOD

5.530 In Regions 1 and 3, except in countries mentioned below, the use of the band 21.4-22 GHz by stations in services other than the broadcasting-satellite service ~~is subject to the provisions of Resolution **525 (Rev.WRC-07)**~~shall not cause harmful interference to nor claim protection from stations in the broadcasting-satellite service operating in accordance with the Table of Frequency Allocations. However, in countries of Regions 1 and 3 (List of the countries), the use of the band 21.4-22 GHz by the broadcasting-satellite service and terrestrial services have equal rights and terrestrial services shall be protected from the station in the broadcasting-satellite service by applying a power flux-density (hard) limit for BSS satellites on the territory of countries in the list as contained in Table **21-4** of RR Article **21**. (WRC-~~07~~12)

5/1.13/6.3.2.3.1.2 Method C5b

Pfd coordination threshold.

The example regulatory text shows possible implementation of the Method by including a pfd coordination threshold in RR Appendix **5** and amending RR Article **5** in respect of a list of countries where terrestrial services have the same co-primary status. In respect of other Regions 1 and 3 countries, the current situation would remain (i.e. terrestrial services operate on a non-protected, non-interference basis).

To further modify RR No. **5.530** as mentioned above to exclude those countries which intend to use the terrestrial services and BSS in their territories on co-primary basis and with equality of rights as indicated below:

MOD

5.530 In Regions 1 and 3, except in countries mentioned in No. **5.C~~B~~113**, the use of the band 21.4-22 GHz by stations in services other than the broadcasting-satellite service ~~is subject to the provisions of Resolution **525 (Rev.WRC-07)**~~shall not cause harmful interference to nor claim protection from stations in the broadcasting-satellite service operating in accordance with the Table of Frequency Allocations. No. **9.11** does not apply with respect to the terrestrial services in Regions 1 and 3. (WRC-~~07~~12)

ADD

5.C113 In countries of Regions 1 and 3 (List of the countries), the use of the band 21.4-22 GHz by the broadcasting-satellite service and terrestrial services is on a co-primary basis with equal rights.

Terrestrial services shall be protected from the station in the broadcasting-satellite service by applying RR No. **9.11** if the power flux-density at any point on the territories of these administrations exceeds the threshold level contained in RR Appendix **5**.

Editor's note: The choice of pfd (hard) limit or coordination threshold to be decided by WRC-12.

5/1.13/6.3.2.3.2 Interference from Regions 1 and 3 terrestrial transmitting stations into Regions 1 and 3 BSS receiving earth stations

5/1.13/6.3.2.3.2.1 Method C5c

Pfd (hard) limits.

To implement the protection of Regions 1 and 3 BSS earth stations from terrestrial services, the following footnote would be necessary. Adequate pfd values shall be developed.

MOD

18.4-22 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
21.4-22 FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ ADD 5.XXZ	**21.4-22** FIXED MOBILE	**21.4-22** FIXED MOBILE BROADCASTING-SATELLITE 5.208B ~~5.530~~ 5.531 ADD 5.XXZ

ADD

5.XXZ Before an administration brings into use transmitting stations of the fixed and mobile services in this band it shall ensure that the power flux-density (pfd) produced at [3] m above ground does not exceed −XXX.X dB(W/(m^2 [1 MHz**]**[4 kHz])) for more than [0.01%] of time at the border of the territory of an administration listed in No. [**5.C113][5.530]**. This limit may be exceeded on the territory of any country whose administration has so agreed. In order to ensure that the pfd limit at the border of the territory of an administration listed in No. [**5.C113][5.530]** is met, the calculations and verification shall be made, taking into account all relevant information, with the mutual agreement of both administrations (the administration responsible for the terrestrial station and the administration responsible for the earth station), with the assistance of the Bureau if so requested. In case of disagreement, the calculation and verification of the pfd shall be made by the Bureau, taking into account the information referred to above. Stations of the mobile and fixed services in the band 21.4-22 GHz shall not claim more protection from space stations than that provided in Table **21-4** of the Radio Regulations.

Editorial note: The list of administrations will be contained in footnote 5.C113 or 5.530 depending on choice of Method C5a or C5b in respect of protection of terrestrial receivers (see sections 5/1.13/6.3.2.3.1.1 and 5/1.13/6.3.2.3.1.2 above).

5/1.13/6.3.2.3.2.2 Method C5d

Pfd coordination thresholds.

The example regulatory text shows possible implementation of the method by including pfd coordination thresholds in RR Appendix **5**.

To implement the protection of Regions 1 and 3 BSS receiving earth stations from terrestrial transmitting stations in Regions 1 and 3 through coordination thresholds, an adequate resolution shall be developed and the following amendments to RR Appendix **5** would be necessary:

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*end*) (WRC-~~07~~12)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.19** Terrestrial, GSO, non-GSO/ GSO, non-GSO	Any transmitting station of a terrestrial service or a transmitting earth station in the FSS (Earth-to-space) in a frequency band shared on an equal primary basis with the BSS, with respect to typical earth stations included in the service area of a space station in the BSS	Bands listed in No. **9.11**, the band 2 520-2 670 MHz,~~ and~~ the band 11.7-12.7 GHz and the band 21.4-22 GHz	i) Necessary bandwidths overlap; and ii) the power flux-density (pfd) of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix **30**/and [TBD] In the band 21.4-22 GHz, No. **9.19** only applies in respect of typical earth stations located in the territory of administrations identified in No. [5.C113][5.530]. *Editorial note: The list of administrations will be contained in footnote 5.C113 or 5.530 depending on choice of Method C5a or C5b in respect of protection of terrestrial receivers (see sections 5/1.13/6.3.2.3.1.1 and 5/1.13/6.3.2.3.1.2 above).*
…	…	…	…	…	…

AGENDA ITEM 1.18

1.18 to consider extending the existing primary and secondary radiodetermination-satellite service (space-to-Earth) allocations in the band 2 483.5-2 500 MHz in order to make a global primary allocation, and to determine the necessary regulatory provisions based upon the results of ITU-R studies, in accordance with Resolution ***613 (WRC-07)****;*

Resolution **613 (WRC-07)**: *Global primary allocation to the radiodetermination-satellite service in the frequency band 2 483.5-2 500 MHz (space-to-Earth)*

5/1.18/1 Executive summary

Currently, the RDSS is allocated to the band 2 483.5-2 500 MHz through a number of separate primary and secondary, regional and country footnote allocations such that there is no overall global RDSS allocation. There is interest from RDSS operators to provide global services in this band with a harmonized regulatory framework. Such a global RDSS allocation with its adjacency to mobile bands could enable innovative low-cost combined navigation/communication applications for the mass market.

Work under WRC-12 Agenda item 1.18 investigated the compatibility of a proposed global primary RDSS allocation in this band with incumbent in-band and adjacent band services.

Sharing studies were carried out between the RDSS and the FS, MSS, MS and the RLS. In addition, compatibility was assessed with the adjacent band MS above 2 500 MHz. Except for the RLS, studies showed that a pfd per RDSS satellite of −129 dBW/(m^2/MHz) will enable the protection of the in-band and adjacent band services. However, studies did not conclude on an appropriate RDSS pfd level to protect RLS and for this case regulatory protection will be sought via an appropriate footnote as is the case for the RNSS sharing with the RLS/RNS in the band 1 215-1 300 MHz.

On the other hand studies showed that in some cases RDSS may experience localized interference. But it is recognized that RDSS is not intended to provide safety-of-life services in this band and thus RR No. **4.10** will not apply to any new global primary RDSS allocation.

Additionally, any new radio regulatory provisions should not impact systems in Region 3 that are currently operating and systems that are planned for which filings have been submitted to the Radiocommunication Bureau under the existing RDSS allocations.

5/1.18/2 Background

The band 2 483.5-2 500 MHz is intended to facilitate navigation signals for existing RDSS systems in this band to be used globally and to support potential signals from new RDSS systems, which, because of this band's proximity to MS allocations above 2.5 GHz, may offer attractive synergies with terrestrial mobile systems due to improved antenna efficiencies and use of shared hardware not possible with other RNSS bands.

WRC-12 Agenda item 1.18 proposed to consider extending the existing primary and secondary RDSS (space-to-Earth) allocations in the band 2 483.5-2 500 MHz in order to make a global primary allocation.

The RDSS is primary in Region 2. The RDSS is secondary in Region 1, subject to RR No. **9.21** (see RR No. **5.371**) and in Region 3 in the Table of Frequency Allocations. However, RR No. **5.400** lists a number of countries in Regions 1 and 3 for which RDSS is allocated as a primary service, still subject to RR No. **9.21**. It is noted that the RLS in Region 1 is secondary. Nevertheless, in Region 1, RR No. **5.399** indicates that harmful interference shall not be caused to, or protection shall not be claimed from, stations of the RLS by stations of the RDSS in countries other than the ones listed in RR No. **5.400.**

Should WRC-12 decide to upgrade the RDSS allocation in Region 1, then No. **5.399** would be degraded, because the relationship between RLS and RDSS would be different. Possible solution to remedy this situation is contained in sections 5/1.18/5 and 5/1.18/6.

5/1.18/3 Summary of technical and operational studies and relevant ITU-R Recommendations

5/1.18/3.1 Summary of studies performed

Several studies have been completed addressing the compatibility between RDSS and other services (FS, MS, MSS, and RLS), and these indicate that sharing is feasible. Results in specific cases are shown below:

Studies carried out using RDSS emissions at −129 dBW/($m^2 \cdot$ MHz) indicate compatibility with FS, MSS and MS.

One study indicated the potential for interference from RDSS into MSS. The study further indicated that relaxing the coordination trigger level given in Appendix **5** of the Radio Regulations, which is regarded by some MSS systems as a hard pfd limit, would allow MSS systems to operate with greater downlink power thereby relieving the potential interference problem.

For the reasons explained in section 5/1.18/2, two studies have also been carried out regarding the compatibility between the RDSS and the RLS. These studies were performed for one type of RDSS system and several types of RLS stations operating in the frequency band 2 483.5-2 500 MHz. The results suggest that RDSS emissions will impact the RLS, however, there is no clear figure on which level of impact may be considered as acceptable.

5/1.18/3.2 Applicable characteristics and Recommendations

List of relevant ITU-R Recommendations and Report: Recommendations ITU-R S.672-4, ITU-R F.699, ITU-R F.1108-4, ITU-R M.1184-2 and ITU-R F.1245; Report ITU-R M.2116.

The relevant parameters of services and applications that utilize the 2 483.5-2 500 MHz band are summarized in Table 1.

TABLE 1

Summary of characteristics of services and applications utilizing the 2 483.5-2 500 MHz band

Service or application	**Emission characteristics**				**C/N**	**Interference criteria**	**Emission restrictions**
	Receiver/carrier bandwidth	**Antenna pattern**	**e.i.r.p.**	**Modulation**			
Fixed service	14 MHz	Rec. ITU-R F.699/F.1245, 25 dBi maximum antenna gain	26-33 dBW	MSK or QPSK	N/A	Maximum acceptable received power −150 dBW/MHz (20%) −114 dBW/MHz (0.005%)	None
SAP/SAB [1]	8 MHz (wireless video camera links)	Usually omnidirectional	0 dBW	OFDM (video)	N/A	−137.6 dBW/8 MHz (I/N = −10 dB)	None
Mobile service [2]	5.0 MHz	N/A	22-24 dBW	BPSK, QPSK, X-QAM	N/A	−140 ➦ −144 dBW (−6 ➦ −10 dB I/N)	None
Mobile service [3]	85 kHz (centre freq. 2 499.7 MHz)	Omnidirectional	−22 dBW	Double modulation GMSK/AM	N/A	−151.6 dBW/85 kHz (I/N = −3 dB)	OOB leakage power < −40 dB
MSS (space-to-Earth) (See Recommendation ITU-R M.1184-2)	1.23 MHz	16 beam, Earth coverage	0-16 dBW	CDMA, DSSS, QPSK	N/A	N/A	Coord. trigger levels −144 dB(W/m^2) in 4 kHz, & −126 dB(W/m^2) in 1 MHz
Radiolocation service	0.635/15 MHz	Planar array or parabolic reflector	78-96 dBW	Pulsed, Non-linear FM	−7/6 dB	I/N = –6 dB	N/A
RDSS (space-to-Earth) (System No. 1 [4])	16.5 MHz	Rec. ITU-R S.672-4	49.7-54.3 dBW	CDMA, DSSS QPSK	−20.1 dB	N/A	N/A
RDSS (space-to-Earth) (System No. 2 [5])	16.5 MHz	Rec. ITU-R S.672-4	27.4-36.5 dBW	CDMA, DSSS, QPSK, BPSK	−22 dB	N/A	N/A

1 Ancillary applications (services ancillary to production (SAP)/Service ancillary to broadcasting (SAB)) used to support programme making, or broadcasting (i.e. wireless video camera links), operating in the fixed service or mobile service.

2 See Report ITU-R M.2116 – Specifically IEEE 802.16e characteristics.

3 See ITU-R Land Mobile Handbook (including Wireless Access) – Volume 4: Intelligent Transport Systems.

4 These technical parameters are for a national RDSS system that has operated since 2000 in accordance with RR No. **5.400**.

5 These technical parameters are for a RDSS system (not global) that is being built and which is in the coordination stage.

5/1.18/3.3 Review of the current regulatory situation for RDSS in the band 2 483.5-2 500 MHz

The restrictions on the emissions of each of the services were taken from the Radio Regulations. These include restrictions on transmitted power and power flux-density (pfd) levels, either absolute or used as coordination trigger levels.

Region 1: RDSS is secondary subject to RR No. **9.21** through RR No. **5.371**. RR No. **5.400** indicates a number of countries in Region 1 for which RDSS is allocated as a primary service, still subject to RR No. **9.21**. RLS is secondary but RR No. **5.399** indicates that harmful interference shall not be caused to, or protection shall not be claimed from, stations of the RLS by stations of the RDSS in countries other than the ones listed in RR No. **5.400**.

Region 2: RLS and RDSS are primary.

Region 3: RLS is primary. RDSS is secondary. RR No. **5.400** indicates a number of countries in Region 3 for which RDSS is allocated as a primary service, subject to RR No. **9.21**.

Furthermore, RR No. **5.402** indicates that the RDSS is also subject to coordination under RR No. **9.11A** and must take all practicable steps to reduce second harmonic emissions in the 4 990-5 000 MHz RAS band.

RDSS in this band is also subject to coordination with terrestrial services at threshold levels defined in RR Appendix **5** which are as follows:

pfd levels in dBW/m²/MHz	Geostationary satellite	Non-geostationary satellite
for $0° \le \delta \le 5$	-128	-126
for $5° \le \delta \le 25$	$-128 + 0.5(\delta - 5)$	$-126 + 0.65(\delta - 5)$
for $25° \le \delta$	-118	-113

5/1.18/4 Analysis of the results of studies

5/1.18/4.1 RDSS – FS

Using the criterion of fractional degradation in performance (FDP), described in Recommendation ITU-R F.1108-4, it has been shown that RDSS emissions at a pfd level of -129 dBW/($m^2 \cdot$ MHz) do not impact FS systems in the band 2 483.5-2 500 MHz, which are used in a few countries. This is for RDSS systems that operate at all azimuth pointing angles with an average FDP criterion of 25%.

With respect to applications operating in the FS that support programme making or broadcasting (such as wireless video camera links), there is a high probability of harmful interference from these applications into RDSS receivers at distances of up to 1 km in built-up areas, while in line-of-sight situations the interference may extend for several km.

5/1.18/4.2 RDSS – MSS

Potential interference to MSS downlinks operating in the 2 483.5-2 500 MHz band could be relieved by allowing MSS systems to operate at greater downlink power levels by relaxing the coordination trigger pfd level in RR Appendix **5**. It was however questioned whether this relaxation could have a negative impact on the operation of the FS and MS.

For the purpose of assessing a worst-case interference, calculations were performed based on a maximum RDSS pfd value of −126 dBW/(m^2 · MHz) (corresponding to the threshold value of RR Appendix **5**) for both the MSS and RDSS satellites.

For that case, RDSS emissions slightly degrade the C/N_0 of the MSS system considered only in the case of one considered modulation type, while the degradation is negligible for the other potential signals options that were studied.

On the other hand, signals from the MSS system studied degrade RDSS reception by a few tenths of dBs (1.2 dB in the worst case).

Additional simulations based on a maximum RDSS pfd value of −129 dBW/(m^2 · MHz) have been made. In this case the C/N_0 degradation of MSS is negligible.

Based on these results, it is shown that in all cases the interference between the two systems stays within acceptable bounds.

5/1.18/4.3 RDSS – MS

Studies between RDSS and MS have been carried out based on MS characteristics that were available to the ITU-R. A question was raised that it might not cover all systems within the MS.

The general conclusion from the studies is that harmful interference from RDSS systems into SAP/SAB systems or BWA systems operating in the band 2 483.5-2 500 MHz is very unlikely.

One study showed that a per satellite RDSS pfd of −130 dBW/(m^2 · MHz) will not cause harmful interference to mobile or fixed (SAP/SAB) receivers with the same polarization, operating in the band 2 483.5-2 500 MHz. Considering that SAP/SAB applications mainly use linear polarization (providing an additional 2 dB of isolation) it is expected that a pfd of −128 dBW/(m^2 · MHz) would still protect the MS and SAP/SAB receivers. There is, however, a high probability of harmful interference from these applications into RDSS receivers at distances of up to 1 km in built up areas, while in line-of-sight situations the interference may extend for several km.

An additional study showed that a pfd per RDSS satellite of −129 dBW/(m^2 · MHz) will not cause interference to BWA receivers operating in the same band. Since BWA only operates in the band 2 483.5-2 500 MHz in some countries in Region 2, it can be concluded that BWA operating above 2 500 MHz outside of Region 2 will, by default, also be protected due to the additional out-of-band isolation.

5/1.18/4.4 RDSS – RLS

Two studies were performed to assess the compatibility between RDSS and RLS.

One technical study shows that with a pfd of −129 dBW/(m^2 · MHz) per RDSS satellite, RDSS systems may, in some cases, interfere with the RLS. It can be seen than the interference will exceed the protection criteria of RLS in 3% of the time as maximum, when considering mean values. With respect to this study it was indicated that the simulation time of 300 seconds used in the study is insufficient to obtain statistically confident results.

Another technical study indicates that with a pfd of −135 dBW/(m^2 · MHz) (evenly spread emission bandwidth) per RDSS satellite, RDSS systems interference will exceed the criterion $I/N = -6$ dB in 28.16% of the time. Using a pfd per satellite of −159 dBW/(m^2 · MHz), interferences will exceed the criterion $I/N = -6$ dB in only 1% of time. With respect to this study it was indicated that simulation of radar in scanning mode may lead to a smaller percentage of time as compared to tracking mode simulation.

It should be noted that restriction of pfd level from one spacecraft to −129 dBW/(m^2 · MHz) is not sufficient for protection of some radars types. The required pfd mask (−159 dBW/(m^2 · MHz)) is more stringent than the considered pfd levels from one spacecraft of the planned Galileo system. Moreover, usage of the stringent pfd mask as the condition for upgrading the allocation status of the RDSS does not ensure protection of the RLS stations from the interferences caused by the RDSS because not only one space system can operate in the RDSS. Thus it is required to find other regulatory and/or technical solutions for protection of the RLS.

5/1.18/4.5 Conclusion

Incumbent services, except RLS, can be protected by implementing a new coordination threshold of −129 dBW/(m^2 · MHz) for RDSS systems in the band 2 483.5-2 500 MHz. For the protection of the RLS, another mechanism, similar to the one contained in RR No. **5.399** (i.e. based on not claiming protection nor causing harmful interference), might be sought.

5/1.18/5 Method to satisfy the agenda item

One method is proposed to satisfy this agenda item: allocate RDSS globally associated with a pfd coordination threshold and add a new footnote with regard to RLS.

It is proposed to include a primary allocation to RDSS in Region 1 and upgrade the RDSS secondary allocation in Region 3 to primary status. As a consequence, appropriate footnotes need to be modified and/or new footnotes to be added (see section 5/1.18/6).

The coordination threshold in RR Appendix **5** is modified for RDSS systems as a result of the studies to protect terrestrial services (except RLS) in the band 2 483.5-2 500 MHz.

With regard to the coordination threshold values in RR Appendix **5** for MSS systems, two options are proposed:

– increasing the values from −126 dBW/(m^2 · MHz) to −122 dBW/(m^2 · MHz),

– retaining the values unchanged.

Resolution **613 (WRC-07)** is consequently proposed to be abrogated.

Advantages

− Global RDSS systems can operate efficiently in the 2 483.5-2 500 MHz band.

− Keeping the existing regulatory relation between RDSS and RLS in Region 1 under RR No. **5.399** ensures the adequate protection of the RLS in this frequency band.

Disadvantages

− Reduction of protection of the existing terrestrial services from MSS emissions if the increase of the MSS pfd coordination thresholds is implemented.

5/1.18/6 Regulatory and procedural considerations

A possible regulatory procedure to satisfy the agenda item could consist of the following modifications to the Table of Frequency Allocations in RR Article **5** and to Annex 1 of RR Appendix **5**:

MOD

1 610-1 660 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 610-1 610.6 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 MOD 5.371 5.372	**1 610-1 610.6** MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) 5.341 5.364 5.366 5.367 5.368 5.370 5.372	**1 610-1 610.6** MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.372
1 610.6-1 613.8 MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION 5.149 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 MOD 5.371 5.372	**1 610.6-1 613.8** MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) 5.149 5.341 5.364 5.366 5.367 5.368 5.370 5.372	**1 610.6-1 613.8** MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) 5.149 5.341 5.355 5.359 5.364 5.366 5.367 5.368 5.369 5.372
1 613.8-1 626.5 MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.208B 5.341 5.355 5.359 5.364 5.365 5.366 5.367 5.368 5.369 MOD 5.371 5.372	**1 613.8-1 626.5** MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.208B 5.341 5.364 5.365 5.366 5.367 5.368 5.370 5.372	**1 613.8-1 626.5** MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) 5.208B Radiodetermination-satellite (Earth-to-space) 5.341 5.355 5.359 5.364 5.365 5.366 5.367 5.368 5.369 5.372
...		

MOD

2 170-2 520 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 Radiolocation 5.150 ~~5.371 5.397 5.398~~ MOD 5.399 ~~5.400~~ 5.402 ADD 5.A118	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION ~~Radiodetermination-satellite~~ RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 ~~5.400~~ 5.402 MOD 5.399 ADD 5.400A
...		

Reasons: In Region 1, RR No. **5.398** is moved from the bottom of the table to the associated new RDSS allocation, as it is the case in Region 2 and 3.

ADD

5.A118 *Different category of service:* In [list of certain countries of Region 1], the band 2 483.5-2 500 MHz is allocated on a primary basis to the radiolocation service. The radiolocation stations in these countries shall not cause harmful interference to nor claim protection from stations of the fixed, mobile and mobile-satellite services operating in accordance with the Radio Regulations in the frequency band 2 483.5-2 500 MHz.

Reasons: This provision will retain the secondary status of RLS in relation to FS, MS and MSS i.e. the existing regulatory relation between RLS and FS, RLS and MS, RLS and MSS is preserved.

ADD

5.400A In [list of certain countries of Region 3], the band 2 483.5-2 500 MHz was already allocated on a primary basis to the radiodetermination-satellite service before WRC-12, subject to agreement obtained under No. **9.21**. The RDSS systems for which filings have been submitted to the Radiocommunication Bureau before the Conference [THE DATE] will retain their regulatory status, as of the time of submission.

Reasons: This provision will retain the regulatory status of the existing RDSS systems after the global upgrade allocation in this band.

MOD

5.371 *Additional allocation:* in Region 1, the band~~s~~ 1 610-1 626.5 MHz (Earth-to-space) ~~and 2 483.5-2 500 MHz (space-to-Earth) are~~is also allocated to the radiodetermination-satellite service on a secondary basis, subject to agreement obtained under No. **9.21**.

Reasons: RR No. **5.371** is removed from this band because of the proposed changes below but this provision remains valid for the band 1 610-1 626.5 MHz.

SUP

5.397

Reasons: France will not use this band any more for RLS after WRC-12.

MOD

5.399 ~~In Region 1, in countries other than those listed in No. **5.400**,~~ RDSS systems in Region 3, except in Australia, Bangladesh, China, India, Iran (Islamic Republic of), Pakistan and Papua New Guinea, filed after the [end of WRC-12] and RDSS systems in Region 1, shall neither cause harmful interference to nor claim~~shall not be caused to, or~~ protection ~~shall not be claimed~~ from~~,~~ stations of the radiolocation service ~~by stations of the radiodetermination satellite serviceoperating~~ in countries listed in No. **5.A118**.

Reasons: This footnote is proposed to be modified in order to keep the same regulatory status for the RDSS and RLS in the countries listed in RR No. **5.A118**. The RDSS has a secondary allocation in Regions 1 and 3, excluding the countries listed in RR No. **5.400**. RR No. **9.21** extends to the allocations under RR No. **5.400**. If the status of the RDSS is upgraded and the requirements under RR No. **9.21** are removed, it becomes necessary to protect the RLS in Region 1 countries (only the countries listed in ADD **5.A118**) from the RDSS in Regions 1 and 3.

SUP

5.400

Reasons: This footnote is proposed to be suppressed as a consequence of the upgrading of RDSS to primary status. Existing RDSS systems submitted to the Radiocommunication Bureau before the Conference will retain their regulatory status, as of the time of submission.

MOD

5.446 *Additional allocation:* in the countries listed in No~~s~~. **5.369**, as well as in Bangladesh ~~and **5.400**~~, the band 5 150-5 216 MHz is also allocated to the radiodetermination-satellite service (space-to-Earth) on a primary basis, subject to agreement obtained under No. **9.21**. In Region 2, the band is also allocated to the radiodetermination-satellite service (space-to-Earth) on a primary basis. In Regions 1 and 3, except those countries listed in No~~s~~. **5.369** and ~~**5.400**~~ in Bangladesh, the band is also allocated to the radiodetermination-satellite service (space-to-Earth) on a secondary basis. The use by the radiodetermination-satellite service is limited to feeder links in conjunction with the radiodetermination-satellite service operating in the bands 1 610-1 626.5 MHz and/or 2 483.5-2 500 MHz. The total power flux-density at the Earth's surface shall in no case exceed -159 dB(W/m^2) in any 4 kHz band for all angles of arrival.

Reasons: Footnote No. **5.400** is proposed for suppression. However, this footnote is referred to in RR No. **5.446**. It is therefore proposed to amend RR No. **5.446** to suppress the reference to RR No. **5.400** and add the administration of Bangladesh, which is the only one in RR No. **5.400** not appearing in RR No. **5.369**.

MOD

APPENDIX 5 (Rev.WRC-07)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

MOD

ANNEX 1

1 Coordination thresholds for sharing between MSS (space-to-Earth) and terrestrial services in the same frequency bands, ~~and~~ between non-GSO MSS feeder links (space-to-Earth) and terrestrial services in the same frequency bands and between RDSS (space-to-Earth) and terrestrial services in the same frequency bands

1.2 Between 1 and 3 GHz

1.2.1 Objectives

Generally, pfd thresholds were used to determine the need for coordination between space stations of the MSS (space-to-Earth) and terrestrial services and for coordination between space stations of the RDSS (space-to-Earth) and terrestrial services. However, to facilitate sharing between digital fixed service stations and non-GSO MSS space stations, the concept of fractional degradation in performance (FDP) was adopted. This concept involves new methods described in this Annex.

1.2.3 Determination of the need for coordination between MSS and RDSS space stations (space-to-Earth) and terrestrial stations

1.2.3.1 Method for the determination of the need for coordination between MSS and RDSS space stations (space-to-Earth) and other terrestrial services sharing the same frequency band in the 1 to 3 GHz range

Coordination of assignments for transmitting space stations of the MSS and RDSS with respect to terrestrial services is not required if the pfd produced at the Earth's surface or the FDP of a station in the fixed service does not exceed the threshold values shown in the following table.

TABLE 5-2 (*continued*) (WRC-07)

Frequency band (MHz)	Terrestrial service to be protected	Coordination threshold values				
		GSO space stations		**Non-GSO space stations**		
		pfd (per space station) calculation factors (NOTE 2)		**pfd (per space station) calculation factors (NOTE 2)**		**% FDP (in 1 MHz) (NOTE 1)**
		P	**r dB/ degrees**	**P**	**r dB/ degrees**	
...						
2 483.5-2 500 (mobile-satellite service)	All cases	−146 dB(W/m²) in 4 kHz and −128 dB(W/m²) in 1 MHz	0.5	−144 dB(W/m²) in 4 kHz and −126[1] dB(W/m²) in 1 MHz ~~(NOTE 7)~~	0.65	
2 483.5-2 500 (radio-determination-satellite service) (NOTE A118)	All cases, except the radiolocation service in the countries listed in **5.A118**	−128 dB(W/m²) in 1 MHz	-	−129 dB(W/m²) in 1 MHz	-	
...						

...

~~NOTE 7 – The pfd values specified for the band 2 483.5-2 500 MHz provide full protection for analogue radio-relay systems using the sharing criteria established by Recommendation ITU-R SF.357, for operation with multiple non-GSO MSS systems employing code division multiple access techniques. The pfd values specified will not provide full protection for existing digital fixed systems in all cases. However, these pfd values are considered to provide adequate protection for digital fixed systems designed to operate in this band, where high-power industrial, scientific and medical equipment and possible low-power applications are expected to produce a relatively high interference environment.~~

NOTE A118 – These pfd values do not apply to systems submitted before [the end of WRC-12].

...

Reasons: The studies carried out show that the new coordination threshold of −129 dBW/(m^2 · MHz) for RDSS systems does not protect RLS stations, so footnote **5.399** is modified and a new footnote **5.A118** is introduced to protect them.

[1] There are ongoing studies to assess the feasibility of increasing the MSS coordination threshold values from −126 dBW/(m^2 · MHz) to −122 dBW/(m^2 · MHz).

SUP

RESOLUTION 613 (WRC-07)

Global primary allocation to the radiodetermination-satellite service in the frequency band 2 483.5-2 500 MHz (space-to-Earth)

AGENDA ITEM 1.25

*1.25 To consider possible additional allocations to the mobile-satellite service, in accordance with Resolution **231 (WRC-07)**;*

Resolution **231 (WRC-07)**: *Additional allocations to the mobile-satellite service with particular focus on the bands between 4 GHz and 16 GHz*

5/1.25/1 Executive summary

ITU-R has undertaken studies of possible bands for new allocations to the MSS in the Earth-to-space and space-to-Earth directions, with particular focus on the range 4-16 GHz, taking into account numerous sharing and compatibility aspects. ITU-R has estimated the total requirements for the MSS in the 4-16 GHz range for the year 2020. The requirements are estimated to be between 240 and 335 MHz[18] in each direction, and are contained in preliminary draft new Report (PDNRep) ITU-R M.[MSS-REQS].

All frequency bands in the 4-16 GHz range have been assessed for possible sharing with new MSS systems and only some bands were identified for further detailed studies. These studies are focused on assessing the feasibility of MSS operations in the following frequency bands: 5 150-5 250 MHz (MSS s-E), 7 055-7 250 MHz (MSS s-E), 8 400-8 500 MHz (MSS E-s), 10.5-10.6 GHz (MSS s-E), 13.25-13.4 GHz (MSS s-E), 15.43-15.63 GHz (MSS E-s). The results of ongoing studies are contained in PDNRep ITU-R M.[MSS-SHARING]. For each of these bands, methods have been developed for new MSS allocations and for no change to the current allocations. Example regulatory text has been developed for each method.

5/1.25/2 Background

In many regions and countries of the world, the use of satellite communication systems for the purpose of mobile satellite telephony and data applications has increased in recent past. However, further development and advancement of these systems has been constrained primarily due to shortage of spectrum resources.

WRC-07 agreed a new agenda item for WRC-12 for consideration of possible new allocations to the MSS, in accordance with Resolution **231 (WRC-07)**.

All allocated services in the Table of Frequency Allocations in RR Article **5** that appear in any candidate band would need to be considered as part of the studies.

5/1.25/3 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

The main elements required for the studies are: 1) to establish technical characteristics of new MSS systems that might operate in the frequency range in question; 2) to evaluate the spectrum requirements for new MSS applications; 3) sharing studies with other services. Technical characteristics of example MSS systems are contained in PDNRep ITU-R M.[MSS-SHARING].

Relevant ITU-R Documents: Recommendations ITU-R RA.769, ITU-R SA.1014, ITU-R SA.1047, ITU-R SA.1157-1, ITU-R RS.1166, ITU-R M.1461, ITU-R M.1739, ITU-R F.1777,

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[18] These figures are not finalized, and work is continuing in WP 4C. See preliminary draft new Report (PDNRep) ITU-R M.[MSS-REQS].

ITU-R M.1796, ITU-R M.1824 and ITU-R M.1828; Reports ITU-R M.2077, ITU-R RS.2068, PDNRep ITU-R M.[MSS-REQS] and PDNRep ITU-R M.[MSS-SHARING].

5/1.25/3.1 Estimated spectrum needs

Assessment of the spectrum needs for the MSS, more precisely for the satellite component of IMT in the 1-6 GHz range, was carried out prior to WRC-07 and is contained in Report ITU-R M.2077. For the year 2020, the shortfall in MSS spectrum in the 1-6 GHz range is between 19 and 90 MHz in the uplink direction and between 144 and 257 MHz in the downlink direction, including the distribution applications. These needs are indicated as being required in the 1-6 GHz range on the basis that high mobility applications would not be feasible in frequency bands above 6 GHz.

The MSS applications envisaged in Report ITU-R M.2077 are related to small, typically handheld, portable devices, with a maximum data rate of 144 kbit/s. By current standards, this is quite modest. Current terrestrial mobile systems using 3G technologies (such as High Speed Downlink Packet Access (HSDPA)) are providing data rates of up to 7.2 Mbit/s (download) to a user and higher data rates are likely to be introduced in the future, particularly when terrestrial IMT-Advanced systems are deployed. The use of such high data rate applications in terrestrial mobile networks is likely to be a driver for demand of higher data rate services in the MSS. In fact MSS systems have been introducing new broadband services according to the spectrum resources available, however, due to the shortfall, the satellite systems have had difficulties to keep pace with the terrestrial systems.

Two new studies have been conducted to estimate the spectrum needs for MSS systems with data rates of up to around 2 Mbit/s. These studies are intended to support the provision of “broadband MSS” service to land, maritime and aeronautical users, using small directional antennas. Such MSS broadband data rates require much more spectrum than is currently available for MSS, and would ensure the availability of broadband to most areas. The studies are summarized in PDNRep ITU-R M.[MSS-REQS].

It is concluded that the estimated spectrum needs shown in Table 1 for the MSS in the range 4-16 GHz should be considered in the context of WRC-12 Agenda item 1.25.

TABLE 1

Estimated spectrum needs by 2020 in the 4-16 GHz range[19]

	Low/baseline scenario	**High traffic scenario**
Estimated spectrum needs in the Earth-to-space direction (as contiguous as possible)	240 MHz	335 MHz
Estimated spectrum needs in the space-to-Earth direction (as contiguous as possible)	240 MHz	335 MHz

It should be noted that the traffic forecasts, from which these spectrum needs were derived, can only be afforded by cost-effective MSS systems if those spectrum needs are addressed through new MSS allocations that are in larger contiguous blocks, and not a large number of small allocations. It is therefore highly desirable that new MSS allocations are, to the extent possible, contiguous.

[19] These figures are not finalized, and work is continuing in WP 4C. See preliminary draft new Report ITU-R M.[MSS-REQS].

5/1.25/3.2 Frequency bands examined for potential new MSS allocations

The ITU-R has examined all frequency bands between 4 and 16 GHz and identified the following bands for detailed studies:

Frequency band[20]	MSS direction (DL = downlink, UL = uplink)
5 150-5 250 MHz	DL
7 055-7 250 MHz	DL
8 400-8 500 MHz	UL
10.5-10.6 GHz	DL
13.25-13.4 GHz	DL
15.43-15.63 GHz	UL

Detailed study results on these bands are contained in preliminary draft new Report (PDNRep) ITU-R M.[MSS-SHARING]. This Report also contains initial assumptions for sharing criteria for MSS applications, which need to be developed further for different types of MSS applications.

To be effective and useful for MSS, it would be necessary to provide both uplink and downlink allocations of approximately similar size as well as contiguous.

During the consideration of WRC-12 Agenda item 1.25 in ITU-R all bands within the 4-16 GHz range were considered. A number of frequency bands were not considered appropriate for MSS allocations because of expected non-compatibility issues with incumbent services.

In addition, in certain frequency bands, detailed technical studies and information on the deployment of existing and planned services were presented within ITU-R which led to the conclusion that sharing is not feasible between the MSS and existing services. Consequently, these bands are no longer under consideration for new MSS allocations. The relevant bands and the studied MSS direction (uplink or downlink) are as follows: 4 400-4 500 MHz (MSS uplink and downlink), 4 800-4 990 MHz (MSS uplink), 7 750-7 900 MHz (MSS uplink)[21] and 14.8-15.35 GHz (MSS uplink and downlink).

5/1.25/3.3 Possible mitigation techniques to be implemented in the potential frequency bands

Some administrations are of the view that the following general issues may need to be taken into consideration.

For MSS downlink bands, where interference may be caused to a mobile earth station (MES) from a terrestrial source (which could be an earth station or a terrestrial station), an MES may be able to operate successfully by selecting a channel that does not overlap with the interfering signal. For example, by scanning all potential channels before establishing a call, one or more interference-free channels may be identified. It should be noted that this method might not be practical if interference is present across the entire MSS downlink band or if for any other reason no other channel is available for the MES to switch to. If successful, and if the MES has the capability to signal the available channels to the MSS channel assignment system during a link establishment, an

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[20] See section 5/1.25/4.7.

[21] Studies for the band 7 850-7 900 MHz also considered the use of this band for MetSat, as is considered under WRC-12 Agenda item 1.24.

interference-free downlink channel could be assigned to the MES. Naturally, it is desirable for MSS systems to operate in an environment as free from interference as possible, but the possibility of interference should not be seen as ruling out potential MSS operations.

For MSS uplink bands, where an MES could cause interference to terrestrial stations or earth stations, the MES would have to comply with exclusion areas. The feasibility of MSS operation therefore depends on the necessary size, locations and number of the exclusion areas. Exclusion areas can be put into effect by using the geo-location facility that already exists in most MESs. This might consist of, for example, a Global Navigation Satellite System (GNSS) receiver in the MES so that its location can be determined and signalled to the MSS control facility. If the MES is located in an exclusion area, it could be prohibited from transmitting on the necessary frequencies. Alternatively, the exclusion could be applied to any MES within a particular satellite beam that overlaps with the excluded area. The latter approach may be simpler to implement but could lead to unnecessarily large exclusion areas. The former approach implies the establishment of a dynamic database to contain the exclusion area characteristics and definition that could be updated as new stations are implemented. However, for both approaches, this would require that information from the operator of the terrestrial or earth station will have to be conveyed to, taken into account and implemented by MSS operators. For some types of earth stations and terrestrial stations, the frequencies that require protection from MESs can change. For such stations, it may be necessary to establish protection based on operation of the earth station or terrestrial station over the full range of operating frequencies. This would *de facto* mean that in some cases the entire bandwidth used by the earth station or terrestrial station is not available for the MES within the exclusion zone. If the number of stations to be protected is very large and they are deployed in high densities, or if they are mobile, the exclusion area may have to be defined for a large geographic area containing all stations (potentially the whole territory of a country or region). If the number of stations to be protected is relatively small, an exclusion area can be defined for each station individually. The size of the exclusion zones varies and will depend on the service and the characteristics of the MES (including aircraft earth stations (AESs), which may require exclusion areas of several hundred km), and on the characteristics of terrestrial/earth stations. The number of stations to be protected from MES emission is an important consideration of the feasibility of MSS operations. Also of particular importance is the protection of increasing numbers of earth stations to be deployed in the future or earth stations that have to be relocated, e.g. due to compatibility issues with other already existing services. A further important consideration is the cross-border issues that would arise from the use of the approaches outlined above.

The downlink channel scanning method to find an interference-free channel requires the availability of an uplink channel to transmit the necessary information to the MSS network control. If the MES is in an exclusion zone for which no uplink operation is permitted, it could not work, unless the MES is equipped to operate with two or more transmit bands. Such capability is being considered by MSS operators for future systems to increase network flexibility.

The administrations supporting these considerations are also of the view that if the operational scenarios are identified and protection requirements are also defined, such approaches can be implemented as part of the MSS network design and operation.

Some other administrations are of the view that the above approach is complex and costly and will be difficult to implement.

5/1.25/4 Analysis of the results of studies

The summary below is based on the understanding that wherever studies are mentioned, these studies are in most cases limited to the GSO MSS versus other radio services in accordance with the relevant frequency band.

5/1.25/4.1 The band 5 150-5 250 MHz

This band is considered for MSS downlinks. This band is currently allocated to the ARNS, the FSS (Earth-to-space) and the MS (except aeronautical mobile) service on a primary basis. This band is also allocated to the AMS on a primary basis in some countries through RR No. **5.446C**. The band 5 150-5 216 MHz is allocated for feeder links for the RDSS (space-to-Earth) through RR No. **5.446**.

5/1.25/4.1.1 Aeronautical radionavigation service

The ARNS allocation in this band is also under consideration under WRC-12 Agenda item 1.3, Unmanned Aircraft Systems (UAS) to be used for “sense and avoid” operations of. Studies are required to determine any possible interference issues between the UAS and the MSS, based on characteristics developed under WRC-12 Agenda item 1.3.

5/1.25/4.1.2 Fixed-satellite service

With regard to the FSS, this band is used for the feeder uplinks to non-GSO MSS systems. Simulation of interference from GSO MSS service downlinks to the non-GSO MSS feeder links indicates that the mean I/N to a non-GSO MSS satellite is about −44 dB and the peak I/N is about −12 dB. Consequently, it is considered that sharing is feasible, although constraints could be required on the MSS service downlinks. Receiving MESs could be vulnerable to interference from non-GSO MSS feeder-link earth stations (gateways). For land-based MESs, interference could exceed the criterion when within a few km (up to about 50 km in the worst case). In the case of AESs, interference above the criterion could be received within the visibility range of the FSS gateway earth station. This range is up to 450 km in the worst case. However, as the number of gateways operating in this band is, currently, low (about 25 throughout the world), some administrations believe that MSS should operate on the conditions of not claiming protection, whereas other administrations believe that a coordination process should be considered. Further development of non-GSO MSS networks with feeder uplinks in the 5 091-5 250 MHz band will lead to additional gateways and additional areas where interference from gateways to MESs would be experienced. It must be noted that the interference analysis conducted was valid only for GSO spacecraft utilizing multibeam downlink antennas. The assumed pfd levels for GSO MSS systems require use of relatively large receive antennas that would need to be pointed at the transmitting spacecraft. The characteristics of alternative systems, such as non-GSO MSS systems serving omnidirectional antennas, that deviate from the assumptions made for the computer simulations could result in interference to the feeder uplinks of non-GSO systems using the 5 150-5 250 MHz band. Therefore, provisions (such as pfd levels) would need to be associated with any addition of an MSS allocation to the 5 150-5 250 MHz band to avoid an unacceptable interference situation for the feeder uplinks for MSS systems. Such limitations could come about through pfd levels to protect terrestrial systems in the band (e.g. radio local area networks (RLANs) or aeronautical mobile telemetry (AMT) discussed below). In addition, constraints on the placement and development of future non-GSO MSS gateways, due to near certain interference from feeder uplinks into GSO MESs, would have to be addressed.

Through RR No. **5.447B**, the band 5 150-5 216 MHz is allocated to the FSS (space-to-Earth), limited to feeder links of non-GSO satellite systems in the MSS. No use of this band by non-GSO MSS feeder links in the space-to-Earth direction has been identified.

5/1.25/4.1.3 RLAN systems in the mobile service

The band 5 150-5 250 MHz is used by RLAN systems, which operate in the MS. In this band, RLANs are limited to indoor use and power limited through Resolution **229 (WRC-03)**. Interference from MSS downlinks to RLANS has been assessed using the RLAN protection requirements in Recommendations ITU-R M.1828 and ITU-R M.1739. Interference from proposed

MSS downlinks would not exceed the protection criteria. The maximum acceptable downlink pfd is −112 dB(W/m^2 · MHz), for all arrival angles. Interference could be received by MESs from RLAN transmitters. It is not envisaged that interference would be likely from RLAN in MSS MESs, as RLAN is limited to indoor while MSS mainly operates outdoor. Interference above the criterion may be received when the MES is within around 100-200m if the RLAN transmitter is in an urban environment and around 900-3 800 m in a rural environment. MESs may be able to coexist with such interference if designed with mitigation features as described in section 5/1.25/3.2.

In some countries, parts of the band 5 150-5 250 MHz are available for broadband disaster relief (BBDR) applications. Such systems would be deployed on an ad hoc basis, in the event of an emergency. Interference from MSS downlinks into BBDR base stations and user equipment has been assessed. In both cases, interference from the proposed MSS downlinks would not exceed the interference criteria. The maximum acceptable downlink pfd is −113 dB(W/(m^2 · MHz)), for all arrival angles. Interference from BBDR base stations and user terminals could cause interference to MESs. The separation distances needed to ensure that interference does not exceed the criterion for the MES are about 2-12 km for the BBDR base station and about 0.8-3.3 km for the BBDR user equipment. MESs may be able coexist with such interference if designed with mitigation features as described above. The operation of BBDR networks would occur only occasionally, which would mitigate the interference potential. MSS systems can also provide solutions for disaster relief operations and in such cases operations are typically coordinated by the national authorities.

5/1.25/4.1.4 Aeronautical Mobile Telemetry

Aeronautical Mobile Telemetry (AMT) is allocated in some countries by RR No. **5.446C**. Interference could occur from MSS downlinks to the aeronautical telemetry receiving ground station. Using the proposed GSO MSS downlink characteristics, interference would meet the criterion for cases where the MSS satellite is above about 30° elevation. At lower elevation angles excessive interference could occur unless the aeronautical telemetry station is able to avoid pointing the receiving antenna at the geostationary arc. One potential pfd mask that may be considered to protect aeronautical telemetry receivers from MSS downlinks and the following mask has been assessed:

pfd value in dB(W/m^2) for angles of arrival (δ) above the horizontal plane[22]			**Reference bandwidth**
0°-5°	**5°-15°**	**15°-90°**	
–135	$-135 + 2(\delta - 5)$	–115	**1 MHz**

This mask may provide adequate protection to aeronautical telemetry stations for all arrival angles.

With regard to the use of the band 5 150-5 216 MHz by the RDSS, no characteristics have been identified and hence no studies have been conducted.

[22] These figures are not finalized, and work is continuing in WP 4C. See PDNRep ITU-R M.[MSS-SHARING].

5/1.25/4.2 The band 7 055-7 250 MHz[23]

The range 7 055-7 250 MHz and parts of this range are considered for MSS downlinks. This band is allocated to the FS and MS on a primary basis. The sub-band 7 055-7 075 MHz is allocated to the FSS (Earth-to-space) and (space-to-Earth). The band 7 145-7 235 is allocated to the SRS for Earth-to-space links. The bands 7 100-7155 MHz and 7 190-7 235 MHz are allocated to the SOS (Earth-to-space) in one country through RR No. **5.459**. The band 7 055-7 250 MHz may be used by passive sensors under the conditions given in RR No. **5.458**.

The band 7 055-7 250 MHz is heavily used for the deployment of FS, including broadcasting auxiliary services (BAS) applications in many administrations. In at least one administration, the band 7 125-7 250 MHz for the FS is used for point-to-point microwave links that carry data for en-route and terminal surveillance radars, voice communications, and other application that are used for air traffic control. These links are critical for maintaining separation of aircraft during all phases of flight and under all weather conditions.

5/1.25/4.2.1 Fixed service, fixed wireless systems

The band 7 055-7 250 MHz is used for fixed wireless systems (FWS). In the case of new MSS allocations, restrictions will have to be applied to pointing of the FS links towards the GSO. Studies identified a gain reduction of 40 dB for the FS antenna in order to be compatible. Pfd limits or thresholds would be required to reduce interference to FS receivers. The existing pfd mask contained in RR Article **21**, applicable to the band 6 825-7 075 MHz, is −134 dBW/m^2/MHz (angles below 5°), rising to −124 dBW/m^2/MHz (for angles above 25°). An alternative pfd mask is between −140 dBW/m^2/MHz (angles below 5°) rising to −115 dBW/m^2/MHz for angles above 20°. Either option will still require some FS off-pointing from the GSO. For the elevation angle of 0º, the interference from the MSS satellite which must meet the pfd mask of −140 dBW/m^2/MHz will require an additional signal reduction of 13 dB. For the mask starting at −134 dBW/m^2/MHz, the additional required signal reduction will be 19 dB. This number will increase as a function of the elevation angle up to 40 dB, requiring off-pointing of the FS station between ±1º and ±15º. This will be a significant constraint for countries at higher latitudes.

In the case of mandatory pfd masks, MSS operations would be restricted to areas where the elevation angle of the MES towards the MSS satellite is above approximately 20°,which would reduce the MSS service area by more than 30% when compared to an area with a minimum elevation angle of 5º.

Some administrations are of the view that this is a severe constraint for MSS operations and, moreover, it would represent an inefficient use of orbit/spectrum resources. Some other administrations believe that it is up to MSS operators which service area they intend to serve and if the reduced service area is the targeted market or not, so this reduction would not be considered as a constraint and will not impact MSS.

Interference could be caused by FWS transmitters to MESs. The separation distance between FWS transmitter and MES is highly dependent on the terrain around the FWS station. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss), separation distances are in the range of about 5 km to 30 km. In cases where the FWS and the MES antenna are pointing towards each other, the separation distances calculated in accordance with Recommendation ITU-R P.452 will exceed 100 km. MESs may be able to coexist with such interference if designed with mitigation features as described above. Some administrations believe that MSS should operate on

[23] See section 5/1.25/4.7.

the conditions of not claiming protection, whereas other administrations believe that a coordination process should be considered.

5/1.25/4.2.2 Broadcasting auxiliary services

The band 7 055-7 250 MHz is used by broadcasting auxiliary services (BAS), which operate as part of the FS or MS. Widespread use has been identified in some countries. Characteristics are contained in Recommendations ITU-R F.1777 and ITU-R M.1824.

Studies have shown that acceptable interference from MSS satellites into BAS would require an off-pointing angle of the BAS up to ±15º in some cases, in other cases probably more. This may be considered as an undesirable constraint for fixed BAS operations and would generally not be feasible for a mobile BAS. Pfd limits or thresholds would be required to reduce interference to BAS receivers. One potential mask proposed is −158 dBW/m^2/MHz (angles below 3°), rising to −124 dBW/m^2/MHz (for angles above 25°). An alternative pfd mask is between −140 dBW/m^2/MHz (angles below 5°) rising to −115 dBW/m^2/MHz for angles above 20°. Considering the difference between the two values, the pfd mask of −140 dBW/m^2/MHz (angles below 5°) rising to −115 dBW/m^2/MHz for angles above 20° causes interference levels of 18 dB above recognized protection criteria with a large parabolic antenna with tilt angles up to 3 degrees. Either option will require some BAS off-pointing from the GSO.

In the case of mandatory pfd masks, MSS operations would be restricted to areas where the elevation angle of the MES towards the MSS satellite is above approximately 20°,which would reduce the MSS service area by more than 30% when compared to an area with a minimum elevation angle of 5º.

Some administrations are of the view that this is a severe constraint for MSS operations and, moreover, it would represent an inefficient use of orbit/spectrum resources. Some other administrations believe that it is up to MSS operators which service area they intend to serve and if the reduced service area is the targeted market or not, so this reduction would not be considered as a constraint and will not impact MSS.

Interference could be caused by BAS transmitters to MESs. The separation distance between BAS transmitter and MES is highly dependent on the terrain around the FS station. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss), separation distances are in the range of a few km to about 40 km in the worst case. In cases where the BAS and the MES antenna are pointing towards each other, the separation distances calculated in accordance with Recommendation ITU-R P.452 will exceed 100 km. MESs may be able to coexist with such interference if designed with mitigation features as described above. This would only work for narrow-band BAS links as no interference-free channels will be available in case of broadband BAS signals. Some administrations believe that MSS should operate on the conditions of not claiming protection, whereas other administrations believe that a coordination process should be considered.

5/1.25/4.2.3 Mobile service (excluding BAS)

The band 7 055-7 250 MHz is currently allocated on a primary basis to the MS. However, characteristics of mobile applications other than BAS to enable sharing studies with MSS downlinks are not available.

5/1.25/4.2.4 Fixed-satellite service

The band 7 055-7 075 MHz is used by GSO FSS systems for uplinks. There are currently six systems notified in the band 7 025-7 075 MHz. Interference could be caused by MSS satellites to FSS satellites for orbital separation of less than about 0.3 deg. In the case that the GSO MSS satellite is in a near antipodal position with respect to the FSS satellite (at almost opposite locations

in the geostationary arc, but just visible to one another), the MSS satellite would have to limit its e.i.r.p. in the direction of the FSS satellite. MSS satellite antenna discrimination of about 12 dB would be required, which would mean that MSS spot beams must avoid intersecting the geostationary arc. This would be a minor constraint on MSS operations. Therefore, coordination between MSS and FSS systems would be feasible with minor constraints on both the MSS and the FSS. MESs could receive interference from FSS uplink earth stations. However, this band is used mostly for feeder links to BSS systems and hence the number of earth stations globally is small, so this would not be a major constraint on MSS operations. The use of the band 7 055-7 075 MHz by non-GSO FSS systems for MSS feeder downlinks and BSS feeder uplinks has not been studied.

5/1.25/4.2.5 Earth exploration-satellite service

In accordance with provision No. **5.458** of the RR the frequency band 6 425-7 250 MHz is also used for passive microwave sensor measurements carried out in the EESS. Studies available show that interference from MSS downlinks is likely to exceed the relevant ITU-R protection criteria, by up to 15 dB, thus causes harmful interference. However, current and planned passive sensors would operate below 7 100 MHz and hence MSS operations above 7 100 MHz would not cause excessive interference to those sensors.

5/1.25/4.2.6 Space operation service

The bands 7 100-7155 MHz and 7 190-7 235 MHz are allocated to the SOS (Earth-to-space) in the Russian Federation through RR No. **5.459**. Studies have shown that interference from MSS downlinks would not cause excessive interference to space operation spacecraft provided the pfd from the MSS system does not exceed −115 dB(W/(m^2 · MHz)). However, for the case of the omnidirectional antenna, interference is only 0.5 dB below the I/N criterion of −10 dB. Further analysis is required to consider the effect of the directional antenna tracking a ground station and possible main beam coupling, and this may yield different results and conclusions.

Also, only a low-Earth orbit space operation system was considered. Sharing with other SOS systems with higher orbits (medium Earth orbit or GSO) is more difficult but has not been studied. It is expected that similar results for these orbits would be obtained as for SRS systems as indicated below.

5/1.25/4.2.7 Space research service

The band 7 145-7 235 MHz is allocated to the SRS (Earth-to-space).

Sub-band: 7 145-7 190 MHz

The use of the lower part of the band: 7 145-7 190 MHz by the SRS is limited to deep-space[24] use through RR No. **5.460**. This band is also used for near-Earth operations of deep-space missions.

MESs operating close to a deep-space earth station could receive interference above the MES protection criterion. For the studies based on space research stations transmitting with the maximum permitted e.i.r.p. in the direction of the horizon, the required separation distances range from several tens of km to several hundred km (600 km in the worst case). For the studies based on space research earth stations transmitting with lower power, consistent with practical operations, and a typical reference bandwidth for the MES of 1 MHz, the separation distances range from several tens of km to about 200 km in the worst case. If the MSS satellite is geostationary, the worst-case separation distances may only be required for certain azimuths. MESs operating in this band will

[24] Deep space is defined as space at distances from the Earth equal to, or greater than 2×10^6 km. (See RR No. **1.177**)

require accurate pointing/tracking mechanisms to maintain a predictable off-axis angle with respect to SRS earth stations.

Despite the relatively low number of SRS earth stations, the required separation distances would make large areas unavailable for MSS use. Any MESs operating at less than the calculated separation distances from the space-research earth stations would have to accept interference or switch to an interference-free channel. However, free channels may not be available if the MSS system is operating close to saturation. Moreover, if a free channel is available momentarily, it will have to take into account the dynamic nature of the SRS signal in this band. An SRS deep-space earth station frequently starts with the transmission of an unmodulated carrier during acquisitions, then switches to a much wider band signal with command subcarrier and modulation, and finally may switch to a ranging signal, with multiple tones, which will spread over an even larger band. Additionally, during a single track, a SRS earth station may switch its frequency in order to support more than one deep-space mission. Moreover, while tracking a deep-space mission, an SRS station continuously changes the frequency of its signal to compensate for the Doppler shift caused by the relative movement of the earth station and the SRS space station.

There are nine deep-space earth stations currently identified in Recommendation ITU-R SA.1014[25], but additional stations are currently under construction and new earth stations will be deployed in the future. Considering the relatively small number of space-research earth stations, particularly in the band 7 145-7 190 MHz, which is used for deep-space missions, this might be an acceptable constraint on MSS operations. To avoid constraints on operation of current and future SRS earth stations, the MSS would not claim protection from the SRS.

Studies for AESs show that separation distances as much as 975 km are required to avoid interference from the SRS earth station uplinks to the MSS aircraft earth stations. Required separation distances are smaller if the MSS aircraft terminals can correctly track the MSS satellite and, in particular, if the MSS satellite is geostationary, which will ensure large antenna off-axis angles between the MES terminals and the SRS sites for most azimuths.

For situations in the band 7 145-7 190 MHz where the SRS spacecraft is beyond 2×10^6 km from the Earth, the worst-case situation arises when the SRS spacecraft is close to the edge of the Earth and in the spot beam of the MSS satellite (the spot beam would intersect the edge of the Earth and the power would “overspill” into space). For this situation, the e.i.r.p. from the proposed MSS satellite would exceed the limit by about 3.6 dB. Hence, limits on the power radiated by the MSS satellite to deep space would be necessary, but would not be a significant constraint. The pfd in the direction of deep-space spacecraft would need to be limited to meet the protection levels in Recommendation ITU-R SA.1157-1. This protection level translates to a pfd value of −199.5 dB(W/m^2) in a bandwidth of 20 Hz, as shown below.

SR space stations protection criterion (Recommendation ITU-R SA.1157-1)	−190	dBW/20 Hz
SR sat antenna gain	48.0	dBi
Frequency	7 145	MHz
Ae_iso	−38.5	dBm^2
max pfd at SRS spacecraft	−199.5	dBW/m^2/20 Hz

25 Recommendation ITU-R SA.1014 is currently being revised to include information on additional SRS earth stations.

The above derived pfd level is based on an SRS satellite antenna diameter of around 4 m. There are currently plans to use larger antennas, such as inflatable antennas with diameters of up to 18 m, reducing the allowable pfd level by at least 10 dB. In the case where deep-space SRS satellites have occasional perigees near Earth, interference could be experienced in excess of up to 30 dB. The SRS satellite would need full protection from MSS transmissions in case of rare but very critical mission phases such as launch and early operations phase (LEOP), Earth fly-bys or sample returns, where excessive interference could result in a loss of the mission. Hence, MSS satellites would be required to interrupt operation on the affected frequencies. The restrictions on MSS operations would be rare events and would be limited to a small bandwidth (up to 3 MHz for the ranging signal). This would require complex procedures whereby the notifying administration of the SRS mission has to contact the notifying administrations of all respective MSS operators to ensure that affected MSS channels are switched off. Such a procedure requires that MSS satellites would have to interrupt their operation during launch, LEOP, Earth fly-by, and sample return phases of the SRS missions (when they operate below the GSO) on the affected frequency channel. Any interference avoidance technique between SRS missions and MSS satellites would require operational coordination when the SRS mission is below 2×10^6 km which would be difficult for SRS operators to accept (noting that such operational coordination would have to be effected with all MSS operators and the responsible administrations around the world). These constraints on the MSS should be acceptable because of the limited number of deep-space earth stations and the limited time period of deep-space SRS missions operating below the GSO. However, if the process is not successful, it may hamper the SRS missions.

It should be noted that some SRS deep-space missions may operate at near-Earth distances for several months after launch. Also, the launch of many deep-space missions is frequently delayed due to weather anomalies or equipment malfunction. If an MES operates in 7 145-7 190 MHz and 8 400-8 450 MHz as paired downlink/uplink bands and the measures described in section 5/1.25/3.3 are implemented to give an MES greater flexibility in operating near a 7 GHz SRS earth station, it should be noted that the MES would not be able to receive in 7 GHz within an exclusion zone for an 8 GHz SRS earth station because it could not transmit using the 8 GHz uplink band. Thus, in this case, the 8 GHz exclusion zone would also lead to constraints on use of the 7 GHz band.

Sub-band: 7 190-7 235 MHz

MESs operating close to a near-Earth earth station in the band 7 190-7 235 MHz could receive interference above the MES protection criterion. For the studies based on space research earth stations transmitting with the maximum permitted e.i.r.p. in the direction of the horizon, the required separation distances range from several tens of km to several hundred km (300 km in the worst case). The required separation distances would make large areas unavailable for MSS use. However, it should be pointed out that, if the MSS satellite is geostationary, large antenna off-axis angles between the MES terminals and the SRS sites will exist for most azimuths, and consequently the worst-case separation distances will only be required for certain azimuths. Any MESs operating at less than the calculated separation distances from a near-Earth space-research earth station would have to accept interference or to adopt measures to avoid interference. There are more near-Earth earth stations than for deep-space, but these constraints might be acceptable for MSS operations. To avoid constraints on operation of current and future SRS earth stations, the MSS would not claim protection from the SRS.

Studies have shown that the sub-band 7 190-7 235 MHz is more difficult to share than the band 7 145-7 190 MHz due to a larger number of earth stations in this part of the band, as well as orbital configurations where interference excess up to 20 dB could be caused repeatedly to SRS satellites when flying through the main beam of the MSS satellite.

Some earth stations are deployed close to large bodies of water. Separation distances for maritime mobile earth stations can range between 460 and 510 km for earth stations in the band 7 145-7 190 MHz and between 370 and 420 km for earth stations in the band 7 190-7 235 MHz. Interference to AESs has not yet been studied for this band, but it is expected that the required separation distances will be greater for AESs than those found for terrestrial MESs in the 7 145-7 190 MHz band.

If an MES operates in 7 190-7 235 MHz and 8 450-8 500 MHz as paired downlink/uplink bands and the measures described in section 5/1.25/3.3 are implemented to give an MES greater flexibility in operating near a 7 GHz SRS earth station, it should be noted that the MES would not be able to receive in 7 GHz within an exclusion zone for an 8 GHz earth station because it could not transmit using the 8 GHz uplink band. Thus, in this case, the 8 GHz exclusion zone could also lead to constraints on use of the 7 GHz band.

Regarding sharing with space research earth stations in the band 7 145-7 190 MHz, it appears to be potentially feasible, subject to the MSS accepting interference when operating in the vicinity of space-research earth stations. However, the required large exclusion zones and the dynamic nature of the SRS transmissions may render sharing impractical unless sufficient MSS channels are available for dynamic reassignment of interference-free channels. This is primarily a function of the frequency re-use scheme and the SRS channel bandwidth. If the SRS channel has a bandwidth of approximately equal size or larger than the bandwidth per MSS beam, this mitigation technique would not be available.

5/1.25/4.3 The band 8 400-8 500 MHz[26]

This band is considered for MSS uplinks. The band is allocated to the fixed and mobile (except aeronautical mobile) services on a primary basis. The band is also allocated to the SRS (space-to-Earth), with the band 8 400-8 450 MHz limited to use in deep space through RR No. **5.465**.

Sharing in the band 8 400-8 500 MHz would require MESs to avoid causing interference to receiving earth stations in the SRS.

5/1.25/4.3.1 Space research service in the band 8 400-8 450 MHz

For the band 8 400-8 450 MHz, adequate protection of SRS earth stations would require separation distances up to several hundred km for transmission paths over land and much longer distances, between 350 and 500 km, when the SRS earth stations are deployed near large bodies of water. Separation distances for AESs would range between 850 and 950 km. The separation distances would have to be based on minimum elevation angles of the SRS earth station as the actual angle is generally not known to the MSS operator.

For a majority of SRS earth stations, the entire frequency sub-band 8 400-8 450 MHz or 8 450-8 500 MHz would have to be taken into account for the separation distance as SRS earth stations generally support several missions per day. In addition, cross-support agreements are in existence and any SRS station could be called upon for support on any of the frequencies in the sub-band over limited time periods. All SRS earth stations can tune to any frequency in the band 8 400-8 500 MHz. Near-Earth SRS stations often support SRS deep-space missions for orbital phases where the perigee is close to Earth as fast movements of large antennas are limited.

In view of the sensitivity of the operations in the band 8 400-8 450 MHz, space agencies have international agreements not to exceed the levels of Recommendation ITU-R SA.1157 at any time

[26] See section 5/1.25/4.7.

as mission objectives could be lost for which a satellite has been cruising for years to far distant locations to encounter a comet or planet.

In the event of harmful interference from MES transmissions into an SRS earth station, the required reacquisition times of the SRS signal may be much longer than the interference burst itself.

Despite the relatively low number of SRS earth stations in the band 8 400-8 450 MHz, the required separation distances would make large areas unavailable for MSS use. MESs would be required to avoid operating in the areas around SRS earth stations where interference would be caused to SRS earth stations. If the MSS satellite is geostationary, the worst-case separation distances may only be required for certain azimuths. MESs operating in this band will require accurate pointing/tracking mechanisms to maintain a predictable off-axis angle with respect to SRS earth stations. Given the relatively small number of space-research earth stations globally, this might be an acceptable constraint on MSS operations.

Procedures and assumptions would need to be agreed for the determination of the required separation distances. Several studies have used propagation models including terrain models and have assumed that the MES is permanently operating at any location, to ensure worst-case assumptions are used. The studies have not included clutter losses, which may reduce the separation distances, but caution is required as clutter losses may vary over time. The ability of MESs to comply with exclusion areas would be an important consideration as the consequences of operation of an MES within the separation distance could be very serious.

It would in practice be difficult for an SRS earth station operator to determine if an MES is the source of interference. A report of infringement (in accordance with RR Appendix **9**) could not be filed as the location of the MES is generally unknown.

Appropriate provisions are required to ensure protection of future deep-space SRS earth stations. No constraints should be placed on deployment of future SRS space stations.

Studies for AESs, taking into account applicable propagation effects, show that separation distances as much as 900 km are required to avoid interference from the AES to the receiving SRS earth stations. Required separation distances are smaller if the AES can correctly track the MSS satellite and, in particular, if the MSS satellite is geostationary, which will ensure large antenna off-axis angles between the MESs and the SRS sites for most azimuths. Moreover, the effect of emissions from multiple MESs in the separation distances around SRS earth stations has been analysed and found to have negligible effect on the required distances.

For those cases where the SRS satellite remains above 2×10^6 km, the protection requirements for MSS satellites can be met but, for the case analysed, would require constraints on the MSS satellite antenna, to avoid pointing towards the edge of the earth. During the near-Earth operations of deep-space SRS spacecraft, interference from the SRS spacecraft could cause the protection requirements for MSS satellites to be exceeded by many dB, unless affected MSS channels can be swapped with non-interfered with channels which may be difficult considering the high velocity of the SRS spacecraft traversing the MSS beams. These constraints on MSS would be acceptable because of the limited time period of deep-space SRS missions operating below 2×10^6 km. It should be noted, however, that some SRS deep-space missions may stay in near-Earth for several months after launch. Also, the launch of many deep-space missions is frequently delayed due to weather anomalies or equipment malfunction. However, any operational coordination during a critical phase of those missions would be difficult for SRS operators to accept (noting that such operational coordination would have to be effected with all MSS operators around the world). However, it should be recognized that the number of co-frequency MSS systems will inherently be limited by the antenna discrimination of the small MSS earth station antennas.

Some administrations are of the view that geostationary MSS systems have several advantages over non-GSO MSS systems in that worst-case interference results would only apply for certain azimuth angles. Recognizing that additional spectrum is sought for GSO MSS systems providing broadband data services via directional transportable terminals, sharing may be feasible when coupled with mitigation techniques. Some administrations have the view that mitigation techniques may result in limited compatibility with some affected service applications when considered in isolation, but the combined impact on all affected services as well as the associated restrictions on the MSS systems would not allow for successful sharing.

5/1.25/4.3.2 Space research service in the band 8 450-8 500 MHz

The band 8 450-8 500 MHz is used for near-Earth applications in the SRS.

For the band 8 450-8 500 MHz, most of the above conclusions regarding SRS earth stations in the band 8 400-8 450 MHz apply similarly. Studies have determined that separation distances up to about 300 km may be required over land. Distances will increase to around 400 km near large bodies of water. AESs would require separation distances up to around 800 km. Exclusion areas around each SRS earth station would be required where MES operations would not be permitted to operate. Given the number of space research earth stations in use throughout the world (currently around 40, but growing), such exclusion areas might be an acceptable constraint on MSS operations. However, it should be pointed out that, if the MSS satellite is geostationary, large antenna off-axis angles between the MES terminals and the SRS sites will exist for most azimuths, and consequently the worst-case separation distances will only be required for certain azimuths. Appropriate provisions are required to ensure protection of future SRS earth stations. No constraints should be placed on deployment of future SRS space stations.

While a majority of near-Earth space research satellites will be able to meet typical MSS protection requirements, there is a limited number of near-Earth SRS satellites that will have regular or even permanent orbit heights underneath the GSO and could use higher power density (well within the RR pfd limits). For these systems, which like all SRS missions typically transmit in a bandwidth of no more than 10 MHz, MSS protection criteria may not be met. Transmissions are often effected via the omnidirectional antenna so that excessive interference levels occurring at the MSS satellite may interrupt the link from MESs.

A number of near-Earth SRS satellites will have orbits below the MSS orbit between several times a day and once every few days. Based on past experience, even mission anomalies would have to be taken into account where the satellite may not reach the desired orbit and may have apogees close to the GSO twice a day for many years. The results of dynamic simulations of hypothetical cases were confirmed by static analyses which showed that protection criteria of MSS satellites can be exceeded by up to 60 dB. Complexity is added by the fact that there are no standard SRS orbits as they always depend on mission objectives. It is therefore not possible to draw general conclusions from a few orbit examples. A general assessment of potential SRS satellites operating in compliance with the RR is needed and such assessments indicate that MSS protection criteria can be exceeded by orders of magnitude. It would be unacceptable to exclude a range of SRS orbits or severely limit their currently allowed power flux-densities.

The effect of emissions from multiple MSS MESs in the separation distances around SRS earth stations has been analysed and found to have little effect on the required distances.

5/1.25/4.3.3 Sharing with the fixed service

In the band 8 400-8 500 GHz, the FS is widely used for FWS. In at least one administration, links are used to carry data for en-route and terminal surveillance radars, voice communications, and

other application that are used for air traffic control. These links are critical for maintaining separation of aircraft during all phases of flight and under all weather conditions.

There is potential for interference from MESs to FWS receivers. In the case of land mobile earth stations, the required separation distance varies depending on the terrain. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss), on the worst-case azimuth, the distance may be up to about 30 km, and on other azimuths the distance may be less than 10 km. In cases where the FWS and the MES antenna are pointing towards each other, the separation distances calculated in accordance with Recommendation ITU-R P.452 will be up to 200 km. All of these estimates do not consider benefits from terrain clutter (e.g. trees and buildings), which would reduce the required separation in cases where diffraction is the main propagation mode but would have little impact in case tropospheric scatter or layer ducting are the main propagation modes.

For aircraft earth stations, the required separation distance may be determined by the visibility limits between the aircraft and FWS station. In such case, the maximum required separation, for an aircraft at 12 200 m (40 000 feet), is about 450 km. Separation distances taking into account beyond line-of-sight propagation modes are expected to be much larger. The exact numbers need further study.

Up to ±10º off-pointing from the GSO will be required to protect MSS satellites from transmitting FS stations which will be a significant constraint for countries at high latitudes. A single FS station could cause interference above an I/N = 30 dB and would disable operation of an entire MSS beam. Provided the off-pointing angle to the MSS satellite exceeds about 10°, interference from an FWS station would be at least 4 dB below the interference criterion (–12.2 dB I/N). There may be several co-frequency FWS stations within an MSS satellite spot beam; however, it is likely that there is sufficient margin such that the interference from all FWS stations would not exceed the criterion.
The band 8 400-8 500 MHz is used in some countries for fixed BAS. Characteristics are described in Recommendation ITU-R F.1777. With regard to interference from BAS transmitters to MSS satellite receivers, an off-pointing angle to the MSS satellite of about 15° would be necessary to ensure that interference is at least 2 dB below the criterion. Similarly, this will be a significant constraint for countries at higher latitudes.

There is potential for interference from MESs to BAS receivers. In the case of land mobile earth stations, the required separation distance varies depending on the terrain. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss), on the worst-case azimuth, the distance may be up to about 30 km, and on other azimuths the distance may be less than 10 km. In cases where the BAS and the MES antenna are pointing towards each other, the separation distances calculated in accordance with Recommendation ITU-R P.452 will be more than 100 km. These estimates do not consider benefits from terrain clutter (e.g. trees and buildings), which would reduce the required separation in many cases where diffraction is the main propagation mode but would have little impact in case tropospheric scatter or layer ducting are the main propagation modes. For aircraft earth stations, the required separation distance is determined by the visibility limits between the aircraft and BAS station. In such cases, the maximum required separation, for an aircraft at 12 200 m (40 000 feet), is about 450 km. Separation distances taking into account beyond line-of-sight propagation modes are expected to be much larger. The exact numbers need further study.

Many administrations acknowledge the fact that sharing with mobile BAS links is generally not feasible in view of their unknown locations and pointing directions. Some administrations do not agree with the above conclusion.

For those countries that operate terrestrial services (including FWS and BAS) in this band, exclusion areas would be required to ensure that MESs do not cause harmful interference. If there are a large number of terrestrial stations, it may be impractical to define an exclusion area for each

one, and alternatively, the exclusion area might need to be defined for a group of terrestrial stations within a specific area or an entire country. In countries where there is little use of the band 8 400-8 500 MHz by terrestrial services, this band may be used by MESs with few constraints with respect to the terrestrial services. Coordination may still be required for stations close to borders in view of the large separation distances. The use of AESs in a particular country would require consideration of terrestrial usage in neighbouring countries, within a distance of at least 450 km based on line-of-sight propagation. Separation distances taking into account beyond line-of-sight propagation modes are expected to be much larger. The exact numbers need further study.

5/1.25/4.4 The band 10.5-10.6 GHz[27]

This band is considered for a possible MSS space-to-Earth allocation. Either this band and/or 13.25-13.4 GHz are considered as potential MSS space-to-Earth bands, paired with 15.43-15.63 GHz as the Earth-to-space band.

The band 10.5-10.55 is currently allocated for FS and MS on a primary basis and the band 10.55-10.6 GHz is currently allocated on a primary basis to the FS and MS (except aeronautical mobile). The RLS is allocated in the band 10.5-10.55 GHz on a primary basis in Regions 2 and 3, and on a secondary basis in Region 1. The RLS is allocated in the band 10.55-10.6 GHz on a secondary basis in all three Regions. The adjacent band, 10.6-10.7 GHz is allocated to the RAS, the EESS (passive) and the SRS (passive).

5/1.25/4.4.1 Sharing with the fixed service, fixed wireless systems

With regard to sharing with FWS systems, there is potential interference from MSS downlinks to FWS receivers. Pfd limits or coordination threshold values would be required to protect FS receivers. Studies are being conducted to assess pfd values for the protection of FWS. One possibility is to consider inclusion of hard limits in RR Article **21** for the band 10.5-10.6 GHz, with the same values as the ones applicable in the frequency band 10.7-11.7 GHz (and converting to a reference bandwidth of 1 MHz), i.e. between −126 dBW/m^2/MHz (angles below 5°) rising to −116 dBW/m^2/MHz for angles above 25°. A further possibility, which is being studied, is −158 dBW/m^2/MHz (angles below 3°), rising to −120 dBW/m^2/MHz (for angles above 25°). Another possibility being studied are pfd values between −140 dBW/m^2/MHz (angles below 5°) rising to −115 dBW/m^2/MHz for angles above 20°. The pfd levels for low arrival angles (less than 3° and 5°) of these latter two masks are respectively 32 dB and 14 dB tighter than the current pfd limit in RR Article **21** for the band 10.7-11.7 GHz and consequently the latter two pfd masks may be considered as either hard limits or coordination threshold values. Studies of the necessary pfd values required for the FWS protection are contained in the PDNRep ITU-R M.[MSS-SHARING] and need to be completed.

Interference might be caused by FWS transmitters to MESs. The separation distance between FWS transmitter and MES is highly dependent on the terrain around the FWS station. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss, antenna gain 49 dBi), separation distances are in the range of a few km to about 15 km in the worst case. Some administrations have the view that some of the assumptions are too optimistic and the distance will exceed 100 km. However some other administrations have the view that this latter number is only a hypothetical assumption, and not based on study results. Further studies are needed to resolve the difference between the results. MESs may be able to coexist with such interference if designed with mitigation features as described above.

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[27] See section 5/1.25/4.7.

5/1.25/4.4.2 Broadcasting auxiliary services

This band is also available for fixed and mobile BAS systems, and characteristics for systems in the range 10.5-10.6 GHz are contained in Recommendations ITU-R F.1777 and ITU-R M.1824.

Pfd limits or coordination threshold values would be required to protect BAS receivers. Studies are being conducted to assess pfd values for the protection of BAS. One possibility is to consider inclusion of hard limits in RR Article **21** for the band 10.5-10.6 GHz, with the same values as the ones applicable in the frequency band 10.7-11.7 GHz (and converting to a reference bandwidth of 1 MHz), i.e. between −126 dBW/m^2/MHz (angles below 5°) rising to −116 dBW/m^2/MHz for angles above 25°. A further possibility, which is being studied, is −158 dBW/m^2/MHz (angles below 3°), rising to −120 dBW/m^2/MHz (for angles above 25°). Another possibility being studied are pfd values between −140 dBW/m^2/MHz (angles below 5°) rising to −115 dBW/m^2/MHz for angles above 20°. The pfd levels for low arrival angles (less than 3° and 5°) of these latter two masks are respectively 32 dB and 14 dB tighter than the current pfd limit in RR Article **21** for the band 10.7-11.7 GHz and consequently the latter two pfd masks may be considered as either hard limits or coordination threshold values. Considering the difference between the latter two masks for low arrival angles, the latter mask could lead to interference potentially 18 dB higher. Studies of the necessary pfd values required for the BAS protection are contained in the PDNRep ITU-R M.[MSS-SHARING] and need to be completed.

Interference could be caused by BAS transmitters to MESs. The separation distance between BAS transmitter and MES is highly dependent on the terrain around the FS station. Using some assumptions (including non-worst-case alignment of antennas, no clutter loss, antenna gain: 35 dBi), separation distances are in the range of a few km to about 35 km in the worst case. Some administrations have the view that some of the assumptions are too optimistic and also that the maximum antenna gain is higher than 45 dBi, and hence the calculated separation distances may exceed approximately 100 km. However, some other administrations have the view that this latter number is only a hypothetical assumption, and not based on study results. MESs may be able to coexist with such interference if designed with mitigation features as described above. However, if these types of mitigation techniques are not implemented, sharing with BAS may not be feasible.

5/1.25/4.4.3 Sharing with the radiolocation service

With regard to the RLS, there are no ITU-R Recommendations that include characteristics of radiolocation systems used in these bands. There are known to be some low power radiolocation devices (type-1) authorized in some countries. In Europe, the band 8.5-10.5 GHz is identified for tank level probing radar applications which, since they are used inside tanks, do not present any sharing issues with respect to possible MSS usage. Also in Europe, the band is identified for other low power applications, with a maximum peak power of 500 mW. However, characteristics of such applications to enable sharing studies with MSS downlinks are not available.

This type of radar applications (type-1) would be protected by the pfd hard limits or thresholds generally applicable to terrestrial services which are described above.

Currently there are no ITU-R Recommendations which include characteristics of higher power radiolocation applications (type-2) operating in the 10.5-10.6 GHz band. Therefore, in the absence of relevant parameters, it has been suggested to use the characteristics of radiolocation systems that operate in the band 8.5-10.5 GHz, as contained in Recommendation ITU-R M.1796, which is currently under revision. The purpose of the revision is to expand the frequency range to include radar characteristics of the frequency band 10.5-10.68 GHz. Some administrations use the band 10.5-10.6 GHz for type-2 radars. One administration uses radiolocation in the 10.5-10.55 GHz band only. The results of studies using radiolocation characteristics based on those contained in Recommendation ITU-R M.1796 show that under certain circumstances it would not be feasible for

MESs and type-2 radiolocation systems to operate co-frequency compatibly in the same geographic area at the same time.

It is recognized that sharing between MSS downlink and type-2 radiolocation would be more difficult than with type-1 radar applications. According to the studies of ITU-R, the pfd level from MSS exceeds the permissible level of interference to radiolocation stations by 27.4 dB. Consequently, in order to protect radar applications in the band 10.5-10.6 GHz contained in Recommendation ITU-R M.1796, in countries where such a use was identified, a pfd value of −146 dBW/m²/MHz is proposed.

NOTE – A better way of describing radiolocation systems type-1 and type-2 needs to be developed, based on their susceptibility to interference.

5/1.25/4.4.4 Compatibility with the Earth-exploration satellite service (passive) and the space research service (passive)

MSS downlink operations in the band 10.5-10.6 GHz are compatible with remote passive sensors operating in the band 10.6-10.7 GHz. Some filtering of up to about 22 dB on the MSS satellite emissions could be necessary to meet the protection criteria of −166 dBW in the band 10.6-10.7 GHz.

5/1.25/4.4.5 Compatibility with the radio astronomy service

MSS downlink operations in the band 10.5-10.6 GHz are compatible with radio astronomy applications operating in the band 10.6-10.7 GHz but some filtering of the MSS satellite emissions of about 29 dB would be required in order to meet the protection criteria for continuum observations of −160 dB(W/m^2) in the band 10.6-10.7 GHz.

5/1.25/4.5 The band 13.25-13.4 GHz

This band is considered for a possible MSS space-to-Earth allocation. Either this band and/or 10.5-10.6 GHz, are considered as potential MSS space-to-Earth bands, paired with 15.43-15.63 GHz as the Earth-to-space band.

The band is currently allocated to the EESS (active) and SRS (active) on a primary basis. The band is also allocated to the ARNS on a primary basis, limited to use for Doppler navigation aids through RR No. **5.497**. Characteristics of Doppler navigation aids systems are currently being determined.

5/1.25/4.5.1 Sharing with remote active sensors

Regarding potential use of this band by remote active sensors, three types of instrument are considered under the EESS (active) allocation: scatterometers, altimeters and precipitation radars. Information from Report ITU-R RS.2068 and Recommendation ITU-R RS.1166, as well as information collected so far, shows that in the band 13.25-13.4 GHz there is currently only one operational system, a scatterometer, which is actually using a few MHz at the edge of 13.4 GHz. There are planned systems that would operate in the 13.25-13.4 GHz band. There is no existing use for altimeters and precipitation radars in this band. Current systems operate in the band 13.4-13.75 GHz. MSS and EESS may use overlapping frequencies in the future. Taking into account the technical analysis, it is expected that a potential MSS downlink would not cause interference to EESS (active) sensors, including those operating in the band 13.25-13.4 GHz. However, special care should be given for the protection of precipitation radars due to the relatively small positive margin.

MSS earth stations will also be susceptible to interference from the EESS (active) space stations, and the effects of this potential interference into the MSS earth stations has not been studied.

Studies related to sharing between the MSS and EESS (active) are not finalized and work is continuing in WP 4C. See the PDNRep ITU-R M.[MSS-SHARING].

No existing or currently planned use has been identified for the SRS (active).

5/1.25/4.5.2 Sharing with the aeronautical radionavigation service

A number of administrations use Doppler navigation aids in this band, which are operated in the ARNS on board aircraft. Such use is under RR No. **4.10**.

Considering potential interference from MSS downlinks to ARNS receivers, studies have shown that interference from MSS downlinks to such radionavigation systems through the ARNS antenna back lobe or side lobe may be acceptable with no significant constraints on MSS operations. However, the case of the MSS signal reflection on the ground might also have an important interference effect on the ARNS antenna main lobe and should therefore be taken into account in future studies.

Regarding interference from ARNS transmitters to MES receivers, calculations show that considerable interference excess (more than 40 dB for any scenario) can be expected for the receiving MESs from the transmitter installed both on airplane and helicopter. ARNS transmissions would cause transitory interference to downlink MES receivers. Taking into account that receiving MES can be located in the visibility area of several aircraft simultaneously, the cumulative interfering effect will result in even greater degradation of the interfering situation for receiving MESs, also with some temporal variation resulting from the aircraft motion. MES receivers would operate on non-protection basis. Some administrations believe that mitigation techniques applicable to MESs need to be further developed/studied in order to minimize the interference into MES.

5/1.25/4.6 The band 15.43-15.63 GHz[28]

This band is considered for a possible MSS Earth-to-space allocation. The band is considered as a potential MSS Earth-to-space band, paired with either 10.5-10.6 GHz and/or 13.25-13.4 GHz as the space-to-Earth bands. Some administrations are of the view that it may also be possible to use the band 5 150-5 250 MHz as a space-to-Earth band, paired with the band 15.43-15.63 GHz.

The band is allocated to the aeronautical radionavigation service on a primary basis. The band is also allocated to the FSS (Earth-to-space and space-to-Earth), limited to use for the feeder links of non-GSO MSS systems through RR No. **5.511A**.

5/1.25/4.6.1 Sharing with the aeronautical radionavigation service

This band is allocated to the ARNS on a primary basis and provision RR No. **4.10** (addressing safety-related services) applies. The entire 15.43-15.63 GHz band is used in several countries for aircraft landing systems (ALS). The characteristics of aeronautical radionavigation systems (including ALS) which operate in the band 15.4-15.7 GHz are contained in Annex 1 of Recommendation ITU-R S.1340 as well as in Report ITU-R M.2170. Studies have assessed the required separation distance between an MES and aircraft operating with ALS. Some ITU-R studies have suggested a separation distance of 21 km, whilst other ITU-R studies have suggested a separation distance of 500 km. Further work needs to be carried out regarding the necessary separation distance. However, co-coverage sharing between MSS and ALS is not feasible in countries which operate ALS, unless sufficient frequency separation can be maintained, bearing in mind that the entire band is used by ALS in several countries. Sharing would be feasible in those countries which do not operate ALS systems in this band, subject to coordination in order to ensure

[28] See section 5/1.25/4.7.

no interference is caused to ALS systems in neighbouring countries. Furthermore the sharing conditions of MESs on board aircraft with ARNS need further to be investigated.

In addition, the above-mentioned usage requires advanced satellite antenna structure, according to PDNRep ITU-R M.[MSS-SHARING]. The antenna discrimination between the satellite receiving antenna main beam and the ALS antenna main beam should be 42 dB to 55.6 dB, which leads to large geographical separation distances between ALS and MSS. Further studies are required.

Airborne multipurpose radars (MPRs) may also be used in the band 15.4-15.7 GHz. ITU-R studies show that co-frequency co-coverage sharing with MSS systems is not feasible and co-coverage sharing of this band with multipurpose radars may be feasible if different frequencies are used. It should be noted that the multipurpose radar operates with a relatively small bandwidth (500 kHz) and therefore MESs may be able to avoid operating on the same frequencies.

5/1.25/4.6.2 Sharing with the fixed-satellite service

Although the band is allocated for non-GSO MSS feeder links in the FSS, it is understood that there is no current or planned use for such applications in this band.

5/1.25/4.6.3 Sharing with the radiolocation service

The band 15.43-15.63 GHz is also considered under WRC-12 Agenda item 1.21, seeking 300 MHz in the band 15.4-15.7 GHz for an allocation to the RLS. This would increase the current allocation to the RLS in the band 15.7-17.3 GHz**.** Preliminary studies of sharing with the RLS show that sharing will be difficult (coordination distance from a single MSS station of 706 km). However, MSS operations could be feasible in the case that spectrum within portions of the band 15.43-15.63 GHz is not allocated to the RLS by WRC-12, leaving the possibility of an allocation to the MSS.

A single MES will cause interference into the radar and, depending on the number of MESs deployed, the interference into the radar receiver may reach harmful levels. Further studies are required before any MSS allocation is made in this band.

5/1.25/4.6.4 Compatibility with the radio astronomy service in the band 15.35-15.4 GHz

MSS uplink operations in the band 15.43-15.63 GHz are expected to be compatible with radio astronomy applications operating in the band 15.35-15.4 GHz assuming some minimum separation distance, and/or some additional filtering on the MES emissions to meet the protection criteria for continuum observations of −156 dB(W/m2) in the band 15.35-15.4 GHz. It should be noted that there is a frequency separation of 30 MHz between the proposed MSS allocation and the radio astronomy service. Further studies are required.

5/1.25/4.7 Views of administrations on the bands 7 055-7 250 MHz, 8 400-8 500 MHz, 10.5-10.6 GHz, and 15.43-15.63 GHz

Many administrations expressed the view that taking into account the cumulative impact of all aspects listed above in sections 5/1.25/4.2 and 5/1.25/4.3, sharing between incumbent services and new MSS applications would practically not be feasible in the frequency bands 7 055-7 250 MHz and 8 400-8 500 MHz due to severe operational constraints that MSS systems may suffer to achieve compatibility with affected current and future systems of other services and due to interference that may be caused by MSS to other services to which the frequency band is allocated. Furthermore Resolution **231 (WRC-07)** could not be complied with considering the constraints which would have to be imposed on existing services in order to allow for viable MSS operations. Therefore, these frequency bands are not supported as potential new MSS allocations.

Some of these administrations furthermore are of the view that the band 10.5-10.6 GHz is not supported as potential new MSS allocations.

Some administrations are of the view that the band 15.43-15.63 GHz is also not applicable for a new MSS allocation.

Some other administrations do not share the above views and consider that MSS operations in these bands may be feasible without undue constraints on existing services. Those administrations expressed the view that these bands provide a potential for new MSS allocations.

Some other administrations are of the view that studies should continue in these bands.

5/1.25/5 Methods to satisfy the agenda item

The methods to satisfy the agenda item are considered below for each of the six examined bands. From these bands, example potential pairings are: 1) MSS uplink in the band 8 400-8 500 MHz paired with either 5 150-5 250 MHz or 7 100-7 190 MHz as MSS downlink bands; and 2) MSS uplink in the band 15.43-15.63 GHz, paired with MSS downlink in the band 10.5-10.6 GHz and/or 13.25-13.4 GHz. Some administrations are of the view that it may also be possible to use the band 5 150-5 250 MHz as a space-to-Earth band, paired with the band 15.43-15.63 GHz.

Some administrations are of the view that, if no MSS allocation could be made by WRC-12 in any of the bands under consideration in Methods A – F, modification to Resolution **231 (WRC-07)** may be necessary to consider other frequency bands outside the range 4-16 GHz to satisfy the requirements for additional MSS spectrum. Some other administrations are of the view that this should be addressed under Agenda item 8.2.

5/1.25/5.1 A. The band 5 150-5 250 MHz

Method A1. There would be no allocation to the MSS in this band and therefore no change to the Radio Regulations.

Advantage

− No impact on existing services.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method A2. Introduction of primary MSS downlink allocation in RR Article **5**, together with additional provisions in RR Articles **5** and **21** and RR Appendices **5** and **7** to ensure necessary protection of existing services, developed based on the studies conducted in PDNRep ITU-R M.[MSS-SHARING]. This method includes the following provisions:

− Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.

− Power flux-density limits in RR Article **21** to protect mobile services (including RLANs) operating under RR No. **5.446A**.

− Power flux-density levels in RR Appendix **5** as coordination thresholds to protect AMT operating under RR No. **5.446C**. RR No. **9.14** would be applied through the footnote referring to RR No. **9.11A**.

− Footnote in RR Article **5** to require coordination of MSS and non-GSO MSS feeder links under RR No. **9.11A** in order to address interference from MSS satellites into non-GSO MSS feeder-link satellite receivers. The coordination trigger in RR

Appendix **5** would be frequency overlap under the current entries for RR No. **9.13** and RR No. **9.12A**.

– With respect to regulatory conditions for potentially affected receiving MESs, there are two options:

Option (1a): Add columns for the frequency band to the appropriate Tables of RR Appendix **7**, regarding coordination of transmitting non-GSO MSS feeder-link stations (Table 9a), RLANs (Table 8c) and AMT stations (Table 8c) with respect to receiving MSS earth stations. Such changes to RR Appendix **7** only apply cross-border coordination, to allow administrations who wish to implement MSS to coordinate these MESs with neighbouring countries.

Option (1b): Regulatory conditions would ensure that MSS earth stations shall not claim protection from terrestrial services and transmitting earth stations in the FSS.

– It may also be necessary to develop appropriate regulatory measures to address sharing between MSS and ARNS; and between MSS and RDSS.

Advantages

– Would provide a downlink allocation of 100 MHz for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

− Implementation of the proposed provisions and coordination mechanisms provides flexibility for operators to reach solutions tailored to particular interference situation, while protecting and not placing undue constraints on the existing services.

− This frequency band being at relatively low frequencies (in comparison to other frequency bands under consideration), it is particularly suitable for the implementation of mobile services including small terminals.

Disadvantages

− Would require the establishment of regulatory provisions to provide for the protection of the existing services, or coordination procedures or other approaches in order to ensure protection of MES, which would place additional regulatory requirements or constraints on these services.

– MSS systems would need to be designed to accept interference from terrestrial or earth stations.

5/1.25/5.2 B. The band 7 055-7 250 MHz

Method B1. There would be no allocation to the MSS in the entire band 7 055-7 250 MHz and therefore no change to the Radio Regulations.

Advantage

− Would ensure the continued operation of the fixed, mobile, space research (both near-Earth and deep-space), and space operations services in accordance with RR No. **5.459** within their existing environment.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method B2. Introduction of primary MSS downlink allocation in RR Article **5** in one or several portions of the band 7 055-7 250 MHz, combined with NOC option in the other parts. The method

is developed based on the studies conducted in PDNRep ITU-R M.[MSS-SHARING], subject to the further development of the studies anticipated before WRC-12.

It should be noted that the options to make an MSS allocation in each sub-band below are not mutually exclusive, nor limited to just the specific sub-bands listed.

Provisions to be associated with Method B2 in the various listed bands						
		SERVICES				
Band (MHz)		**FSS⇗⇙**	**FS/MS**	**SRS (deep space)⇙**	**SRS (near Earth)⇙**	**SOS⇙**
7 055-7 075		1, 2, 3	1, 3, 4			
7 075-7 145			1, 3, 4			1, 11 (above 7 100 MHz)
7 145-7 190			1, 3, 4	1, 5, 6, 7		1, 11 (below 7 155 MHz)
7 190-7 235			1, 3, 4		1, 8, 9, 10	1, 11
7 235-7 250			1, 3, 4			

Provisions applicable to Method B2

1 Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.

2 With respect to the FSS uplink allocation (generally used for BSS feeder links), RR No. **9.7** would apply for coordination between GSO systems. RR Appendix **5** provides the coordination trigger and RR Appendix **8**, section 2.2.2, provides the calculation method for bidirectional situations. A footnote in RR Article **5** would be required to address coordination of MSS and non-GSO FSS systems under RR No. **9.11A** in order to address interference from MSS satellites into non-GSO FSS satellite receivers. The coordination trigger in RR Appendix **5** would be frequency overlap under the current entries for RR No. **9.13** and RR No. **9.12A**.

3 With respect to regulatory conditions for potentially affected receiving MESs, there are two options:

Option (1a): Add columns for the frequency band to the appropriate Tables of RR Appendix **7**, regarding coordination of transmitting FS or MS stations (RR Appendix **7**, Table 8c) and transmitting BSS feeder link earth stations (RR Appendix **7**, Table 9a) with respect to receiving MESs. Such changes to RR Appendix **7** only apply cross-border coordination, to allow administrations who wish to implement MSS to coordinate these MESs with neighbouring countries.

Option (1b): Regulatory conditions would ensure that MESs shall not claim protection from terrestrial services and transmitting earth stations in the FSS.

4 Power flux-density levels to protect the FS and MS (including broadcasting auxiliary service applications):

Option (2a): Coordination thresholds in RR Appendix **5**, together with a footnote in RR Article **5** applying RR No. **9.14**.

Option (2b): Hard limits in RR Article **21**.

5 MESs would select channels without interference in the vicinity of the small number of deep-space SRS earth stations in 7 145-7 190 MHz. Therefore, no changes would be made to RR Appendix **7**. A footnote would be added to RR Article **5** stating that, in this band, MSS shall not claim protection from current and future SRS earth stations.

6 With respect to protection of SRS space stations in deep space, insert a pfd limit in RR Article **22** at 2×10^6 km from the Earth.

7 WRC Resolution to establish procedures to address the Earth fly-bys, LEOPs, and sample return operations of deep-space missions through operational coordination.

8 MSS earth stations would select channels without interference in the vicinity of the limited number of near-Earth SRS earth stations in 7 190-7 235 MHz. Therefore, no changes would be made to RR Appendix **7**. A footnote would be added to RR Article **5** stating that, in this band, MSS shall not claim protection from current and future SRS near-Earth stations.

9 With respect to protection of SRS space stations, RR No. **9.7** would apply for coordination between GSO systems. RR Appendix **5** provides the coordination trigger and RR Appendix **8**, section 2.2.2, provides the calculation method for bidirectional situations.

10 WRC Resolution to establish procedures to address the coordination between GSO MSS and near-Earth SRS space stations through operational coordination.

11 It may be necessary to develop appropriate regulatory provisions to address sharing between MSS and space operations under RR No. **5.459**. A footnote would be added to RR Article **5** stating that, in this band, MSS shall not claim protection from current and future SOS earth stations.

Advantages

– Would provide a downlink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

– Implementation of the proposed coordination mechanisms provides flexibility for operators to reach solutions tailored to particular interference situation, while protecting the existing services.

– In the 7 145-7 190 MHz band, it is acceptable for MSS operators that the service would be interrupted infrequently, such as in near-Earth phases of deep-space SRS missions, which would require operational coordination to avoid mutual interference.

Disadvantages[29]

– Would require the establishment of numerous and complex regulatory provisions to provide for the protection of the existing services, or coordination procedures or other approaches in order to ensure protection of MES (under option (1a) within provision 3) and would not allow for MSS operations in many and, in some cases, large areas around existing stations due to excessive interference.

– Mandatory MSS pfd limits to protect FS/BAS systems would restrict MSS operations to areas where the elevation angles of the MES towards the MSS satellite is above 20º, reducing the MSS service area by more than 30% when compared to an area with a minimum elevation angle of 5º.

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[29] Considering that five different services have to be addressed with a least eight different service applications and five different sub-bands to be considered, it is necessary to allow for at least a minimum description of the various impacts. It would be confusing for delegates preparing for WRC-12 to summarize all these different combinations in three disadvantages.

– Would require FS stations to off-point between ±1º and ±15º from the GSO to protect FS stations from MSS interference, and for fixed BAS stations occasionally more than ±15º to protect BAS stations which would generally not be feasible for a mobile BAS.

– Under option (1b) within provision 3, MES could not claim protection from current and future fixed and mobile stations, and therefore would need to be designed to accept interference from them.

– Would in some cases result in interference to SRS satellites up to 30 dB in excess of applicable ITU-R recommendations in the band 7 145-7 235 MHz, being particularly critical for deep space missions in the band 7 145-7 190 MHz, where interference during essential orbital manoeuvres may result in loss of the mission. A similar situation may occur for the space operation service in the bands 7 100-7155 MHz and 7 190-7 235 MHz operating in accordance with RR No. **5.459** for which studies are not completed.

– Would require operational coordination and disruption of MSS services during operations of the near-Earth SRS missions in 7 190-7 235 MHz and operations of the deep space SRS missions during near-Earth phases in 7 145-7 190 MHz, and the resultant burden that would be difficult for SRS operators to accept (noting that such operational coordination would have to be effected with all MSS operators around the world to ensure that affected MSS channels are switched off, noting that the number of MSS systems is inherently limited by the small earth station antenna size, e.g., 20 cm earth stations would lead to around 12 co-frequency systems). During launch of SRS satellites and their early orbit phases, an additional complexity is added as launch dates may shift at short notice. MSS operators would have to be prepared to switch off affected channels at very short notice many times over an extended period of days or weeks.

– Would require MES to perform real-time channel scanning and channel switching in the band 7 145-7 235 MHz, which is complicated by the dynamic nature of the signal from SRS earth stations. MES may suffer loss of service occasionally because they cannot claim protection from current and future SRS earth stations. Alternatively, required separation distances of several tens of km to several hundreds of km to SRS earth stations would make large areas unavailable for MSS use. MSS aircraft earth stations (AES) may need separation distances up to 975 km away from SRS earth stations.

5/1.25/5.3 C. The band 8 400-8 500 MHz

Method C1. There would be no allocation to the MSS in this band and therefore no change to the Radio Regulations.

Advantage

– Would ensure the continued operation of the fixed, mobile except aeronautical mobile and space research (both near-Earth and deep space) services within their existing environment.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method C2. Introduction of a primary MSS uplink allocation in RR Article **5** in the band 8 400-8 500 MHz, together with additional provisions in RR Article **5** and RR Appendices **5** and **7** and an associated Resolution to ensure necessary protection of existing services, developed based

on the studies conducted in PDNRep ITU-R M.[MSS-SHARING]. This method entails the following provisions:

- Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.
- To ensure protection of current and planned terrestrial services and SRS earth stations: Add columns for the frequency band to the appropriate Tables of RR Appendix **7**, regarding coordination of transmitting MSS earth stations with respect to receiving SRS earth stations (RR Appendix **7**, Table 9a) and receiving fixed and mobile stations (RR Appendix 7, Table 7b). Such changes to RR Appendix **7** only apply cross-border coordination, to allow countries who wish to implement MSS to coordinate these MSS terminals with neighbouring countries. Coordination requirements would be enabled through RR Nos. **9.17** and **9.17A**.
- WRC Resolution to establish a procedure to determine exclusion zones to protect current and future SRS earth stations, and a footnote in RR Article **5** that refers to this Resolution.
- WRC Resolution to establish procedures to address potential interference to MSS satellites from near-earth operations of SRS spacecraft (i.e. near-Earth operations of deep-space SRS mission or any operation of near-Earth SRS satellite network) in the band 8 400-8 500 MHz through operational coordination.
- Coordination under RR No. **9.7** would address coordination of GSO MSS and GSO SRS satellites (which may operate in the band 8 450-8 500 MHz) without any additional changes to the Radio Regulations.

Advantages

- Would provide an uplink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.
- Implementation of the proposed coordination mechanisms could provide flexibility for operators to reach solutions tailored to particular interference situations, while protecting the existing services, depending on the regulatory provisions developed.

Disadvantages[30]

- Would require the establishment of numerous and complex regulatory provisions to provide for the protection of the existing services, or coordination procedures or other approaches in order to ensure protection of MSS space stations. Coordination would be required for MES operations in the vicinity of current and future SRS earth stations and countries operating terrestrial systems in this band. This could result in large exclusion areas of up to several hundreds of km for MESs around SRS earth stations and even greater separation distances up to 900 km for AESs.
- Would require FS stations to off-point between ±1º and ±10º from the GSO to protect MSS satellites from FS interference, and for fixed BAS stations up to ±15º to protect MSS satellites. In case of BAS using horn antennas, the required off-pointing could be

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[30] Considering that four different services have to be addressed with a least six different service applications and two different sub-bands to be considered, it is necessary to allow for at least a minimum description of the various impacts. It would be confusing for delegates preparing for WRC-12 to summarize all these different combinations in three disadvantages.

even higher. Sharing with mobile BAS links would not be feasible as their locations are generally not known.

– SRS would need to coordinate with MSS systems to prevent SRS satellites operating in the near-Earth distances from interfering with MSS satellites; the resultant coordination burden would be difficult for SRS operators to accept (noting that such operational coordination would have to be effected with all MSS operators around the world, noting that the number of MSS systems is inherently limited by the small earth station antenna size, e.g. 20 cm earth stations would lead to around 12 co-frequency systems).

− In the 8 450-8 500 MHz band, studies of interference from SRS satellites operating in compliance with the RR indicate that MSS protection criteria can be exceeded by several orders of magnitude for a limited number of SRS orbits in a typical SRS mission transmit bandwidth of no more than 10 MHz. Sharing with transmitting SRS satellites would not be possible in these cases.

− Would require the establishment and maintenance of dynamic databases to establish and ensure the viability of large exclusion zones around current and future SRS earth stations requiring protection. It may be difficult to enforce proper implementation and maintenance of such safeguards by all MSS systems, potentially exposing extremely sensitive SRS earth stations to interference whose source cannot easily be determined.

Method C3. Introduction of an MSS uplink allocation in RR Article **5** in the band 8 400-8 500 MHz, subject to RR No. **9.21**, with the following provisions:

– Sharing with the existing services is possible subject to off-pointing of FS and BAS stations from the GSO as well as exclusion zones around each station of the existing services where operations of transmitting MES should not be permitted. The protection of stations in the existing services shall be ensured through seeking the agreement from administrations under RR No. **9.21**. In addition, explicit agreement from administrations on inclusion of their territories in the service areas of particular MSS satellite networks would be required through the satellite network coordination.

– Separation distances for AESs can extend up to about 900 km into the territory of another country(s). It is difficult to realize such constraints in practice. Therefore, it is necessary to exclude the use of transmitting aircraft earth stations from potential MSS allocations.

Advantages

– Would provide an uplink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

− The agreement seeking procedure ensures protection of future and/or planned stations of existing services.

Disadvantages

− Would require the establishment of numerous and complex regulatory provisions to provide for the protection of the existing services, while placing additional regulatory requirements or constraints on the MSS, including prohibiting the operation of MSS AESs, therefore this allocation would be limited to the land mobile-satellite and maritime mobile-satellite services only. However, MESs would need, in some cases, large separation distances away from stations of incumbent services.

− Would require FS stations to off-point between ±1º and ±10º from the GSO to protect MSS satellites from FS interference, and for fixed BAS stations up to ±15º to protect

MSS satellites, in case of BAS using horn antennas probably more. Sharing with mobile BAS links would not be feasible as their locations are generally not known.

– Requires the explicit agreement from administrations on inclusion of their territories in the service areas of particular MSS satellite networks.

5/1.25/5.4 D. The band 10.5-10.6 GHz

Method D1. There would be no allocation to the MSS in this band and therefore no change to the Radio Regulations.

Advantage

− No impact on existing services.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method D2. Introduction of MSS primary downlink allocation in the band 10.5-10.6 GHz in RR Article **5**, together with additional provisions in RR Article **5** and RR Appendices **5** and **7,** and/or RR Article **21** to ensure necessary protection of existing services, developed based on the studies conducted in PDNRep ITU-R M.[MSS-SHARING], subject to the further development of the studies anticipated before WRC-12. This method entails the following provisions:

− Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.

− Power flux-density levels to protect the FS, MS (including broadcasting auxiliary service applications) and radiolocation services:

Option (1a): Coordination thresholds in RR Appendix **5**, together with a footnote in RR Article **5** applying RR No. **9.14**[31].

Option (1b): Hard limits to be added in RR Article **21**.

− With respect to the radiolocation service only:

The allocation to the radiolocation service is primary in the band 10.5-10.55 GHz (Regions 2 and 3); is secondary in the band 10.5-10.55 GHz (Region 1 only); and secondary in the band 10.55-10.6 GHz (all three Regions). Consequently, there is a need to address the potential application of pfd limits or thresholds to protect a secondary service. Therefore, it is proposed to upgrade the radiolocation allocation to primary through a footnote, applying to specific countries only; ones which currently operate radiolocation systems in the secondary radiolocation allocations. Under this method, a footnote would maintain the secondary status of the radiolocation service with respect to the existing primary services (fixed and mobile).

– Measures for protection of the RAS in the adjacent band, 10.6-10.7 GHz, may be required. This could be through use of Recommendation ITU-R RA.769, pfd limits, or pfd threshold levels for consultation.

– Respect to regulatory conditions for potentially affected receiving MESs, there are two options:

[31] Potentially affected administrations are identified by the BR, solely on the basis of exceedence of the pfd threshold on their territory, regardless of whether they have terrestrial stations recorded in the MIFR. Potentially affected administrations are required to respond within four months to confirm their desire to be included in coordination.

Option (2a): Add columns for the frequency band to the appropriate Tables of RR Appendix **7** (RR Appendix **7**, Table 8c) regarding coordination of transmitting stations in the FS, MS and RLS with respect to receiving MSS earth stations. Such changes to RR Appendix **7** only apply cross-border coordination, to allow administrations who wish to implement MSS to coordinate these MESs with neighbouring countries.

Option (2b): Regulatory conditions would ensure that MSS earth stations shall not claim protection from terrestrial services (including the RLS).

Advantages[32]

– Would provide a downlink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

− Implementation of the proposed provisions and coordination mechanisms provides flexibility for administrations to reach solutions tailored to particular interference situation.

− Under Option (1a) MSS systems may be able to provide service to areas where the pfd threshold would be exceeded, with the consent of potentially affected administrations; and existing terrestrial stations and those planned to be brought into use within three years of the date of receipt of the satellite coordination request will be protected through the coordination process. Under Option (1b) there would be no coordination requirement on administrations and all existing and future stations of terrestrial services will be protected.

− Under Option (2a), MESs would obtain protection from terrestrial services through the coordination process. Under Option (2b), there is no coordination requirement on terrestrial services with respect to protection of MESs

− This frequency band being nearby existing satellite allocations that are extensively used, technology to implement such MSS systems is already available.

Disadvantages[33]

− Would require the establishment of regulatory provisions to provide for the protection of the existing services, or coordination procedures, or other approaches in order to ensure protection of MES.

− Under Option (1a), there is an additional burden for administrations to conduct coordination with MSS networks to protect terrestrial services, if the pfd threshold is exceeded. During this coordination process, terrestrial stations planned to be brought into use more than 3 years after the MSS satellite coordination request may not be protected. Also, there is a risk that a potentially affected administration is not included in the coordination process if the pfd threshold level is exceeded on their territory and they do not respond within four months. Under Option (1b), MSS systems could be

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[32] Some administrations are of the view that, based on the application of procedures as prescribed in the method description, as an additional advantage, undue constraints are not likely to be placed on the existing systems in the frequency band 10.5-10.6 GHz, in line with Resolution **231 (WRC-07)**.

[33] Some administrations, also believe that this option, since it does not solve the issue of constraints on future FS systems, is not in line with Resolution **231 (WRC-07)** (no undue constraints on existing services).

constrained by the pfd limits, even if it is unnecessary for protection of terrestrial systems in some areas. This could limit the coverage provided by the MSS system.

– Under Option (2a), there is an additional burden for administrations to protect receiving MESs through the coordination process, and further deployment of terrestrial services near borders between administrations may be constrained. Under Option (2b), MESs would have to accept interference from terrestrial services.

5/1.25/5.5 E. The band 13.25-13.4 GHz

Method E1. There would be no allocation to the MSS in this band and therefore no change to the Radio Regulations.

Advantage

– No impact on existing services.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method E2. Introduction of an MSS primary downlink allocation in the band 13.25-13.4 GHz in RR Article **5**, together with additional provisions in the RR to ensure necessary protection of existing services, developed based on the studies conducted in PDNRep ITU-R M.[MSS-SHARING], subject to the further development of the studies anticipated before WRC-12. This method entails the following provisions:

– Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.

– To address sharing between the MSS and ARNS (limited to Doppler navigation aids) there are two options:

  – Option (1a) to include MSS into the scope of RR No. **5.498A**;

  – Option (1b), a provision providing a power flux-density limit to protect stations in the aeronautical radionavigation service, together with a footnote to ensure the MESs cannot claim protection from the ARNS.

– To address sharing between the MSS and the EESS (active) and between the MSS and the SRS (active), a power flux-density limit would be applied. Furthermore, a footnote would be added to ensure the MESs cannot claim protection from potential interference from the EESS (active) and SRS (active).

– With respect to the allocation to the FS in some countries through RR No. **5.499**, regulatory conditions for potentially affected receiving MESs may be required. Two options are proposed:

  – Option (2a): A coordination process between the FS and receiving MESs would be developed;

  – Option (2b): Regulatory conditions to ensure that MESs shall not claim protection from the fixed service in those countries.

Advantages[34]

– Would provide a downlink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

− Implementation of the proposed regulatory measures would allow to identify sharing solutions, while protecting the existing services.

− This frequency band being nearby existing satellite allocations that are extensively used, technology to implement such MSS systems is already available.

– With regard to Option (1a): The current privileged status of the ARNS allocation with respect to the currently allocated services would be maintained in this band with respect to the MSS, and all existing and possible new ARNS systems would remain protected from interference from MSS downlinks, even if future ARNS systems are more susceptible to interference. The future use and development of ARNS systems will not be constrained in this band.

– With regard to Option (1b): The MSS downlink pfd limits are clearly defined and hence provide clear and predictable sharing conditions for the MSS and ARNS, and provide protection to existing ARNS systems[35].

Disadvantages

− Would require the establishment of regulatory provisions to provide for the protection of the existing services, or coordination procedures or other approaches in order to ensure protection of MES, which would place additional regulatory requirements or constraints on these services.

– MSS systems would need to be designed to accept interference from existing and future stations of terrestrial and space services. If not adequately designed, MSS systems might not be able to deliver the required quality of service.

– With regard to Option (1a): MSS systems could be required to reduce their downlink e.i.r.p. without warning, to meet changing protection requirements of ARNS systems in the future. The absence of predictable sharing conditions between the MSS and the ARNS would preclude the development of the MSS.

– With regard to Option (1b): The current privileged status of the ARNS allocation with respect to existing services in the band will not be maintained with respect to the MSS and future systems in the ARNS, if more sensitive to interference than current systems, could suffer from harmful interference from MSS downlinks. The future use and development of ARNS systems may be constrained in this band.

5/1.25/5.6 F. The band 15.43-15.63 GHz

Method F1. There would be no allocation to the MSS in this band and therefore no change to the Radio Regulations.

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[34] Some administrations are of the view that, based on the application of procedures as prescribed in the method description, as an additional advantage, undue constraints are not likely to be placed on the existing systems in the frequency band 13.25-13.4 GHz, in line with Resolution **231 (WRC-07)**.

[35] Some administrations are of the view that the definition of an appropriate pfd limit would also allow the protection of future ARNS systems.

Advantage

– No impact on existing primary safety-related services.

Disadvantage

– The demand for broadband MSS spectrum would not be met, unless adequate spectrum is found in other frequency bands.

Method F2. Introduction of a MSS primary uplink allocation in the band 15.43-15.63 GHz in RR Article **5**, together with additional provisions in the RR to ensure necessary protection of existing services, developed based on the studies conducted in PDNRep ITU-R M.[MSS-SHARING], subject to the further development of the studies anticipated before WRC-12. The band allocated to MSS would take into account the possible need for an allocation in the range 15.4-15.7 GHz to address the requirements of UASs (WRC-12 Agenda item 1.3) and the requirements of radiolocation systems (WRC-12 Agenda item 1.21). For example allocations could be made to each of the three proposed new services in the range 15.4-15.7 GHz.

This method entails the following provisions:

– Footnote in RR Article **5** limiting use of the MSS allocation to GSO systems.

– Option (1a) Add columns for the frequency band to the appropriate Tables of RR Appendix **7**, regarding coordination of transmitting MES stations with respect to ARNS stations. Such changes to RR Appendix **7** only apply cross-border coordination, to allow countries who wish to implement MSS to coordinate these MSS terminals with neighbouring countries (RR No. **4.10** applies). Option (1b) Transmitting MESs should not cause harmful interference to ARNS stations (RR No. **4.10** applies).

– To address potential interference from the ARNS to MSS satellites, a footnote would be added to ensure that MSS would not claim protection from ARNS. In addition, it has also been proposed by some administrations that a footnote would be added to the effect that ARNS operating in the band 15.4-15.7 GHz and MSS would operate on different frequencies within the band 15.43-15.63 GHz.

– Measures for protection of the RAS in the nearby band, 15.35-15.4 GHz, may be required.

– Implementation of AESs would need to be considered separately.

– To address any potential use of the FSS (Earth-to-space) allocations (see RR No. **5.511A**), RR No. **9.11A** would be applied, to require coordination between the FSS and the MSS.

Advantages[36]

– Would provide an uplink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

– Implementation of the proposed regulatory measures would allow to identify sharing solutions, while protecting the existing services.

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[36] Some administrations are of the view that, based on the application of procedures as prescribed in the Method description, as an additional advantage, undue constraints are not likely to be placed on the existing systems in the frequency band 15.43-15.63 GHz, in line with Resolution **231 (WRC-07)**.

– This frequency band being nearby existing satellite allocations that are extensively used, technology to implement such MSS systems is already available.

− Depending on the considerations by WRC-12 on other relevant agenda items, MSS operations may be feasible in the band 15.43 to 15.63 GHz in those countries where the ARNS is not used, as appropriate.

– Under Option (1a), coordination areas for MESs would be established, subject to agreement of the relevant administrations, within which MESs would be able to operate under defined conditions, while ensuring no interference to existing ARNS stations.

− Under Option (1b), new ARNS stations are not required to coordinate with existing MESs while being ensured of protection by MES.

Disadvantages

− Would require the establishment of regulatory provisions to provide for the protection of the existing services, or coordination procedures or other approaches in order to ensure protection of MSS space stations, which would place additional regulatory requirements or constraints on these services.

– Under Option (1a), new ARNS stations (a safety service) would be required to coordinate with existing MESs

– Under Option (1b), there are no defined conditions to ensure MES would not cause harmful interference to the ARNS.

– Taking into account the separation distances required for co-frequency sharing between ARNS and MSS (Earth-to-space) links in the frequency band 15.43-15.63 GHz as well as the constant “mobility” of MES and the ARNS stations, sharing between the considered stations in the same geographical area will be difficult.

– Coordination would be required for MES operations in the vicinity of countries operating terrestrial systems in this band. This could result in some exclusion areas for MESs.

– Interference could be caused by ALS transmitters to MSS satellite receivers, and therefore MSS satellites may not be able to cover areas where ALS is used.

Method F3. Introduction of a MSS uplink allocation in RR Article **5** in the band 15.43-15.63 GHz, subject to RR No. **9.21**, with the following provisions. The method is developed based on the studies conducted in ITU-R, subject to the further development of the studies anticipated before WRC-12.

– The protection of stations in the existing services shall be ensured through seeking the agreement from administrations under RR No. **9.21**. In addition, explicit agreement from administrations on inclusion of their territories in the service areas of particular MSS satellite networks would be required through the satellite network coordination.

– Measures for protection of the RAS in the nearby band, 15.35-15.4 GHz, may be required.

– It is proposed to exclude the use of transmitting aircraft earth stations from potential MSS allocations.

Advantages

– Would provide an uplink allocation for the MSS, partially responding to the need for additional MSS allocations, and make a significant step towards meeting the demand for broadband MSS applications in parallel with terrestrial advancements.

– The agreement seeking procedure ensures protection of future and/or planned stations of existing services.

Disadvantages

– Would require the establishment of regulatory provisions to provide for the protection of the existing services, while placing additional regulatory requirements or constraints on the MSS, and excluding the operation of AESs.
– Requires the explicit agreement from administrations on inclusion of their territories in the service areas of particular MSS satellite networks.
– Taking into account the separation distances required for co-frequency sharing between ARNS and MSS (Earth-to-space) links in the frequency band 15.43-15.63 GHz as well as the constant "mobility" of MES and the ARNS stations, sharing between the considered stations in the same geographical area will be difficult.
– Interference could be caused by ALS transmitters to MSS satellite receivers, and therefore MSS satellites may not be able to cover areas where ALS is used.

5/1.25/6 Regulatory and procedural considerations

5/1.25/6.1 Methods A1, B1, C1, D1, E1, F1: no change to the Radio Regulations

SUP

RESOLUTION 231 (WRC-07)

Additional allocations to the mobile-satellite service with particular focus on the bands between 4 GHz and 16 GHz

5/1.25/6.2 Method A2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

4 800-5 570 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 150-5 250	AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B MOBILE-SATELLITE (space-to-Earth) ADD 5.A125 [ADD 5.B125 *for Option (1b)*] 5.446 5.446C 5.447 5.447B 5.447C	

ADD

5.A125 Use of the band 5 150-5 250 MHz by the mobile-satellite service is limited to geostationary-satellite networks and is subject to the application of the provisions of No. **9.11A**.

NOTE – It may also be necessary to develop appropriate regulatory measures to address sharing between MSS and ARNS; and between MSS and RDSS.

*NOTE – The following provisions provide power flux-density limits in RR Article **21** to protect mobile services (including RLANs) operating under RR No. **5.446A**.*

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

MOD

TABLE **21-4** (*continued*) (Rev.WRC-~~07~~12)

Frequency band	**Service***	**Limit in dB(W/m²) for angles of arrival (δ) above the horizontal plane**			**Reference bandwidth**
		0°-5°	**5°-25°**	**25°-90°**	
...					
5 150-5 250 MHz	Mobile-satellite (space-to-Earth)	[TBD]	[TBD]	[TBD]	1 MHz
…					

NOTE – With respect to regulatory conditions for potentially affected receiving MESs, there are two options.

Option (1a):

MOD

APPENDIX 7 (Rev.WRC-~~07~~12)

*NOTE – Text is required for RR Appendix **7**.*

End Option (1a)

Option (1b):

ADD

5.B125 In the band 5 150-5 250 MHz, earth stations in the mobile-satellite service shall not claim protection from [insert relevant services].

End Option (1b)

*NOTE – The following provisions provide power flux-density levels in RR Appendix **5** as coordination thresholds to protect AMT operating under RR No. **5.446C**.*

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*continued*) (WRC-~~07~~12)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.13** GSO/ non-GSO	A station in a GSO satellite network in the frequency bands for which a footnote refers to No. **9.11A** or No. **9.13**, in respect of any other non-GSO satellite network, with the exception of coordination between earth stations operating in the opposite direction of transmission	Frequency bands for which a footnote refers to No. **9.11A** or No. **9.13**	1) Bandwidths overlap 2) For the band 1 668-1 668.4 MHz with respect to MSS network coordination with **SRS** (passive) networks, in addition to bandwidth overlap, the e.i.r.p. spectral density of mobile earth stations in a GSO network of the mobile-satellite service operating in this band exceeds −2.5 dB(W/4 kHz) or the power spectral density delivered to the mobile earth station antenna exceeds −10 dB(W/4 kHz)	1) Check by using the assigned frequencies and bandwidths 2) Check by using MSS network Appendix **4** data	

No. **9.14** Non-GSO/ terrestrial, GSO/ terrestrial	A space station in a satellite network in the frequency bands for which a footnote refers to No. **9.11A** or to No. **9.14**, in respect of stations of terrestrial services where threshold(s) is (are) exceeded	1) Frequency bands for which a footnote refers to No. **9.11A**; or 2) 11.7-12.2 GHz (Region 2 GSO FSS) 3) 5 150-5 250 MHz MSS with respect to countries listed in No. **5.446C**) (GSO	1) See § 1 of Annex 1 to this Appendix; In the bands specified in No. **5.414A**, the detailed conditions for the application of No. **9.14** are provided in No. **5.414A** for MSS networks or 2) In the band 11.7-12.2 GHz (Region 2 GSO FSS): -124 dB(W/(m^2 · MHz)) for $0° \leq \theta \leq 5°$ $-124 + 0.5 (\theta - 5)$ dB(W/(m^2 · MHz)) for $5° < \theta \leq 25°$ -114 dB(W/(m^2 · MHz)) for $\theta > 25°$ where θ is the angle of arrival of the incident wave above the horizontal plane (degrees) 3) In the band 5 150-5 250 MHz MSS): (GSO [pfd values TBD]	1) See § 1 of Annex 1 to this Appendix	To protect aeronautical mobile telemetry in the countries specified in No. **5.446C**.

NOTE – As an alternative to including pfd values in the above table, the values could be included in section 1.3 of Annex 1 of RR Appendix **5** *as shown below.*

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

ANNEX 1

1 Coordination thresholds for sharing between MSS (space-to-Earth) and terrestrial services in the same frequency bands and between non-GSO MSS feeder links (space-to-Earth) and terrestrial services in the same frequency bands

1.3 Above 3 GHz

ADD

1.3.1 Frequency band 5 150-5 250 MHz

In the band 5 150-5 250 MHz, when an administration proposes to use a GSO MSS space station whose emissions exceed the threshold values given in Table 5-3, it shall coordinate with affected administrations in respect of the aeronautical telemetry systems (see No. **5.446C**).

TABLE 5-3

Frequency band (GHz)	Coordination threshold values			
	pfd value dB(W/m^2) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
	0°-5°	5°-15°	15°-90°	
5 150-5 250	TBD	TBD	TBD	1 MHz

NOTE – Other provisions may need to be developed.

5/1.25/6.3 Method B2

NOTE – This method envisions that one or several portions of the band 7 055-7 250 MHz could be allocated for MSS, combined with NOC option in the other parts. The below example regulatory text is if the entire 7 055-7 250 MHz band is allocated to MSS. If the allocation is made in portions of the band, then the provisions below would be updated accordingly.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

5 570-7 250 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 700-7 055	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B 5.458C	
7 055-7 075	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) ~~5.441~~ MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.C125 [ADD 5.F125 *for Option (1b)*] 5.458 5.458A 5.458B 5.458C	
7 075-7 145	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.C125 [ADD 5.F125 *for Option (1b)*] 5.458 5.459	
7 145-7 235	FIXED MOBILE SPACE RESEARCH (Earth-to-space) 5.460 MOBILE-SATELLITE (space-to-Earth) ADD 5.C125 ADD 5.D125 ADD 5.E125 [ADD 5.F125 *for Option (1b)*] 5.458 5.459	
7 235-7 250	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.C125 [ADD 5.F125 *for Option (1b)*] 5.458	

ADD

5.C125 Use of the band 7 055-7 250 MHz by the mobile-satellite service is limited to geostationary orbit systems and is subject to the application of the relevant provisions of No. **9.11A**, except with regard to space research service in the band 7 145-7 235 MHz.

ADD

5.D125 In the band 7 145-7 235 MHz earth stations in the mobile-satellite service shall not claim protection from earth stations in the space research service, and from earth stations in the SOS operating in accordance with No. **5.459**.

ADD

5.E125 In the band 7 145-7 235 MHz, Resolution **[A125-SRS]** shall apply.

ARTICLE 22

Space services

ADD

Section VII – Control of interference to space research service space stations

22.40 In the frequency band 7 145-7 190 MHz, the maximum power flux-density produced in deep space (space at distances from the Earth equal to, or greater than, 2×10^6 km) by a geostationary-satellite system in the mobile-satellite service shall not exceed EEE dB(W/m^2) in any X Hz band.

NOTE – With respect to regulatory conditions for potentially affected receiving MESs, there are two options:

Option (1a):

MOD

APPENDIX 7 (Rev.WRC-~~07~~12)

*NOTE – Text is required for RR Appendix **7**.*

End Option (1a)

Option (1b):

ADD

5.F125 In the band 7 055-7 250 MHz, earth stations in the mobile-satellite service shall not claim protection from [insert relevant services].

End Option (1b)

For power flux-density levels to protect the FS and MS (including broadcasting auxiliary service applications), there are two options:

Option (2a):

MOD

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (*continued*) (WRC-~~07~~12)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.13** GSO/ non-GSO	A station in a GSO satellite network in the frequency bands for which a footnote refers to No. **9.11A** or No. **9.13,** in respect of any other non-GSO satellite network, with the exception of coordination between earth stations operating in the opposite direction of transmission	Frequency bands for which a footnote refers to No. **9.11A** or No. **9.13**	1) Bandwidths overlap 2) For the band 1 668-1 668.4 MHz with respect to MSS network coordination with **SRS** (passive) networks, in addition to bandwidth overlap, the e.i.r.p. spectral density of mobile earth stations in a GSO network of the mobile-satellite service operating in this band exceeds −2.5 dB(W/4 kHz) or the power spectral density delivered to the mobile earth station antenna exceeds −10 dB(W/4 kHz)	1) Check by using the assigned frequencies and bandwidths 2) Check by using MSS network Appendix **4** data	

No. **9.14** Non-GSO/ terrestrial, GSO/ terrestrial	A space station in a satellite network in the frequency bands for which a footnote refers to No. **9.11A** or to No. **9.14,** in respect of stations of terrestrial services where threshold(s) is (are) exceeded	1) Frequency bands for which a footnote refers to No. **9.11A**; or 2) 11.7-12.2 GHz (Region 2 GSO FSS) <u>3) 7 055-7 250 MHz (GSO MSS)</u>	1) See § 1 of Annex 1 to this Appendix; In the bands specified in No. **5.414A**, the detailed conditions for the application of No. **9.14** are provided in No. **5.414A** for MSS networks or 2) In the band 11.7-12.2 GHz (Region 2 GSO FSS): –124 dB(W/(m^2 · MHz)) for 0° ≤ θ ≤ 5° –124 + 0.5 (θ – 5) dB(W/(m^2 · MHz)) for 5° < θ ≤ 25° –114 dB(W/(m^2 · MHz)) for θ > 25° where θ is the angle of arrival of the incident wave above the horizontal plane (degrees) <u>3) In the band 7 055-7 250 MHz (GSO MSS): [pfd values TBD]</u>	1) See § 1 of Annex 1 to this Appendix	

NOTE – As an alternative to including pfd values in the above table, the values could be included in section 1.3 of Annex 1 of RR Appendix **5**.

Option (2b):

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

MOD

Section V – Limits of power flux-density from space stations

21.16 § 6 1) The power flux-density at the Earth's surface produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limit given in Table **21-4**. The limit relates to the power flux-density which would be obtained under assumed free-space propagation conditions and applies to emissions by a space station of the service indicated where the frequency bands are shared with equal rights with the fixed or mobile service, unless otherwise stated.

TABLE **21-4** (*continued*) (Rev.WRC-12)

Frequency band	Service*	Limit in dB(W/m^2) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
XXX-YYY MHz	Mobile-satellite (space-to-Earth)	[TBD]	[TBD]	[TBD]	[1 MHz/ 4 kHz]

End of Option (2b)

ADD

RESOLUTION [A125-SRS] (WRC-12)

Provisions for operational coordination of stations in the mobile-satellite service with [insert relevant service(s)] systems in the band 7 145-7 235 MHz

NOTE – Text to be developed to address operational coordination between MSS stations and stations of other service, as appropriate. A footnote would be required in RR Article ***5*** *indicating that the Resolution would apply.*

NOTE – Other provisions may need to be developed.

5/1.25/6.4 Method C2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

7 250-8 500 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
8 400-8 500	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.465 5.466 MOBILE-SATELLITE (Earth-to-space) ADD 5.G125 ADD 5.H125	

ADD

5.G125 In the band 8 400-8 500 MHz, Resolution **[B125-SRS-MSS2]** shall apply.

ADD

5.H125 Use of the bands 8 400-8 500 MHz by the mobile-satellite service is limited to geostationary orbit systems.

MOD

APPENDIX 7 (Rev.WRC-~~07~~12)

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

*NOTE – Text is required for RR Appendix **7**.*

ADD

RESOLUTION [B125-SRS-MSS2] (WRC-12)

Coordination of networks in the mobile-satellite service with the space research service systems in the band 8 400-8 500 MHz

*NOTE – Text to be developed to address operational coordination between MSS stations and stations of SRS, as appropriate. A footnote would be required in RR Article **5** indicating that the Resolution would apply.*

NOTE – Other provisions may need to be developed.

5/1.25/6.5 Method C3

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

7 250-8 500 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
8 400-8 500	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.465 5.466 [MOBILE-SATELLITE] [Mobile-satellite] except aeronautical mobile satellite (Earth-to-space) ADD 5.I125	

ADD

5.I125 Use of the band 8 400-8 500 MHz by the mobile-satellite service is limited to geostationary satellite networks and subject to application of No. **9.21**.

NOTE – Other provisions may need to be developed.

5/1.25/6.6 Method D2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

10-11.7 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
10.5-10.55 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.J125 [ADD 5.K125 *for Option (1b)*] [ADD 5. K125A *for Option (2b)*] Radiolocation ADD 5.L125	**10.5-10.55** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.J125 [ADD 5.K125 *for Option (1b)*] [ADD 5. K125A *for Option (2b)*] RADIOLOCATION ADD 5.L125	

10.55-10.6	FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (space-to-Earth) ADD 5.J125 [ADD 5.K125 *for Option (1b)*] [ADD 5.K125A *for Option (2b)*] Radiolocation ADD 5.L125

ADD

5.J125 Use of the band 10.5-10.6 GHz by the mobile-satellite service is limited to geostationary satellite networks [and is subject to application of the provisions of RR No. **9.14** (*relevant for Option (1a) only*)].

ADD

5.L125 *Different category of service:* In [insert country names ….] the allocation of the band 10.5-10.6 GHz for the radiolocation service is on a primary basis (see No. **5.33**). Stations of the radiolocation service in these countries shall not cause interference to nor claim protection from stations of the fixed and mobile services. (WRC-12)

NOTE – Footnotes may need to be developed to ensure that the unwanted emissions for MSS satellites operating in the band 10.5-10.6 GHz do not cause harmful interference to stations in the radio astronomy service, and stations in the EESS (passive), operating in the adjacent band 10.6-10.7 GHz.

*NOTE – For power flux-density levels to protect the FS, MS (including broadcasting auxiliary service applications) and radiolocation (system type-1 and type-2), there are two options. Option (1b) is based on mandatory pfd limits to be included in RR Article **21**. Option (1a) is based on coordination threshold levels to be included in Appendix **5**.*

Option (1a):

NOTE – A pfd mask is required to protect fixed, mobile and radiolocation services from the MSS downlinks.

APPENDIX 5 (Rev.WRC-~~07~~12)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

ANNEX 1

1 Coordination thresholds for sharing between MSS (space-to-Earth) and terrestrial services in the same frequency bands and between non-GSO MSS feeder links (space-to-Earth) and terrestrial services in the same frequency bands

1.3 Above 3 GHz

ADD

1.3.1 Frequency band 10.5-10.6 GHz

In the band 10.5-10.6 GHz, when an administration proposes to use a GSO MSS space station whose emissions exceed the threshold values given in Table 5-3, it shall coordinate with affected administrations.

TABLE 5-3

Frequency band (GHz)	**Terrestrial service to be protected**	**Coordination threshold values**			
		pfd value dB(W/m^2) for angles of arrival (δ) above the horizontal plane			**Reference bandwidth**
		0°-5°	**5°-20°**	**20°-90°**	
10.5-10.6	Fixed, mobile radiolocation (system type-1)[1]	[TBD]	[TBD]	[TBD]	1 MHz

[1] To protect the radiolocation service in countries listed in No. **5.L125** and using radiolocation system type-2, and in the frequency band 10.5-10.55 GHz in Regions 2 and 3, a threshold value of −[TBD (different value from those above)] dB(W/m^2/MHz) for all angles of arrival (δ) applies. (WRC-12)

End of Option (1a)

Option (1b):

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

MOD

Section V – Limits of power flux-density from space stations

TABLE **21-4** (*continued*) (Rev.WRC-~~07~~12)

Frequency band	Service*	Limit in dB(W/m^2) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
10.5-10.6 GHz	Mobile-satellite service	[TBD]	[TBD]	[TBD]	1 MHz

NOTE – The pfd values in this table would also apply for the protection of radiolocation systems type-1.

ADD

5.K125 In the band 10.5-10.6 GHz in countries listed in No. **5.L125** and using radiolocation system type-2, and in the frequency band 10.5-10.55 GHz in Regions 2 and 3, to protect the radiolocation service, the pfd level from space stations in the mobile-satellite service (s-E) shall not exceed −[TBD] dB(W/m^2/MHz) for all angles of arrival (δ) at the Earth's surface. (WRC-12)

NOTE – A better way of describing type-1 and type-2 radiolocation systems needs to be developed.

End of Option (1b)

NOTE – With respect to regulatory conditions for potentially affected receiving MESs, there are two options:

Option (2a):

MOD

APPENDIX 7 (Rev.WRC-~~07~~12)

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

*NOTE – Text is required for RR Appendix **7**.*

End of Option (2a)

Option (2b):

ADD *(to relevant portion of Article 5 Table)*

5.K125A In the band 10.5-10.6 GHz, earth stations in the mobile-satellite service shall not claim protection from [insert relevant services].

End Option (2b)

5/1.25/6.7 Method E2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

11.7-14 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
13.25-13.4	EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) MOBILE-SATELLITE (space-to-Earth) [ADD 5.P125 ADD 5.M125 *Option (1a) only*] [ADD 5.N125 ADD 5.O125 *Option (1b) only*] MOD 5.498A [*for Option (1a) only*] 5.499	

Option (1a):

MOD

5.498A The Earth exploration-satellite (active), ~~and~~ space research (active), and mobile-satellite services operating in the band 13.25-13.4 GHz shall not cause harmful interference to, or constrain the use and development of, the aeronautical radionavigation service. (WRC-12)

ADD

5.P125 Use of the band 13.25-13.4 GHz by the mobile-satellite service is limited to geostationary-satellite networks. In order to protect systems in the Earth exploration-satellite service (active) and space research service (active), the pfd density at the surface of the Earth from MSS space stations shall not exceed −[TBD] dBW/m^2/MHz for all angles of arrival.

ADD

5.M125 In the band 13.25-13.4 GHz, earth stations in the mobile-satellite service shall not claim protection from stations in the Earth exploration-satellite service (active) or space research (active) services. (WRC-12)

End of Option (1a)

Option (1b):

ADD

5.N125 The use of the band 13.25-13.4 GHz by the mobile-satellite service is limited to geostationary-satellite systems. In order to protect systems in the Earth exploration-satellite service (active), space research service (active) and aeronautical radionavigation service, the pfd density at the surface of the Earth from MSS space stations shall not exceed −[TBD] dBW/m^2/MHz for all angles of arrival. (WRC-12)

ADD

5.O125 In the band 13.25-13.4 GHz, earth stations in the mobile-satellite service shall not claim protection from stations in the Earth exploration-satellite service (active), space research (active) or aeronautical radionavigation services. (WRC-12)

End of Option (1b)

NOTE – Other provisions may need to be developed.

5/1.25/6.8 Method F2

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
15.43-15.63	FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION MOBILE-SATELLITE (Earth-to-space) [ADD 5.R125 *for Option (1a)*] [ADD 5.S125 *for Option (1b)*] 5.511C [ADD 5.Q125 *proposed by some admins*]	

NOTE – Measures for protection of the RAS in the nearby band, 15.35-15.4 GHz, may be required.

NOTE – Other provisions may need to be developed.

Option (1a):

ADD

5.R125 Use of the band 15.43-15.63 GHz by the mobile-satellite service is limited to geostationary-satellite networks and is subject to coordination under No. **9.11A**. Space stations in the mobile-satellite service shall not claim protection from stations in the aeronautical radionavigation service. No. **5.43A** does not apply. (WRC-12)

APPENDIX 7 (Rev.WRC-~~07~~12)

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

ANNEX 7

System parameters and predetermined coordination distances for determination of the coordination area around an earth station

MOD

TABLE 10 (WRC-~~07~~12)

Predetermined coordination distances

Frequency sharing situation		**Coordination distance (in sharing situations involving services allocated with equal rights) (km)**
Type of earth station	**Type of terrestrial station**	
...		
Non-GSO MSS feeder-link earth stations (all bands)	Mobile (aircraft)	500
Ground-based in the band 15.43-15.63 GHz	Mobile (aircraft)	[TBD]
Ground-based in the bands in which the frequency sharing situation is not covered in the rows above	Mobile (aircraft)	500

…

End of Option (1a)

Option (1b):

ADD

5.S125 Use of the band 15.43-15.63 GHz by the mobile-satellite service is limited to geostationary satellite networks and is subject to coordination under No. **9.11A**. Such use shall not cause harmful interference to stations of the aeronautical radionavigation service. (WRC-12)

End of Option (1b)

NOTE – In addition, some administrations proposed the following footnote:

ADD

5.Q125 Administrations responsible for aeronautical radionavigation systems operating in the band 15.4-15.7 GHz and administrations responsible for MSS space stations operating in the band 15.43-15.63 GHz are encouraged to have their respective systems operate on different frequencies, so as to minimize interference to MSS space stations. (WRC-12)

5/1.25/6.9 Method F3

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

15.4-18.4 GHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
15.43-15.63 FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION [MOBILE-SATELLITE] [Mobile-satellite] except aeronautical mobile satellite (Earth-to-space) ADD 5.T125 5.511C		

ADD

5.T125 Use of the band 15.43-15.63 GHz by the mobile-satellite service is limited to geostationary satellite networks, subject to agreement obtained under No. **9.21**. (WRC-12)

NOTE – Measures for protection of the RAS in the nearby band, 15.35-15.4 GHz, may be required.

NOTE – Other provisions may need to be developed.

AGENDA ITEM 7

*7 to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: "Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks", in accordance with Resolution **86 (Rev.WRC-07)**;*

Resolution **86 (Rev.WRC-07)**: *Implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference*

In dealing with Agenda item 7, careful examination of the new or modified regulatory texts proposed for each method to satisfy this agenda item is required taking into account the fundamental principles on which the relevant Articles of the Radio Regulations, in particular Articles **9** to **15**, were established.

5/7/1 Issues related to RR Appendix 4 parameters

5/7/1A Issue 1A: New RR Appendix 4 data item for non-geostationary satellite systems in bands other than those where epfd limits are specified in RR Article 22

5/7/1A.1 Executive summary for Issue 1A

When a non-GSO filing is submitted to the Radiocommunication Bureau in the frequency bands subject to the epfd limits of RR Article **22**, one of the parameters required in RR Appendix **4** is the minimum height above the Earth's surface at which any satellite in the system transmits. In bands other than those where epfd limits apply this parameter is not currently required. The requirement to supply this parameter for non-GSO satellite systems operating in frequency bands other than those subject to epfd limits is needed in order to describe operational characteristics of the non-GSO satellite system so that potential for interference can more accurately be calculated.

5/7/1A.2 Background

The information required by RR Appendix **4** to be supplied when any filing for a non-GSO satellite system is submitted to the Radiocommunication Bureau includes the apogee and perigee heights and the eccentricity, but currently the active arc limits, which are relevant only for non-GSO systems of the HEO-type, are not listed in the data to be supplied. However, for all types of non-GSO systems planned to use bands in which RR Article **22** epfd limits apply, one of the parameters required by RR Appendix **4** is the minimum height above the Earth's surface at which any satellite in the system transmits.

Considering that many frequency bands may be used for both GSO and non-GSO satellite systems in accordance with the Radio Regulations, in the frequency bands other than those where epfd limits are specified in the RR Article **22**, there is no data item to request the administration to provide the minimum height above the Earth's surface at which any satellite in the system transmits.

5/7/1A.3 Summary of technical and operational studies and relevant ITU-R Recommendations

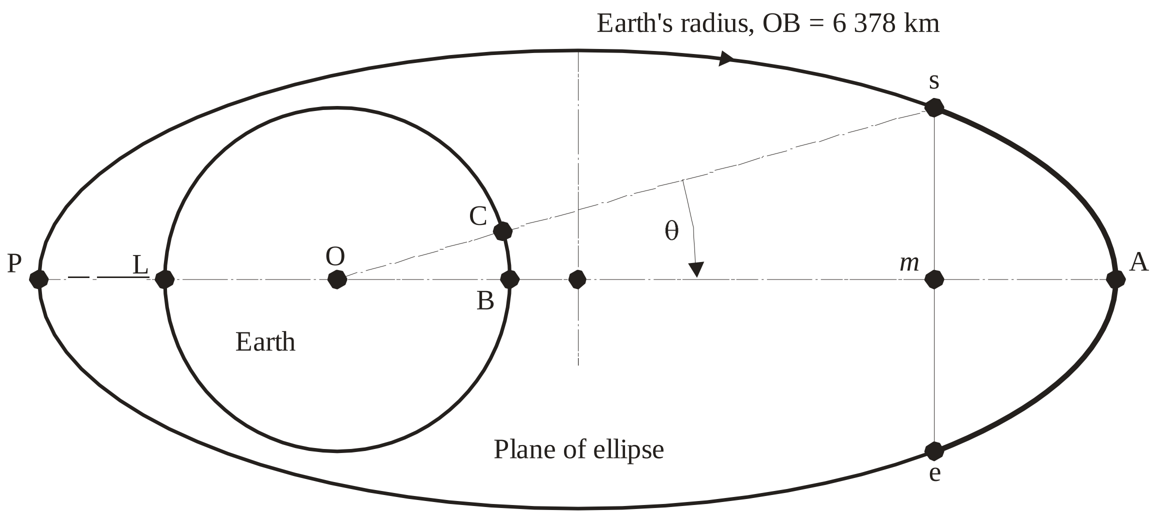
It is noted that Recommendation ITU-R S.1673-1 "Methodologies for the calculation of the worst-case interference levels from a non-geostationary HEO-type FSS systems into geostationary FSS satellite networks operating in the 10 to 30 GHz frequency bands" is relevant for the calculation of interference levels from non-GSO satellite systems.

5/7/1A.4 Analysis of the results of studies

The key parameter to determine the worst case of interference between an HEO-type system and a GSO system is the minimum separation angle at which an active HEO-type satellite is seen by any earth station operating with a GSO satellite. The determination of the minimum separation angle between an HEO-type system and a GSO network would facilitate rapid preliminary assessments of the potential for an HEO-type system to share a band with GSO systems. In such cases, the maximum interference levels potentially occur when a satellite is at the beginning or the end of its active arc (Figure 1).

FIGURE 1

Plane geometry of an elliptical orbit



DCPM11-2-CH5-01

The length of the active arc varies from system to system. In Figure 1 the start of the active arc is shown as s, and the end as e. AB (km) and PL (km) are apogee height and perigee height respectively.

As maximum interference levels potentially occur when a satellite is at the beginning or the end of its active arc, for the determination of the minimum separation angle between an HEO-type system and a GSO network the first step is to determine the length Os from the basic orbit characteristics.

Information normally provided to ITU-R concerning an HEO-type system includes the following: apogee height (AB (km)); perigee height (PL (km)); eccentricity, *e*; inclination, *i* degrees.

The information required by RR Appendix **4** to be supplied when any filing for a non-GSO satellite system is submitted to the Radiocommunication Bureau includes the apogee and perigee heights and the eccentricity, but currently the active arc limits, which are relevant only for non-GSO systems of the HEO type, are not listed in the data to be supplied. However, for all classes of non-GSO systems planned to use bands in which RR Article **22** epfd limits apply, one of the parameters required by RR Appendix **4** is the minimum height above the Earth's surface at which any satellite in the system transmits. For an HEO-type satellite this is sC in Figure 1.

5/7/1A.5 Method to satisfy Issue 1A

Modify RR Appendix 4 Annex 2 Table A to include the requirement to provide the minimum altitude of the space station above the surface of the Earth at which any satellite transmits for non-GSO systems not operating in bands subject to RR Article 22 epfd limits in the following situations:

– Advance publication of a non-GSO system not subject to coordination;

– Notification or coordination of non-GSO systems subject to coordination.

5/7/1A.6 Regulatory and procedural considerations for Issue 1A

MOD

APPENDIX 4 (Rev.WRC-~~07~~12)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-~~07~~12)

Table of characteristics to be submitted for space and radio astronomy services (WRC-~~07~~12)

	A – GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION											

…

A.4.b.4	**For each orbital plane, where the Earth is the reference body:**										A.4.b.4	
...	...											
A.4.b.4.f	the minimum altitude of the space station above the surface of the Earth at which any satellite transmits			**X**		**X**						
...	...											
~~A.4.b.6.b~~	~~the minimum altitude of the space station above the surface of the Earth at which any satellite transmits~~					~~X~~					~~A.4.b.6.b~~	

5/7/1B Issue 1B: Addition of a data item in Appendix 4 of the Radio Regulations about occurrence of transmissions of a non-geostationary satellite network

5/7/1B.1 Executive summary for Issue 1B

It is proposed to add new data item in Appendix **4** of the Radio Regulations (RR) in order to allow administrations to indicate whether the space station of a non-geostationary satellite network transmits continuously or only in visibility of the associated earth stations. This addition will help to reduce the administrative correspondence between administrations by describing more accurately the interference potential of such satellite systems.

5/7/1B.2 Background

NOTE – No need for this section.

5/7/1B.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Because of the limited time to comment (4 months) and the number of satellite networks to consider, comments under RR No. **9.3** are generally sent to other administrations on the basis of a first simple analysis:

- Is there a frequency overlap?
- Is there a geographical overlap based on associated service areas?
- Are the directions of transmission identical?
- Does the space station emit only in visibility of the associated earth stations or not?

In order to be able to answer the last question, a commenting administration needs to request the notifying administration to provide further information on this subject. The data is sometimes provided by the notifying administration as a note to the advance publication of a non-geostationary satellite system, but there is currently no such data item listed in RR Appendix **4**. Therefore, in absence of any information, a comment is issued based on the three first considerations. Very often, the comment also requests the notifying administration to indicate whether the space station emits only in visibility of the associated earth stations or not.

In order to ease the commenting procedure, it is therefore proposed to include new data element in RR Appendix **4** for non-geostationary satellite networks or systems. This new data element would be an indicator whether the space station transmits only in visibility of either the service area or the associated earth stations. This addition has the potential to reduce administrative correspondence and to limit the number of comments received by an administration submitting such a satellite network. Regarding some applications, such as a small number of associated earth stations are located in a relatively large service area, it is noted that requiring the indicator only for associated earth stations and not the entire service area may cause burden to the notifying administration when additional associated earth stations other than that submitted for initial publication of the network in question would be added in the service area.

5/7/1B.4 Analysis of the results of studies

Requiring new data in RR Appendix **4** for non-geostationary satellite networks or systems to answer the question of continuous or non-continuous transmission has the potential to ease the commenting procedure by reducing administrative correspondence and limiting the number of comments received by an administration submitting such a satellite network.

These new data would consist in an indicator specifying whether the space station transmits continuously or only when in visibility of either the service area or the associated earth stations. In the latter case, because of some operational conditions, some non-geostationary satellite networks may transmit only when they are seen from one of their associated earth stations with an elevation angle strictly greater than 0° (which corresponds to “visibility”), therefore this minimal elevation angle may also be provided.

5/7/1B.5 Method to satisfy Issue 1B

The method consists in adding new data items in RR Appendix **4** in order to allow administrations to indicate whether the space station of a non-geostationary satellite network transmits continuously or only when in visibility of the service area or of the associated earth stations (only in the latter case, the minimum elevation angle at which the space station is seen from one of its associated earth station when it transmits may also be provided).

Advantages

– Reduce administrative correspondence by allowing administrations to provide an essential element to assess the interference potential of a non-geostationary satellite network.

Disadvantages

– None.

5/7/1B.6 Regulatory and procedural considerations for Issue 1B

In order to implement the proposed method, two alternatives for modification of Appendix **4** are provided below:

5/7/1C Issue 1C: Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix 4

5/7/1C.1 Executive summary for Issue 1C

A possible ambiguity associated with the text of Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix **4** has been identified by ITU-R. This ambiguity could lead to either under-estimation, or over-estimation, of the maximum power density of carriers. Changes to the wording of this footnote, along with an updating of an ITU-R Recommendation, are seen as an effective way of addressing this issue.

Some administrations questioned the scope of this ambiguity and the need to take any action in this regard.

5/7/1C.2 Background

Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix **4** provides guidance to compute the maximum power density of a carrier. In particular, it indicates the averaging bandwidth over which the maximum power density shall be computed (4 kHz for assignments below 15 GHz, 1 MHz for assignments above 15 GHz). In the case of a carrier having a bandwidth smaller than the averaging bandwidth, Footnote 2 currently states that “… the maximum density is calculated as if the assignment occupied the averaging bandwidth”. This wording has led to two different interpretations of this footnote by administrations. Under one interpretation it is assumed that the entire averaging bandwidth is occupied by multiple narrow bandwidth carriers, and under the second it is assumed that the power of a single narrow bandwidth carrier is distributed across the entire averaging bandwidth. Depending upon the bandwidth of the narrow-band carrier, relative to 1 MHz, these two interpretations can lead to very different results.

5/7/1C.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Recommendation ITU-R SF.675 “Calculation of the maximum power density (averaged over 4 kHz) of an angle modulated carrier”.

Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix **4** calls for the most recent version of Recommendation ITU-R SF.675 to be used to the extent applicable in calculating the maximum power density per Hz. As such, the studies conducted included a consideration of a possible revision of this Recommendation.

5/7/1C.4 Analysis of the results of studies

In discussing the studies associated with this issue within ITU-R, it was concluded that the possible ambiguity associated with the wording of Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix **4** could be addressed by expanding the scope of Recommendation ITU-R SF.675 such that it would address the case of calculating the maximum power density averaged over 1 MHz. It should be noted that such a revision is currently under way within the appropriate ITU-R Study Groups and is expected to be completed before WRC-12.

5/7/1C.5 Methods to satisfy Issue 1C

Method A

One method identified to address this issue was to revise Recommendation ITU-R SF.675 so as to expand its scope to include 1 MHz averaging bandwidth, and to then consequentially modify Footnote 2 to Tables A, B, C and D of Annex 2 of RR Appendix **4** to delete the currently ambiguous sentence.

Method C

No change.

5/7/1C.6 Regulatory and procedural considerations for Issue 1C

Method A

MOD

APPENDIX 4 (Rev.WRC-~~07~~<u>12</u>)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-~~07~~<u>12</u>)

Footnotes to Tables A, B, C and D

1 Not required for coordination under No. 9.7A.

2 The most recent version of Recommendation ITU-R SF.675 should be used ~~to the extent applicable~~ in calculating the maximum power density per Hz. For carriers below 15 GHz, the

power density is averaged over the worst 4 kHz band. For carriers at or above 15 GHz, the power density is averaged over the worst 1 MHz band.~~ In the case of assignments with a bandwidth less than the stated averaging bandwidth, the maximum density is calculated as if the assignment occupied the averaging bandwidth.~~

Method B

No change to Footnote 2 to Tables A, B, C, and D of Annex 2 to RR Appendix **4**.

Alternative 1

APPENDIX 4 (Rev.WRC-07)
ANNEX 2
Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-07)

MOD

Table of characteristics to be submitted for space and radio astronomy services (WRC-07)

	B – CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA											
B.1	**IDENTIFICATION AND DIRECTION OF THE SATELLITE ANTENNA BEAM**										**B.1**	
B.1.a	the designation of the satellite antenna beam For an earth station, the designation of the satellite antenna beam of the associated space station			X	X	X	X	X	X	X	B.1.a	
B.1.b	an indicator showing whether the antenna beam, under B.1.a, is fixed or whether it is steerable and/or reconfigurable			X	X	X		X	X	X	B.1.b	
B.2	**TRANSMISSION/RECEPTION INDICATOR FOR THE BEAM OF THE SPACE STATION OR THE ASSOCIATED SPACE STATION**	X	X	X	X	X	+ [1]			X	**B.2**	
B.2A	**INDICATOR SHOWING WHETHER THE SPACE STATION TRANSMITS/RECEIVES ONLY IN VISIBILITY OF SERVICE AREA OR NOT**			X		X					**B.2A**	
B.3	**SPACE STATION ANTENNA CHARACTERISTICS**										**B.3**	

Alternative 2

APPENDIX 4 (Rev.WRC-07)

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-07)

MOD

Table of characteristics to be submitted for space and radio astronomy services (WRC-07)

	C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA											
C.3	**ASSIGNED FREQUENCY BAND**										**C.3**	
C.3.a	the bandwidth of the assigned frequency band, in kHz (see No. **1.147**) In the case of advance publication, required only for active sensors In the case of geostationary and non geo-stationary satellite networks, required for all space applications except passive sensors In the case of Appendix **30B**, required only for notification under Article 8			+	+	+	X	X	X	+	C.3.a	
C.3.b	the bandwidth of the frequency band, in kHz, observed by the station In the case of satellite networks, required only for passive sensors			+	+	+					C.3.b	X

	C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA											
C.3A	**OCCURRENCE OF TRANSMISSIONS OF THE FREQUENCY ASSIGNMENTS**										**C.3A**	
C.3A.a	an indicator specifying whether the frequency assignments are transmitted continuously or only when in visibility of the space station's associated earth stations Required only for frequency assignments of a non-geostationary satellite transmitting beam			**±**		**±**					C.3A.a	
C.3A.b	in the case of non-continuous transmission under item C.3A.a, the minimal elevation angle above which transmissions occur when in visibility of an associated specific earth station			**O**		**O**					C.3A.b	
C.4	**CLASS OF STATION AND NATURE OF SERVICE**										**C.4**	
C.4.a	the class of station, using the symbols from the Preface	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	C.4.a	**X**
C.4.b	the nature of service performed, using the symbols from the Preface	**X**	**X**	**X**	**X**	**X**	**X**				C.4.b	**X**

5/7/1D Issue 1D: Steerable beams and antenna gain contour covering area beyond submitted service area (Annex 2 to Appendix 4 of the RR)

5/7/1D.1 Executive summary for Issue 1D

The Radiocommunication Bureau is receiving coordination request information for satellite networks including characteristics of steerable beams for which the service area is restricted to the territory of one or a few administrations, whereas the area over which these beams can be steered is defined as worldwide. Although this does not reduce to the maximum extent possible the level of emission over the territories outside of the actual service area and therefore is not limiting the spectrum use to the minimum essential to provide in a satisfactory manner the necessary services, there is no provision under the present framework of the Radio Regulations (RR) which can prevent such usage, which is thus considered in conformity with the Radio Regulations (see RR Appendix **4**, Annex 2, Item B.3 b.1, which indicates the cases for which the equivalent gain contour diagram of an antenna beam is to be provided).

In addition, it is noticed that some submitted satellite antenna gain contours under item B.3.b.1 of Annex 2 to Appendix **4** of the Radio Regulations (RR) contained high gain areas outside the service area submitted under item C.11.a of Annex 2 of the same Appendix for the same satellite beam.

There is a question whether an additional item in RR Appendix **4** should be added under B.3.b in order to more clearly describe the equivalent antenna gain contour diagram of a steerable beam around the proposed service area and to address the issue of high gain area outside the submitted service area.

5/7/1D.2 Summary of technical and operational studies and relevant ITU-R Recommendations

It is worth noting that previous WRCs made several attempts to clarify the matter but no progress was reached due to the fact that there are several ambiguities in the technical and regulatory parts of the issue.

Introducing a regulatory procedure that discourages inaccurate claims of beam coverage should be considered taking account of the balance between the long term rights and flexibility for satellite operations and the need for ITU community to manage the limited spectrum/orbit resources efficiently. The use of these resources could be improved with more efficiency and without side-effect of the service applications when satellite antenna gain used for radiation in, or reception from, unnecessary directions is minimized by taking the maximum practical advantage of the properties of directional antennas whenever the technical method and the nature of service permits.

The question of submission of a small service area within a large repositionable area is that one may coordinate the potential interference from and to its own satellite everywhere; however, the potential interference from any earth stations located outside the service area is not taken into account. It may be then considered as only half coordinated. Indeed, if a new service area is added within the regulatory 7-year time-limits, the other half would need new coordination with new date and must be brought into use within those 7 years (no benefit after 7 years).

The following observations, which are similar to both the issue of steerable beams and antenna gain contour covering area beyond the submitted service area, are made:

1) administrations and satellite operators understand the spectrum application requirement in both aspects, i.e. not only the need for ITU community to manage the limited spectrum and orbit resources efficiently, but also the long-term rights and flexibility for satellite operations;

2) the wide variety of geographical appearance and service area requirement may pose the difficulty of exact similarity between the coverage area and the service area;

3) the notifying administration knows the details of why the characteristics of the satellite antenna coverage pattern need to be submitted;

4) when necessary, the BR could send a fax with a possible suggestion, or for a clarification, to the notifying administration in order for its submission to meet the requirement of RR No. **15.5**, decreasing the unnecessary interference to and/or from the directions outside of the actual service area.

5/7/1D.3 Methods to satisfy Issue 1D

5/7/1D.3.1 Method A: No change

In view of the difficulties and ambiguity of this issue, no change is proposed, but further studies are required in order to provide clear and workable method(s) to address these issues.

5/7/1D.3.2 Method B

The relevant item should be contained in Annex 2 of Appendix **4** of the Radio Regulations in order to meet the purpose of reflecting the actual satellite beam contours under RR No. **15.5** and accurately evaluating potential interference. However, it is noted that the existing Item B.3.b.1 is completely used for the purpose to indicate the cases for which the equivalent gain contour diagram of an antenna beam is to be provided.

However this method needs more elaborations to make it more efficient.

5/7/1D.4 Regulatory and procedural considerations for Issue 1D

5/7/1D.4.1 Method A

No change is proposed to the Radio Regulations.

5/7/1D.4.2 Method B

To implement this method, the following modifications are proposed to Annex 2 of Appendix **4** of the Radio Regulations.

MOD

APPENDIX 4 (Rev.WRC-~~07~~12)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-~~07~~12)

	B – CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA											
B.3.b.1	the co-polar antenna gain contours which shall be minimized as much as possible to cover the service area with due account of technical restrictions in certain cases, plotted on a map of the Earth's surface, preferably in a radial projection from the satellite onto a plane perpendicular to the axis from the centre of the Earth to the satellite The space station antenna gain contours shall be drawn as isolines of the isotropic gain, at least for –2, –4, –6, –10 and –20 dB and at 10 dB intervals thereafter, as necessary, relative to the maximum antenna gain, when any of these contours is located either totally or partially anywhere within the limit of visibility of the Earth from the given geostationary satellite Whenever possible, the gain contours of the space station antenna should also be provided in a numerical format (e.g. equation or table) Where a steerable beam (see No. **1.191**) is used, if the effective boresight area (see No. **1.175**) is less than the global service area, the contours are the result of moving the boresight of the steerable beam around the limit defined b the effective boresight area and are to be provided as described above but shall also include the 0 dB relative gain isoline The antenna gain contours shall include the effects of the plannec inclination excursion, longitudinal tolerance and the planned pointing accuracy of the antenna In the case of Appendix **30**, **30A** or **30B**, required only for non-elliptica beams				X			+	+	+	B.3.b.1	

5/7/1E Issue 1E: Addition of a data item in Appendix 4 of the Radio Regulations for antenna dimension aligned with the geostationary arc

5/7/1E.1 Executive summary for Issue 1E

It is proposed to add a new data item in Appendix **4** of the Radio Regulations (RR) in order to allow administrations to implement new Recommendation ITU-R S.1855[1]. This addition will permit the use of an alternative reference radiation pattern for earth station antennas.

5/7/1E.2 Background

Recommendation ITU-R S.1855 provides alternative reference radiation patterns to the ones given in Recommendation ITU-R S.465 which may be used for both circular and non-circular earth station antennas used with satellites in the geostationary-satellite orbit (GSO) and which, in the absence of particular information concerning the radiation pattern, may be used for coordination and/or interference assessment between earth stations in the fixed-satellite service (FSS) and stations of other services sharing the same frequency band as well as coordination and/or interference assessment between systems in the FSS.

5/7/1E.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Administrations can benefit from the antenna radiation patterns depicted in Recommendation ITU-R S.1855 as the use of antennas with the best achievable radiation patterns will contribute to a more efficient use of the radio-frequency spectrum and the GSO orbit. In addition, this Recommendation can handle both rotationally and non-rotationally symmetric antenna patterns and, therefore, other antenna shapes (i.e. rectangular, elliptical, etc.) are also now addressed.

5/7/1E.4 Analysis of the results of studies

In order to implement Recommendation ITU-R S.1855, a new data item, the parameter D_{GSO} (antenna dimension aligned with the geostationary arc), would need to be provided. Requiring this new data item in RR Appendix **4** will permit administration to benefit from the use of this Recommendation.

When the value of D_{GSO} is provided in Appendix **4**, the expression for calculating the value of the dimension D (in metres) of the antenna aperture in the plane of interest, as defined in *recommends* 2.1, is given by equation (2) in Annex 1 of Recommendation ITU-R S.1855.

If the value of D_{GSO} is not provided in Appendix **4**, it is automatically assumed that the equivalent diameter, D_{eq}, is equal to D_{GSO}. Also, in this case where D_{GSO} is not provided, the antenna performance is the same for all angles of θ (i.e. θ is set to 0° for all angles of θ) as defined in *recommends* 2.1 or 2.2 (whichever is applicable) in Recommendation ITU-R S.1855.

5/7/1E.5 Method to satisfy Issue 1E

The method consists of adding a new data item in RR Appendix **4** in order to allow administrations to specify the antenna dimension of the earth station aligned with the geostationary arc.

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[1] Administrative Circular CACE/503 announced the adoption and approval of Recommendation ITU-R S.1855.

Advantages

– Inclusion of the additional parameter D_{GSO} will allow the antenna pattern in Recommendation ITU-R S.1855 to be implemented in BR's *Reference Antenna Pattern Library* so that the antenna gain in the direction of interference (caused or received) can be calculated.

Disadvantages

– None.

5/7/1E.6 Regulatory and procedural considerations for Issue 1E

In order to implement this method, the following addition is proposed to Annex 2 of Appendix **4**:

MOD

APPENDIX 4 (Rev.WRC-~~07~~12)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-~~07~~12)

ADD

Table of characteristics to be submitted for space and radio astronomy services (WRC-~~07~~12)

	A – GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION											
A.7	**SPECIFIC EARTH STATION OR RADIO ASTRONOMY STATION SITE CHARACTERISTICS**										**A.7**	
...												
A.7.f	the antenna diameter, in metres Required only for fixed-satellite service earth stations operating in the frequency band 13.75-14 GHz						+[1]				A.7.f	
<u>A.7.f.1</u>	<u>antenna dimension aligned with the geostationary arc (D_{GSO}), in metres (see the most recent version of Recommendation ITU-R S.1855)</u>						<u>**O**</u>				<u>A.7.f.1</u>	
...												

2 See footnote 1.

	C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA											
C.10	**TYPE AND IDENTITY OF THE ASSOCIATED STATION(S)** *(the associated station may be another space station, a typical earth station of the network or a specific earth station)* *For all space applications except active or passive sensors*										**C.10**	
...												
C.10.d	**For an associated earth station (whether specific or typical):**										C.10.d	
...												
C.10.d.7	the antenna diameter, in metres In cases other than Appendix **30A**, required for fixed-satellite service networks operating in the frequency band 13.75-14 GHz and for maritime mobile-satellite service networks operating in the frequency band 14-14.5 GHz				+	+			**X**		C.10.d.7	
<u>C.10.d.7.a</u>	<u>antenna dimension aligned with the geostationary arc (D_{GSO}), in metres (see the most recent version of Recommendation ITU-R S.1855)</u>				<u>**O**</u>		<u>**O**</u>				<u>C.10.d.7.a</u>	
...												

5/7/2 Issues related to publication and coordination process/trigger

5/7/2A Issue 2A: Application of the coordination arc trigger and of RR No. 9.41 in the GSO/GSO FSS coordination under RR No. 9.7 in the frequency bands 6/4 GHz and 14/10/11/12 GHz

5/7/2A.1 Executive summary for Issue 2A

In frequency bands where the coordination arc applies, RR No. **9.41** states:

"**9.41** Following receipt of the BR IFIC referring to requests for coordination under Nos. **9.7** to **9.7B**, an administration believing that it should have been included in the request or the initiating administration believing that an administration identified under No. **9.36** in accordance with the provisions of No. **9.7** (GSO/GSO) (items 1) to 8) of the frequency band column), No. **9.7A** (GSO earth station/non-GSO system) or No. **9.7B** (non-GSO system/GSO earth station) of Table 5-1 of Appendix 5 should not have been included in the request, shall, within four months of the date of publication of the relevant BR IFIC, inform the initiating administration or the identified administration, as appropriate, and the Bureau, giving its technical reasons for doing so, and shall request that its name be included or that the name of the identified administration be excluded, as appropriate."

In certain frequency bands used by FSS networks where the coordination arc applies any new network filed with the ITU is likely to have to conduct coordination with a very large number of previously filed satellite networks.

According to some views, coordination with those networks which are at larger orbital separations may be unnecessary because the new satellite network will already be constrained by those networks which are at closer orbital separations. Moreover, it is recognized that, under current identification based on the coordination arc, separation of coverage is not taken into account in identifying coordination requirements. Therefore, a reduction in the number of satellite networks with which a newly filed network would have to coordinate may be possible without risk of mutual harmful interference between networks that have not been previously coordinated[28]. Such a reduction would facilitate access to the geostationary-satellite orbit and promote its efficient use.

The situation in these frequency bands is further aggravated because even satellite networks outside the coordination arc can be included in coordination through the application of RR No. **9.41**.

Other views were expressed that coordination with those networks which are at larger orbital separations may still be necessary even though the newly filed satellite network has some constraints by those networks which are at closer orbital separations, since such constraints may be insufficient in order to protect those networks which are at larger orbital separations in certain situations[28*bis*].

Views were also expressed that to reduce the coordination requirements for new submissions while ensuring adequate protection of other satellite networks and to reduce the need for provisional recording, use of a coordination arc could be combined with appropriate mechanisms to ensure that networks located outside the arc would be fully protected. These mechanisms would be applied by the Radiocommunication Bureau. Moreover, a pfd mask could also be considered to be used inside

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[28] This assumes that at least some of the coordination conducted with closer networks will correspond to a co-coverage situation.

[28*bis*] Some of the coordination conducted with closer networks would involve a more complex situation.

the arc in order to allow an administration/network inside the arc to request to be excluded from the coordination process.

According to other views, the use of the coordination arc and its further reduction is contrary to the basic principles on which the Radio Regulations were established and could exclude the very rights of many administrations which should have been identified as affected if the concept of coordination arc would have not been used. Therefore, the coordination arc should be eliminated or, as a minimum, the values of the coordination arc should not be reduced.

Views were expressed that the new coordination threshold or protection criteria to be established (i.e. pfd mask, pfd threshold, etc.) should secure the protection equivalent to the current situation. If they cannot, RR No. **9.41** and associated protection criteria in RR Appendix **5** should be maintained as a safety net.

Other views were expressed that too stringent provisions would delay the processing of satellite network applications and would not promote an efficient utilization of the GSO and frequency spectrum.

5/7/2A.2 Background

In certain portions of the 6/4 GHz band[29] as well as of the 10/11/12/14 GHz band[30], a new GSO FSS network is likely required to effect coordination with a large number of other satellite networks with orbital separations much less than the coordination arc. Views were expressed that the need to coexist and ensure appropriate protection of all these satellite networks implies that coexistence with and protection of satellite networks with larger separation angles will automatically result and coordination with such networks is actually unnecessary.

According to these views, one of the consequences of this situation is that many of the coordinations triggered by the current coordination arcs of ±10° (6/4 GHz) and ±9° (14/10/11/12 GHz) of the nominal orbital position of a new GSO FSS network are never conducted because neither of the parties involved feels an actual need for it to be done. The burden of having to conduct coordination with satellite networks which are closer to the incoming network is already heavy enough to discourage operators and administrations to devote scarce resources to conduct coordination exercises that are clearly unnecessary.

According to other views, these facts could not be used as a basis for proposing reduction of the coordination arc due to the fact that the use of orbital positions with such small separations stems from numerous multiple filings by administrations as speculation and warehousing of orbit/spectrum resources.

According to these other views, the concept of coordination arc and its inclusion in RR Appendix **5** was a temporary measure adopted by WRC-2000 merely aimed at the reduction of the huge backlog accumulated. Other temporary measures such as use of separate $\Delta T/T$ for uplink and downlink were also used for the reduction or liquidation of backlog. In order to preserve the rights of affected administrations as results of such measures, the regulatory provisions of RR No. **9.41** were substantially modified by inclusion of a counter measure allowing other administrations to retain

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[29] 3 400-4 200 MHz (space-to-Earth), 5 725-5 850 MHz (Earth-to-space) in Region 1, 5 850-6 725 MHz (Earth-to-space), 7 025-7 075 MHz (space-to-Earth) and (Earth-to-space).

[30] 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3, 12.7-12.75 GHz (Earth-to-space) in Region 2, and 13.75-14.5 GHz (Earth-to-space).

the rights to be included in the coordination process or the affecting administration to be excluded from the subject process.

Now that the backlog is eliminated as result of those temporary measures as well as due to other factors, then, according to these views, it is necessary to invoke the traditional technical criteria for the coordination. This means that the use of visible arc for the earth stations (the most interfering transmitting earth stations and the most sensitive receiving earth stations) as contained in Appendix **8** to the Radio Regulations.

Views were also expressed that to facilitate access to orbit spectrum resources for new networks while ensuring the required protection of other satellite networks and to reduce the need for provisional recording, use of a coordination arc could be combined with appropriate mechanisms to ensure that networks located outside the arc would be fully protected. These mechanisms would be applied by the Radiocommunication Bureau. Moreover, a pfd mask could also be considered to be used inside the arc to avoid identification of coordination requirements where there is no potential for interference (e.g. networks with no overlapping coverage).

5/7/2A.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Studies conducted in the previous study period of ITU-R revealed that, under certain conditions, an angular separation of ±9° for the 13-14/11-12 GHz band and ±8° for the 30/20 GHz band will ensure that the $\Delta T/T$ of 80% of the GSO FSS networks studied will not exceed the value of 6% (see Recommendation ITU-R S.1524). Studies have been conducted in this study period claiming that it may be possible to reduce the ±10° and ±9° coordination arcs associated with some portions of the 6/4 GHz and 14/10/11/12 GHz frequency bands without risk of mutual harmful interference between the newly filed satellite network and a network outside the coordination arc under different conditions or under the assumption that the new satellite network will already be constrained by those networks which are at closer orbital separations.

Proponents of a reduction in the value of the coordination arc trigger recognized that such a reduction may increase the number of satellite networks outside the coordination arc that will request to be included in the coordination in accordance with RR No. **9.41**. Therefore, according to these views, if the coordination arc is reduced, or even if the 10° and/or 9° values of the coordination arc remain unchanged, it would be advisable to consider additional conditions for the application of RR No. **9.41**. A survey conducted by the Radiocommunication Bureau showed that 1 613 cases relating to RR No. **9.41** had been received from 2001 through 2010. The introduction of the additional conditions for the application of RR No. **9.41** would reduce this number but may change the protection requirement from those contained in various ITU-R Recommendations (i.e. Recommendations ITU-R S.735, S.1323, S.1432, etc.) or qualify the satellite networks to be protected.

For protection of satellite networks in the 6/4 GHz and 14/10/11/12 GHz bands, coordinated under RR Articles **9** and **11**, other studies have suggested the use of a coordination arc with pfd thresholds to protect networks outside the arc and a pfd mask to be used inside the arc as an alternative to the current coordination arc together with $\Delta T/T$ outside the arc. Careful consideration would need to be given in determining the appropriate pfd thresholds and pfd mask, not only to protect satellite networks outside the coordination arc, but also to ensure efficient operation of satellite networks.

Proponents of this approach are of the view that this would reduce the coordination requirements for new submissions while ensuring the required protection of other satellite networks. As a result, this approach would reduce the need for provisional recording of frequency assignments and would enhance access to spectrum resources for new satellite networks and facilitate efficient spectrum usage.

5/7/2A.4 Analysis of the results of studies

The studies described in section 5/7/2A.3 claim that a reduction of the values ±10° and ±9° that appear in Table 5.1 in Appendix **5** of the Radio Regulations in connection with the GSO/GSO FSS coordination under RR No. **9.7** should be considered at WRC-12. These studies further suggest that, for GSO satellite networks in the 6/4 GHz and 14/10/11/12 GHz bands, the establishment of additional conditions for the application of RR No. **9.41** for inclusion in the coordination process, or conditions to be used as an alternative to RR No. **9.41**, should also be examined by WRC-12.

The studies submitted to the ITU-R showed that in the band 3 700-4 200 MHz the average separation between adjacent orbital locations with filed satellite networks is on the order of 1°, while in the band 14.0-14.5 GHz this average orbital separation is on the order of 1°. Moreover, the orbital separation between any adjacent filed networks does not exceed 4° for the band 3 700-4 200 MHz or 3° for the band 14.0-14.5 GHz.

In the band 3 700-4 200 MHz, about 98.8% of the separations between adjacent filed satellite networks do not exceed 2°, while in the band 14.0-14.5 GHz the corresponding percentage is 99.6%.

Assessments in these two frequency ranges, similar to those described above, were also submitted to the ITU-R for satellites currently in orbit and led to similar conclusions.

5/7/2A.5 Methods to satisfy Issue 2A

Method A: Reduce the ±10° coordination arc applicable in certain portions of the 6/4 GHz frequency bands to ±X° and the ±9° coordination arc applicable in certain portions of the 14/10/11/12 GHz frequency bands to ±Y°. Some administrations suggested values of 6° for X and 5° for Y. In any case, administrations not identified by the Bureau under RR No. **9.36** having satellite networks only outside these coordination arcs can still be included in the coordination through the application of RR No. **9.41**.

Method B: Specify pfd coordination levels on the Earth's surface and at the geostationary-satellite orbit outside the coordination arc that, if met, would preclude the use of RR No. **9.41** for inclusion in the coordination process. Otherwise, RR No. **9.41** for inclusion in the coordination process could continue to apply. The values of the pfd coordination levels to be verified by the Radiocommunication Bureau need to be carefully and cautiously studied and agreed upon in order to fully protect satellite networks outside the coordination arc.

NOTE 1 – Method B can be applied in combination with a reduction in the coordination arc.

NOTE 2 – "Coordination levels" in this method is not used for the conformity examination under RR No. **9.35** (i.e. "Favourable finding" is given and the mechanism of inclusion of coordination procedure currently ensured by RR No. **9.41** is applicable, in case of the exceeding the pfd levels).

Method C: Specify pfd thresholds on the Earth's surface and at the geostationary-satellite orbit outside the coordination arc that, if met, would preclude the use of RR No. **9.41** for inclusion in the coordination process. If the pfd thresholds are not met, an administration can request that its name be included in the list of identified administrations under RR No. **9.41** if it can demonstrate that $\Delta T/T$ exceeds 6%.

Moreover, if, in respect of a network inside the coordination arc, the produced downlink pfd everywhere inside its service area is below a specified mask, coordination is not necessary. Similarly, if the uplink pfd threshold is met also towards a network inside the coordination arc, coordination is not necessary.

The pfd values to be verified by the Radiocommunication Bureau need to be carefully and cautiously studied and agreed upon in order to fully protect satellite networks inside and outside the coordination arc as the case may be.

Editorial Note: Working Party 4A is invited to study and confirm the appropriate pfd values in time for consideration by WRC-12.

NOTE – Method C can be applied in combination with a reduction in the coordination arc.

Method D: No change to the Radio Regulations with respect to Issue **2A**.

5/7/2A.6 Regulatory and procedural considerations for Issue 2A

Method A: This method can be implemented by modifying Table 5-1 in RR Appendix **5**. An example regulatory text with the values 5 and 6 proposed by some administrations is shown below.

Methods B and C: These methods can be implemented by modifying relevant parts of Table 5-1 in RR Appendix **5**, including introduction of the appropriate pfd values. RR No. **9.41** may require some consequential changes. An example of possible regulatory changes to implement Method C is shown below.

EXAMPLE OF REGULATORY CHANGES FOR METHOD A

APPENDIX 5 (Rev.WRC-07)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (WRC-07)
Technical conditions for coordination
(see Article **9**)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.7** GSO/GSO	A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radio-communication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission	1) 3 400-4 200 MHz 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz 7 025-7 075 MHz	i) Bandwidth overlap, and ii) any network in the fixed-satellite service (FSS) and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±~~10~~6° of the nominal orbital position of a proposed network in the FSS		With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5), 6), 7) and 8), an administration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of *T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix 8 exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used
		2) 10.95-11.2 GHz 11.45-11.7 GHz 11.7-12.2 GHz (Region 2) 12.2-12.5 GHz (Region 3) 12.5-12.75 GHz (Regions 1 and 3) 12.7-12.75 GHz (Region 2) and 13.75-14.5 GHz	i) Bandwidth overlap, and ii) any network in the FSS or broadcasting-satellite service (BSS), not subject to a Plan, and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of ±~~9~~5° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan		

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Chapter 5

EXAMPLE OF REGULATORY CHANGES FOR METHOD C

APPENDIX 5 (Rev.WRC-07)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

MOD

TABLE 5-1 (WRC-07)

Technical conditions for coordination
(see Article **9**)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.7** GSO/GSO	A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radiocommunication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission	1) 3 400-4 200 MHz 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz 7 025-7 075 MHz 2) 10.95-11.2 GHz 11.45-11.7 GHz 11.7-12.2 GHz (Region 2) 12.2-12.5 GHz (Region 3) 12.5-12.75 GHz (Regions 1 and 3) 12.7-12.75 GHz (Region 2) and 13.75-14.5 GHz	i) Bandwidth overlap, and ii) any network in the fixed-satellite service (FSS) and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±10° of the nominal orbital position of a proposed network in the FSS i) Bandwidth overlap, and ii) any network in the FSS or broadcasting-satellite service (BSS), not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±9° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan		<u>In respect of space services operating in the bands in 1), see Notes 1 and 2</u> <u>In respect of space services operating in the bands in 2), see Notes 3 and 4</u> With respect to the space services listed in the threshold/condition column in the bands in ~~1), 2),~~ 3), 4), 5), 6), 7) and 8), an administration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of *T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%.

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
					When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used

NOTE 1 - With respect to the space services listed in the threshold/condition column in the bands in 1), if, for a proposed assignment;

i) the pfd produced anywhere on the surface of the Earth by emissions in the space-to-Earth direction exceeds -190.5^{*} dB(W/(m^2 · Hz)) or;

ii) the pfd produced at the GSO arc more than ±10° of the nominal orbital position of the proposed network by emissions in the Earth-to-space direction exceeds -202^{*} dB(W/(m^2 · Hz)),

an administration may request, pursuant to No. **9.41**, to be included in requests for coordination in respect of that assignment, indicating the networks for which the value of *T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used.

NOTE 2 - With respect to the space services listed in the threshold/condition column in the bands in 1), an assignment to a network at a nominal location less than ±10° of the nominal orbital position of the proposed network is considered as not affected by a proposed assignment if;

i) the pfd produced on the surface of the Earth by emissions in the space-to-Earth direction does not exceed the following values anywhere within the service area of the potentially affected assignment*:

-243.5 dB(W/(m^2 · Hz)) for $0° \leq \theta < 0.09°$

$-222.6 + 20 \log \theta$ dB(W/(m^2 · Hz)) for $0.09° \leq \theta < 3.0°$

$-219.8 + 0.75\, \theta^2$ dB(W/(m^2 · Hz)) for $3.0° \leq \theta < 5.5°$

$-215.5 + 25 \log \theta$ dB(W/(m^2 · Hz)) for $5.5° \leq \theta < 10°$

where θ is the nominal geocentric orbital separation in degrees between the wanted and interfering space stations, or;

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* *Editorial Note: Working Party 4A is invited to study and confirm the appropriate pfd values in Notes 1 to 4 in time for consideration by WRC-12.*

ii) the pfd produced at the nominal orbit location in the GSO of the potentially affected assignment by emissions in the Earth-to-space direction of the proposed assignment does not exceed the pfd value in ii) in Note 1 above.

NOTE 3 - With respect to the space services listed in the threshold/condition column in the bands in 2), if, for a proposed assignment;

i) the pfd produced anywhere on the surface of the Earth by emissions in the space-to-Earth direction exceeds −180.8[*] dB(W/(m^2 · Hz)) or;

ii) the pfd produced at the GSO arc more than ±9° of the nominal orbital position of the proposed network by emissions in the Earth-to-space direction exceeds −205[*] dB(W/(m^2 · Hz)),

an administration may request, pursuant to No. **9.41**, to be included in requests for coordination in respect of that assignment, indicating the networks for which the value of *T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used.

NOTE 4 - With respect to the space services listed in the threshold/condition column in the bands in 2), an assignment to a network at a nominal location less than ±9° of the nominal orbital position of the proposed network is considered as not affected by a proposed assignment if;

i) the pfd produced on the surface of the Earth by emissions in the space-to-Earth direction does not exceed the following values anywhere within the service area of the potentially affected assignment[*]:

-238.0	dB(W/(m^2 · Hz))	for $0°$	$\le \theta < 0.05°$
$-212.0 + 20 \log \theta$	dB(W/(m^2 · Hz))	for $0.05°$	$\le \theta < 3.0°$
$-210.9 + 0.95\,\theta^2$	dB(W/(m^2 · Hz))	for $3.0°$	$\le \theta < 5°$
$-204.6 + 25 \log \theta$	dB(W/(m^2 · Hz))	for $5°$	$\le \theta < 9°$

where θ is the nominal geocentric orbital separation in degrees between the wanted and interfering space stations,

or

ii) the pfd produced at the nominal orbit location in the GSO of the potentially affected assignment by emissions in the Earth-to-space direction of the proposed assignment does not exceed the pfd value in ii) in Note 3 above.

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[*] *Editorial Note: Working Party 4A is invited to study and confirm the appropriate pfd values in Notes 1 to 4 in time for consideration by WRC-12.*

5/7/2B Issue 2B: Comments under RR Nos. 9.51 and 9.52 as applied to coordination under RR No. 9.7

5/7/2B.1 Executive summary for Issue 2B

Currently, if an administration is identified by the Radiocommunication Bureau under RR No. **9.7** then, according RR No. **9.51**, it shall, within four months of the publication of the coordination request, either inform the requesting administration of its agreement or formally express its disagreement under RR No. **9.52**, i.e. the need for coordination. In the vast majority of cases, administrations respond in accordance with RR No. **9.52** without providing any reasons for their disagreement.

Consequently, there is a proposal to lift the mandatory nature of this requirement for coordination requests made under RR No. **9.7** (GSO vs. GSO) in order to decrease the amount of administrative correspondence generated by the application of RR No. **9.52** for coordination cases under RR No. **9.7**.

Regarding this issue, the following methods are proposed:

– Method A: No change to the current process.

– Method B: Removing the requirement to respond under RR No. **9.52** for coordination cases under RR No. **9.7**.

5/7/2B.2 Background

An administration identified by the Bureau under RR No. **9.7** shall, according RR No. **9.51**, within four months of the publication of the coordination request, either inform the requesting administration of its agreement or formally express its disagreement under RR No. **9.52**, i.e. the need for coordination. In the vast majority of cases, administrations respond in accordance with RR No. **9.52** without providing any reasons for their disagreement. Consequently, it was proposed to study a possible improvement to the process by lifting the mandatory nature of this requirement for coordination requests made under RR No. **9.7** (GSO vs. GSO) in order to decrease the amount of administrative correspondence generated by the application of RR No. **9.52** for coordination cases under RR No. **9.7**.

5/7/2B.3 Summary of technical and operational studies and relevant ITU-R Recommendations

After a coordination request is received under RR No. **9.7,** the Bureau identifies the administrations with which coordination has to be effected. An administration identified by the Bureau shall, according RR No. **9.51**, within four months of the publication of the coordination request, either inform the requesting administration of its agreement or formally express its disagreement under RR No. **9.52**, i.e. the need for coordination. In the vast majority of cases, administrations respond in accordance with RR No. **9.52** without providing any reasons for their disagreement. The requirement mentioned in RR No. **9.52** generates a large amount of administrative correspondences, which, in turn, has to be sorted out, forwarded to the relevant satellite operators, stored, etc. Correspondence to other administrations has also to be prepared by each satellite operator compiled by the administration and sent, very often to simply list the satellite networks with which coordination is to be performed.

Consequently, it was proposed to study a possible improvement to the process by lifting the mandatory nature of this requirement for coordination requests made under RR No. **9.7** (GSO vs. GSO) in order to decrease the amount of administrative correspondence generated by the application of RR No. **9.52** for coordination cases under RR No. **9.7**.

However, it was noted that administrations need to receive replies from other administrations at an early stage of the process relating to their views/disagreement on the matter, in order to permit the requesting administration to further pursue the matter. Removing such a course of action and closing the dialogue between administrations in seeking clarification and in asking for further information on the networks which are the basis of disagreement and leaving/postponing everything to the last moment is counter-productive.

It was also noted that from the text of the provision it is quite evident that those administrations which do not convey their disagreement would be considered as affected.

5/7/2B.4 Analysis of the results of studies

It follows from the previous section that the required formal answer under RR Nos. **9.51** or **9.52** has lost its value in the framework of coordination under RR No. **9.7** between geostationary satellite networks.

It was however noted that the lack of comments sent under RR No. **9.52** for coordination cases under RR No. **9.7** currently implies no regulatory consequences for the administration deciding not to send a comment.

5/7/2B.5 Methods to satisfy Issue 2B

5/7/2B.5.1 Method A: No change to the current process

Under this method, no change is proposed to the current process due to the following reasons:

1) From the text of the provision it is quite evident that those administrations which do not convey their disagreement would be considered as affected.

2) Administrations need to receive replies from other administrations at an early stage of the process relating to their views/disagreement on the matter, in order to permit the requesting administration to further pursue the matter. Removing such a course of action and closing the dialogue between administrations in seeking clarification and in asking for further information on the networks which are the basis of disagreement and leaving/postponing everything to the last moment is counter-productive.

3) Lack of reply under RR No. **9.52** as proposed in Method B, may lead to a request for assistance under sub-section IID of RR Article **9**, which has entirely different objectives.

4) There is no record of any difficulty being reported in this area. Consequently, a stable provision as it is today is highly required in order to provide a sufficient degree of stability in the provisions of the Radio Regulations which is a fundamental requirement for many countries, in particular developing countries.

5) Radio Regulations from the outset identify, either by using the Coordination Arc Concept or by using RR Appendix **8**, as appropriate, the administrations which are likely to be affected and not every and all the satellite networks belonging to those administrations. However, previous WRCs agreed that the list of satellite networks which could also be identified as affected be compiled by the Bureau and be contained in the Special Sections concerned. The publication of this list was accepted by previous WRCs only if the list remains informal. Changing the status of that list from informal to formal may create unintended implications as administrations are free to accept any networks to be included in the coordination agreement, if they so agreed.

6) The identification of affected administrations, when RR Appendix **8** is used, is based on the concept of increase of the •*T*/*T* beyond 6%. In so doing, as soon as the above criteria is not met at the first test point, the process would stop and identify the administration

responsible for that network as affected without going to any further examinations of other test points and other networks of that administration.

7) Administrations are free to agree on any networks whether or not identified by the Bureau at their bilateral and multilateral coordination which they usually agree upon as an overall/package arrangement. This course of action became a usual practice due to the fact: a) number of coordination expert is less and less at the level of operators and their notifying administration and b) holding the coordination meeting is very costly. The package deal is therefore being used to compensate for the above two main difficulties. Making the informal list formal removes that flexibility for administrations and limits them to only those networks identified, without any possibility for an overall coordination package, and thus ties the hands of administrations.

8) The current process has not produced any difficulties so far, and need not be changed without solid reasons. Moreover, administrations, in particular those of developing countries, due to the limited regulatory expert resources wish to see the basic provisions of RR to remain as stable as possible and not subject to frequent changes.

9) WRCs are almost faced with overloading agenda items and treatments of these agenda items has become more and more complex due to the congestion of a given frequency band by various services and due to the complex sharing conditions. Modifications of the radio regulatory texts which have proved to work well without any serious complaint would add more workload to the agenda items of the Conference and generate very often unnecessary discussions and misunderstanding.

In view of the above, there is no need to review the text of RR No. **9.52** and its associated Rules of Procedure due to the fact that administration(s) requesting coordination require/requires receiving a firm and formal reply from those administrations identified by the Bureau as likely to be affected concerning the agreement. This firm and formal reply enable the requesting administration to take necessary action and properly pursue the coordination and notification actions. Removing the requirement to respond in a specific and not tacit manner under RR No. **9.52** would create uncertainty and place considerable burden to the administrations requesting coordination and, in most cases, would adversely affect the follow up action in further applying the relevant provisions of RR Articles **9** and **11**.

Advantages

– The current provisions are kept stable.

Disadvantages

– Unnecessary administrative correspondence will continue to be processed by administrations.

5/7/2B.5.2 Method B: Removing the requirement to respond under RR No. 9.52 for coordination cases under RR No. 9.7

Under this method, it is proposed to remove the requirement to respond under RR No. **9.52** in order to eliminate a significant amount of correspondence that in most cases does not contribute in any way to expedite the coordination process.

In an improved process, after the coordination request of a satellite network of an administration is published together with the initial list of administrations and corresponding provisional list of satellite networks with which coordination has to be effected, administrations would review this list. In case an administration wants to add or remove itself and/or a network, then it would send this request to the Bureau, as well as the requesting administration, within four months of the date of publication of the coordination request. However, if an administration agrees with the initial list of administrations and provisional list of corresponding networks published by the Bureau, no action would be required. In particular, an administration already included in the list would not be removed from the final list due to the lack of response under RR No. **9.52** as such lack of a response would be understood by the Bureau to mean that this administration believes that coordination with one or more of its networks is required.

In summary, it is proposed that changes to RR Article **9** be introduced in order to allow that:

i) if an administration, in respect to a coordination request from another administration, is not in a position to give its agreement under RR No. **9.51** then this administration would not need to respond to such a request; and

ii) the lack of such a response would be understood by the Bureau to mean that this administration believes that coordination with one or more of its networks is required.

Advantages

– This method removes unnecessary administrative correspondence between administrations as well as between administrations and the Bureau.

Disadvantages

– The application of RR No. **9.60** may be more frequent.

5/7/2B.6 Regulatory and procedural considerations for Issue 2B

5/7/2B.6.1 Method A

No change to the Radio Regulations is required.

5/7/2B.6.2 Method B

An example for implementing Method B is provided below.

MOD

9.52 If an administration, following its action under No. **9.50**, does not agree to the request for coordination, it shall, within four months of the date of publication of the BR IFIC under No. **9.38**, or of the date of dispatch of the coordination data under No. **9.29**, inform the requesting administration of its disagreement and shall provide information concerning its own assignments upon which that disagreement is based. It shall also make such suggestions as it is able to offer with a view to satisfactory resolution of the matter. A copy of that information shall be sent to the Bureau[24A]. Where the information relates to terrestrial stations or earth stations operating in the opposite direction of transmission within the coordination area of an earth station, only that information relating to existing radiocommunication stations or to those to be brought into use within the next three months for terrestrial stations, or three years for earth stations, shall be treated as notifications under Nos. **11.2** or **11.9**.

Reasons: *To indicate that the following footnote is added:*

ADD

[24A] **9.52.1** In the case of coordination requests under No. **9.7**, an affected administration identified by the Bureau under No. **9.36** that is not responding under Nos. **9.51** or **9.52** shall be considered to have expressed its disagreement within the time-limit prescribed in No. **9.52**. That administration shall continue to be considered as one with which coordination must be effected.

Reasons: *A non-response by an affected administration can be considered as a response confirming within the 4-month comment period that the affected administration agrees with the Bureau that coordination is required with one or more of its networks.*

Reasons for modification of No. 9.60: Consequential change to RR No. **9.60** as a result of removing the mandatory requirement for administrations to provide their explicit disagreement under RR No. **9.52** when coordinating under RR No. **9.7** is required. An example of such changes is given below.

MOD

9.60 If, within the same four-month period specified in Nos. **9.51** or **9.51A**, an administration with which coordination is sought under Nos. **9.7A** ~~to~~ or **9.7B** ~~and~~or **9.15** to **9.19** fails to reply or to give a decision under Nos. **9.51** or **9.51A** or, following its disagreement under No. **9.52**, fails to provide information concerning its own assignments on which its disagreement is based, the requesting administration may seek the assistance of the Bureau. The administration initiating the coordination under No. **9.7** may also request the assistance of the Bureau when this administration considers that an affected administration~~s~~ which has received a request to provide information required to conduct coordination, fails to provide such information within [XX] days after the date of receipt of the request.

5/7/2C Issue 2C: List of satellite networks with which coordination under RR No. 9.7 needs to be effected (Application of No. 9.36 of the Radio Regulations)

5/7/2C.1 Executive summary for Issue 2C

For coordination cases related to RR No. **9.7**, as the list of the satellite networks of an identified administration provided by the Bureau under RR No. **9.36.2** is "for information purposes only", the notifying administration does not know the complete list of networks of the identified administration that have to be considered until bilateral coordination between both administrations is conducted.

Two methods are proposed regarding this issue:

– Method A: No change to the current provisions;

– Method B: Defining a final list under RR No. **9.36.2**;

5/7/2C.2 Background

The provisions Nos. **9.36** and **9.36.2** of the Radio Regulations (RR) currently in force indicate that the Radiocommunication Bureau, when it examines a request for coordination in application of RR Nos. **9.34** to **9.38**, shall identify any administration with which coordination may need to be effected. More precisely, RR No. **9.36.2** states that "In the case of coordination under Nos. **9.7**, **9.7A** and **9.7B**, the Bureau shall also identify the specific satellite networks or Earth stations with which coordination needs to be effected. In the case of coordination under No. **9.7** the list of the networks identified by the Bureau under No. **9.27** is for information purposes only, to help administrations comply with this procedure."

As the list of the satellite networks of an identified administration provided by the Bureau is "for information purposes only", the notifying administration does not know the complete list of networks of the identified administration that have to be considered until bilateral coordination between both administrations is conducted.

5/7/2C.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Assume that the coordination request of a satellite network of Administration A has been published and that Administration B has been identified by the Bureau under RR No. **9.7** as one of the administrations with which coordination has to be effected.

As the list of the satellite networks of Administration B provided by the Bureau under RR No. **9.36.2** is "for information purposes only", Administration A will not know the complete list of networks of Administration B that have to be considered until bilateral coordination between A and B is conducted.

Provision RR No. **9.36.2** stipulates that the Bureau identifies the satellite networks with which coordination needs to be effected in the framework of the coordination procedure foreseen in RR Article **9** (Section II) for the coordination forms RR Nos. **9.7** to **9.7B**. The Bureau uses for this identification either the "coordination arc" concept or the method described in RR Appendix **8** (*T*/*T* > 6%). On the above basis, the Bureau establishes the list of affected administrations (RR No. **9.36**) and a list of satellite networks which may be affected by the network is contained in the "incoming" coordination request. The latter list, however, may not be complete or definitive for a given coordination request. Under the provisions of RR No. **9.41**, administrations which are not included in the list under RR No. **9.36** may request their inclusion in this list, identifying networks outside the coordination arc for which the value of *T*/*T* calculated by the method in RR Appendix 8 exceeds 6%.

In addition, administrations which are included in the list of RR No. **9.36** may at a later time request that, in addition to the networks included in the list of RR No. **9.36.2**, other networks should also be included in the coordination process. The latter case is not covered by the provisions of RR No. **9.41** which only deals with cases of administrations not included in the first list established under RR No. **9.36** rather than the satellite networks. Consequently, this problem needs to be solved by administrations during bilateral coordination discussions. Additions under RR No. **9.41** to the list of the affected administrations are handled by addenda to the first publication under RR No. **9.38** at different times, after the first publication (see RR Nos. **9.41** and **9.42**). While the additionally affected administrations are in this way published and consequently known by all the administrations after the four-month comment period, the complete list of networks to be considered is not available, as the list of networks originally published under RR No. **9.36.2** is not updated.

Having experienced the above difficulties, a Rule of Procedure (RoP) concerning the application of provisions RR Nos. **9.41** and **9.42** has been established. The RoP recognizes that under the current regulations the list of affected networks (RR No. **9.36.2**) cannot be considered as exhaustive. In addition, it is also recognized that when administrations disagree on the list of networks to be considered the problem can only be solved by the Bureau at the very end of the notification process (RR Article **11**, RR Nos. **11.32A** and probably **11.41**).

It is noted that the wording of RR No. **9.41** excludes from its application those administrations which have been selected for inclusion in the list of affected administration under RR No. **9.36**. These administrations may also find that some of their networks which were not included in the list of RR No. **9.36.2** – since they were outside the coordination arc – should be included into the coordination procedure as their *T*/*T* value exceeds the threshold value of 6%. Logically for these administrations the concept of RR No. **9.41** should also apply. The current Rule of Procedure on RR Nos. **9.41-9.42** recognizes this problem (see § 2.1 of the RoP) and suggests that such cases should be considered under RR No. **9.52** (disagreement communicated to the initiating administration). For such a case the Rule of Procedure states that the administration should, *"while applying No.* ***9.52*** *and without having to apply No. **9.41**, bring into the bilateral coordination discussion any of their networks located outside the coordination arc which meet the $T/T > 6\%$ criterion".*

5/7/2C.4 Analysis of the results of studies

The uncertainty about the precise list of satellite networks with which coordination has to be performed is not desirable, especially because detailed coordination is often conducted between operators, whereas satellite networks are submitted to the ITU by administrations. Operator-to-operator coordination agreements are subsequently ratified by the administrations involved and a formal coordination meeting between administrations may never happen. Therefore the operator of Administration A associated with the satellite network under consideration may never know the complete list of networks of Administration B with which coordination is required.

Moreover, there is currently no provision for an administration already identified as potentially affected under RR No. **9.36** to include possible additional networks which were not identified under RR No. **9.36.2** where the only criterion applied was the coordination arc. A clarification in RR Article **9** on the way to deal with such cases would clarify the matter and diminish the need for an associated Rule of Procedure.

It was noted that the list established under RR No. **9.36.2** does not take into account the status of the various assignments to the listed satellite networks, therefore it is recognised that the list may contain satellite networks for which coordination will not be required under RR Nos. **11.32** or **11.32A**. However, it was also noted that this is not an issue since the coordination requirement will *de facto* disappear at the notification stage.

5/7/2C.5 Methods to satisfy Issue 2C

5/7/2C.5.1 Method A: No change to the current provisions

The current Regulation is sufficient and no modifications are required, based on the following considerations:

1) Radio Regulations from the outset identify the administrations which are likely to be affected and not the satellite networks belonging to those administrations. However, previous WRCs agreed that the list of satellite networks which could also be identified as affected be compiled by the Bureau and be contained in the Special Sections concerned. The acceptance of the publication of this list was accepted by previous WRCs only if the list remains informal. Changing the status of that list from informal to formal may create unintended implications as administrations are free to accept any networks to be included in the coordination agreement, if they so agreed.

2) The identification of affected administrations when RR Appendix **8** is used is based on the concept of increase of the $\Delta T/T$ beyond 6%. However, this process is carried out so as soon as the above criteria is not met at the first test point, the process would stop and identify the administration responsible for that network as affected without going to any further examinations of other networks of that administration.

3) Administrations are free to agree on any networks whether or not identified by the Bureau as their bilateral and multilateral coordination which they usually agree upon as a lump sum package. Making the informal list formal removes that flexibility for administrations and limits them to only those networks identified, without any possibility for an overall coordination package, and thus ties the hands of administrations.

4) The current process has not produced any difficulties so far, and need not be changed without solid argument. Moreover, administrations, in particular those of developing

countries, due to the limited regulatory expert resources wish to see the basic provisions of the RR to remain as stable as possible and not subject to frequent changes.

From the above, it is implied that the proposal to change the list of networks currently published by the Bureau for information only to a definitive and formal list of networks which need to be taken into account in coordination negotiation is contrary to the spirit and circumstances in which provision RR No. **9.36.2** was introduced.

It should bear in mind that:

1) Publication of the list of networks (associated with administrations which are likely to be affected) by the Bureau for information was the results of rigorous and extensive discussions at previous WRCs.

2) The information published under RR No. **9.36.2** is sufficient to assist administrations to carry out coordination.

3) There is no need to modify the status of the published information from information status to mandatory status since such an action:

    3.1) Remove the flexibility provided to administrations in their bilateral and multilateral negotiation to freely discuss among themselves and arrive at an overall and block/package coordination agreement, and:

    3.2) engage administration to be based on a list which was published purely for information and limit their ability to negotiate with their counterparts on the list of satellite networks concerned which might affect their networks based on the coordination discussions.

    3.3) Such action would be contrary to the spirit and circumstances in which provision RR No. **9.36.2** was introduced.

    3.4) Such course of action may lead the administrations to propose the total deletion of provision RR No. **9.36.2** from RR Article **9** and limit the identification to the name of administrations which are likely to be affected only.

5/7/2C.5.2 Method B: Defining a final list under RR No. 9.36.2

Under this method, the list of networks identified under RR No. **9.36.2** with respect to coordination under RR No. **9.7** would be considered provisional and not “for information only”. Moreover, the current possibility under RR No. **9.41** to add or remove an administration from the list generated by the Bureau would be expanded so that requests could also be made to add or remove networks from the list generated by the Bureau[1]. The Bureau would then study all these requests (see RR No. **9.42**) and subsequently publish, at the earliest possible date, a definitive list of administrations and corresponding satellite networks with which coordination would be required.

5/7/2C.6 Regulatory and procedural considerations for Issue 2C

5/7/2C.6.1 Method A

No change to the Radio Regulations is required under Method A.

5/7/2C.6.2 Method B

A possible implementation of Method B is provided below.

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[1] Requests for addition of an administration should also include the specification of the networks of this administration to be considered in the coordination.

MOD

[21] **9.36.2** In the case of coordination under Nos. **9.7, 9.7A** and **9.7B**, the Bureau shall also identify the specific satellite networks or earth stations with which coordination needs to be effected (see also No. **9.42**). ~~In the case of coordination under No. 9.7 the list of the networks identified by the Bureau under No. **9.27** is for information purposes only, to help administrations comply with this procedure.~~

Reasons: This modification renders the list of affected networks a definitive maximal list of networks with which coordination needs to be performed under RR No. **9.7**. According to the modifications proposed to RR No. **9.42** hereafter, this list will be updated after the completion of actions under RR No. **9.41**, and, at the end of this procedure, will be made available to the administrations.

MOD

9.41 Following receipt of the BR IFIC referring to requests for coordination under Nos. **9.7** to **9.7B**, an administration believing that it, or any of its satellite networks not identified under No. **9.36.2**, should have been included in the request or the initiating administration believing that an administration, or any of the satellite networks identified under No. **9.36.2,** in accordance with the provisions of No. **9.7** (GSO/GSO) (items 1) to 8) of the frequency band column), No. **9.7A** (GSO earth station/non-GSO system) or No. **9.7B** (non-GSO system/GSO earth station) of Table 5-1 of Appendix **5** should not have been included in the request, shall, within four months of the date of publication of the relevant BR IFIC, inform the initiating administration or the identified administration, as appropriate, and the Bureau, giving its technical reasons for doing so, and shall request that its name, or the name of any of its satellite networks not identified under No. **9.36.2**, be included or that the name of the identified administration, or any of its satellite networks identified under No. **9.36.2**, be excluded, as appropriate.

Reasons: To allow the initiating administration to propose changes not only to the list of administrations identified by the BR but also to the list of networks associated with these administrations. To require that an administration that wants to be included in the coordination, but has not been identified by the BR, also identify its specific networks to be considered.

MOD

9.42 The Bureau shall study this information on the basis of Appendix **5** ~~and shall inform both administrations of its conclusions~~. Should the Bureau agree to include or exclude, as appropriate, ~~the~~an administration or a satellite network in the request, it shall inform both administrations of its conclusion and publish a Special Section, indicating the list of administrations and associated satellite networks with which coordination needs to be effected~~an addendum to the publication under No. **9.38**~~.

Reasons: To indicate that inclusions and exclusions to the list may refer to administrations and/or networks and to publish the updated list, originally established under RR No. **9.36.2**, with the inclusions and/or exclusions of administrations and/or networks submitted by administrations under RR No. **9.41** and considered justifiable after having been studied by the Bureau. The publication of this updated list renders superfluous the specific need to inform both administrations.

APPENDIX 5

MOD[2]

TABLE 5-1

Reference of Article 9	…….	Remarks
No. **9.7** GSO/GSO	………………..	With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5), 6), 7) and 8), an administration may request, pursuant to No. **9.41**, to be included<u>, or that any of its satellite networks be included,</u> in requests for coordination, indicating the networks for which the value of T/T calculated by the method in § 2.2.1.2 and 3.2 of Appendix 8 exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix 8 shall be used

Reasons*: To add a reference to the case where an administration already identified as affected desires to add networks outside the coordination arc, provided the trigger level of T/T is exceeded for these networks.*

5/7/2D Issue 2D: Review of the bands listed in Table 5-1 of RR Appendix 5 for RR Nos. 9.11 and 9.19

5/7/2D.1 Executive summary for Issue 2D

Because inaccuracies in Table 5-1 of RR Appendix **5** lead to confusion in applying the provisions of Section II of RR Article **9** and may cause difficulties for both administrations and the Bureau, the list of frequency bands indicated in the row corresponding to RR No. **9.11** is reviewed and proposed to be updated. It is also proposed to explicitly list the bands where RR No. **9.19** applies instead of referring to the row dealing with RR No. **9.11**.

5/7/2D.2 Background

Table 5-1 of RR Appendix **5** lists the technical conditions for the various coordination cases contained in Section II of Article **9**. Among other conditions, the frequency bands where a specific provision applies are listed. In particular, for the row corresponding to No. **9.11**, a number of bands are listed where the Bureau is supposed to apply this provision. However some inconsistencies with other parts of the Radio Regulations have been identified. Moreover, the row corresponding to No. **9.19** only refers to the row of No. **9.11** concerning the involved frequency bands.

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[2] It is to be noted that in the above simplified presentation only the first and last columns of Table 5-1 of RR Appendix **5** are shown. The other columns of this table are not to be modified.

5/7/2D.3 Summary of technical and operational studies and relevant ITU-R Recommendations

5/7/2D.3.1 Frequency bands listed in Table 5-1 of Appendix 5 for No. 9.11

5/7/2D.3.1.1 Frequency band 620-790 MHz

The BSS allocation in this band was suppressed by WRC-07 with the deletion of No. **5.311**. Grand-fathered assignments are subject to Resolution **549 (WRC-07).**

5/7/2D.3.1.2 Frequency band 1 452-1 492 MHz

Pursuant to Resolution **528 (Rev.WRC-03)**, it should be noted that only the band 1 467-1 492 MHz can currently be used and is therefore subject to No. **9.11**.

5/7/2D.3.1.3 Frequency band 2 310-2 360 MHz

The BSS allocation is contained in No. **5.393** and that No. **9.11** applies with regards to terrestrial services of all countries.

5/7/2D.3.1.4 Frequency band 2 535-2 655 MHz

The reference to this band in Table 5-1 reflects the allocation situation in RR Article **5**.

5/7/2D.3.1.5 Frequency band 12.5-12.75 GHz

In this band, the BSS allocation is limited to Region 3. Terrestrial services in Region 1 are only allocated in a certain number of countries (see Nos. **5.494** (on a primary basis), **5.495** (on a secondary basis) and **5.496** (on a primary basis)). Resolution **34 (Rev.WRC-03)** indicates in its *resolves* 3*b)* that "the provisions of Article **21** (Table **21-4**) shall apply in the countries mentioned in Nos. **5.494** and **5.496**". Resolution **34** also applies pfd limits for terrestrial services in all three regions through *resolves* 3*a)*.

5/7/2D.3.1.6 Frequency band 17.3-17.8 GHz

The frequency band 17.3-17.7 GHz is not allocated to terrestrial services on a primary basis, whereas, in Region 2, this band is allocated to the broadcasting-satellite service.

In the frequency band 17.7-17.8 GHz, No. **9.11** applies to the BSS allocated in Region 2 with regards to terrestrial services in all three Regions.

5/7/2D.3.1.7 Frequency band 21.4-22 GHz

Sharing between BSS and terrestrial services in this frequency band is considered under WRC-12 Agenda item 1.13.

5/7/2D.3.1.8 Frequency band 74-76 GHz

The reference to this band in Table 5-1 reflects the allocation situation in RR Article **5**.

5/7/2D.3.2 Frequency bands listed in Table 5-1 of Appendix 5 for No. 9.19

The bands listed in Table 5-1 of Appendix **5** for No. **9.19** are the "bands listed in No. **9.11**, the band 2 520-2 670 MHz and the band 11.7-12.7 GHz".

5/7/2D.3.2.1 Frequency band 620-790 MHz

The BSS allocation in this band was suppressed by WRC-07 with the deletion of No. **5.311**. Grand-fathered assignments are subject to Resolution **549 (WRC-07)**. Nothing prevents to apply No. **9.19** with regard to these assignments.

5/7/2D.3.2.2 Frequency band 1 452-1 492 MHz

Pursuant to Resolution **528 (Rev.WRC-03)**, it should be noted that only the band 1 467-1 492 MHz can currently be used and is therefore subject to No. **9.19**.

5/7/2D.3.2.3 Frequency band 2 310-2 360 MHz

The BSS allocation is contained in No. **5.393**. No. **9.19** applies to terrestrial services in all three Regions with regards to this BSS allocation.

5/7/2D.3.2.4 Frequency band 2 520-2 670 MHz and 2 535-2 655 MHz

WRC-07 revised No. **5.416** to clarify that the "provisions of No. **9.19** shall be applied by administrations in this band in their bilateral and multilateral negotiations".

5/7/2D.3.2.5 Frequency band 11.7-12.7 GHz

The reference to this frequency band intends to cover the specific case of the Appendix **30** Plan.

5/7/2D.3.2.6 Frequency band 12.5-12.75 GHz

In this band, the unplanned BSS allocation is limited to Region 3. There are terrestrial services in a number of countries in Region 1 (see Nos. **5.494** (on a primary basis), **5.495** (on a secondary basis) and **5.496** (on a primary basis)) as well as in Regions 2 and 3. Because pfd limits contained in Table 21-4 apply to protect terrestrial services in the countries mentioned in Nos. **5.494** and **5.496**, No. **9.11** does not apply in this case. Similarly, *resolves* 3*a)* of Resolution **34** deals with coordination of BSS with terrestrial services in all three Regions. However, nothing indicates that No. **9.19** should not apply in the reverse direction.

5/7/2D.3.2.7 Frequency band 17.3-17.8 GHz

The frequency band 17.3-17.7 GHz is not allocated to terrestrial services on a primary basis, whereas, in Region 2, this band is allocated to the broadcasting-satellite service. Therefore No. **9.19** can not apply in this frequency band to terrestrial services.

In the frequency band 17.7-17.8 GHz, No. **9.19** applies to terrestrial services in all three Regions with regards to the BSS allocated in Region 2. For transmitting earth stations in the fixed-satellite service, the provisions of Article 4 of Appendix **30A** No. **9.19** apply through footnotes 4 and 15 against sections 4.1.1 and 4.2.2, respectively.

5/7/2D.3.2.8 Frequency band 21.4-22 GHz

Sharing between BSS and terrestrial services in this frequency band is considered under WRC-12 Agenda item 1.13.

5/7/2D.3.2.9 Frequency band 74-76 GHz

The reference to this band in Table 5-1would reflect the allocation situation in RR Article **5**.

5/7/2D.3.3 Frequency bands not listed in Table 5-1 of Appendix 5 for No. 9.11 or No. 9.19

5/7/2D.3.3.1 Frequency band 40.5-42.5 GHz

The BSS allocation in this band does not appear in the entries in Table 5-1 for either No. **9.11** or No. **9.19**. There are limits in Article **21** for BSS in this band, which mean it is not necessary to apply No. **9.11**. However, there is a need to address this allocation under No. **9.19**.

5/7/2D.4 Analysis of the results of studies

5/7/2D.4.1 Frequency bands listed in Table 5-1 of Appendix 5 for No. 9.11

5/7/2D.4.1.1 Frequency band 620-790 MHz

Resolution **549 (WRC-07)** stipulates that "any submission of a frequency assignment relating to the broadcasting-satellite service in the frequency band 620-790 MHz, received by the Radiocommunication Bureau under Articles **9** and/or **11**, as the case may be, other than those referred to in *resolves* 1, shall be returned to the submitting administration" therefore No. **9.11** could only be applied for modifications to those grand-fathered assignments ("STATSIONAR-T" and "STATSIONAR-T2"). This band should be listed in Table 5-1 with a clear link to Resolution **549 (WRC-07)**.

5/7/2D.4.1.2 Frequency band 1 452-1 492 MHz

It was noted above that Resolution **528 (Rev.WRC-03)** applies in this band. While a reference could be made to this Resolution in Table 5-1, it was felt that it is not possible to include all information in other parts of the Radio Regulations in Table 5-1, so the entry was just left as the frequency band.

5/7/2D.4.1.3 Frequency band 2 310-2 360 MHz

Because the BSS allocation in this band is made by footnote, it was felt that Table 5-1 should indicate that the BSS allocation is contained in No. **5.393** and that No**. 9.11** applies with regards to terrestrial services of all countries.

5/7/2D.4.1.4 Frequency band 2 535-2 655 MHz

No change to Table 5-1 is required.

5/7/2D.4.1.5 Frequency band 12.5-12.75 GHz

Because Resolution **34 (Rev.WRC-03)** indicates in its *resolves* 3*b)* that "the provisions of Article **21** (Table **21-4**) shall apply in the countries mentioned in Nos. **5.494** and **5.496**", even if the broadcasting-satellite service is not listed in the row of Table 21-4 corresponding to the band 12.5-12.75 GHz, this *resolves* indicates that the pfd limits contained in Article 21 do apply. Similarly, *resolves* 3*a*) of Resolution **34** deals with coordination of BSS with terrestrial services in all three Regions. Given that No. **9.6.3** stipulates that "Unless otherwise specified, coordination under any of the particular sharing situations defined in Nos. **9.7** to **9.21** is not applicable when limits for that sharing situation are specified elsewhere in these Regulations", and the need to avoid duplicative coordination requirements, No. **9.11** does not apply in the band 12.5-12.75 GHz with regards to terrestrial services of any region. Table 5-1 should therefore not include this frequency band.

5/7/2D.4.1.6 Frequency band 17.3-17.8 GHz

Because No. **9.11** does not apply in the 17.3-17.7 GHz band, Table 5-1 should indicate that No. **9.11** applies to the BSS allocated in Region 2 only in the 17.7-17.8 GHz band with regard to terrestrial services in all three Regions.

5/7/2D.4.1.7 Frequency band 21.4-22 GHz

The decisions of WRC-12 with regard to Agenda item 1.13 will be reflected in Table 5-1 of Appendix **5**.

5/7/2D.4.1.8 Frequency band 74-76 GHz

No change to Table 5-1 is required.

5/7/2D.4.2 Frequency bands listed in Table 5-1 of Appendix 5 for No. 9.19

The bands listed in Table 5-1 of Appendix **5** for No. **9.19** are the "bands listed in No. **9.11**, the band 2 520-2 670 MHz and the band 11.7-12.7 GHz". Table 5-1 should preferably provide an actual list of bands for No. **9.19** instead of a reference to "bands listed in No. **9.11**". This list is analysed based on the following considerations.

5/7/2D.4.2.1 Frequency band 620-790 MHz

Following the suppression of the BSS allocation in this band by WRC-07, grand-fathered assignments are subject to Resolution **549 (WRC-07)**, where nothing prevents to apply No. **9.19** with regards to these assignments. Table 5-1 should establish a clear link between this band and Resolution **549 (WRC-07)**.

5/7/2D.4.2.2 Frequency band 1 452-1 492 MHz

It was noted previously that Resolution **528 (Rev.WRC-03)** applies in this band. While a reference could be made to this Resolution in Table 5-1, it was felt that it is not possible to include all information in other parts of the Radio Regulations in Table 5-1, so the entry was just left as the frequency band.

5/7/2D.4.2.3 Frequency band 2 310-2 360 MHz

Table 5-1 should provide clarifications that the BSS allocation is contained in No. **5.393**.

5/7/2D.4.2.4 Frequency band 2 520-2 670 MHz and 2 535-2 655 MHz

For these two frequency bands, Table 5-1 should refer to No. **5.416** because this footnote references No. **9.19**.

5/7/2D.4.2.5 Frequency band 11.7-12.7 GHz

Table 5-1 should establish a clear link between this frequency band and the relevant provisions of Appendix **30**.

5/7/2D.4.2.6 Frequency band 12.5-12.75 GHz

Because Resolution **34** applies pfd limits to protect terrestrial services in all three Regions, No. **9.11** does not apply in this case. However, nothing indicates that No. **9.19** should not apply in the reverse direction. Table 5-1 should indicate that No. **9.19** applies in this band to the terrestrial services of all three Regions with regards to the Region 3 BSS allocation. The cases where No. **9.19** may apply to FSS transmitting earth stations should also be clarified.

5/7/2D.4.2.7 Frequency band 17.3-17.8 GHz

Because the band 17.3-17.7 GHz is not allocated to terrestrial services on a primary basis, there is no need to include this frequency band in the row corresponding to No. **9.19** because of terrestrial stations.

In the frequency band 17.7-17.8 GHz, No. **9.19** applies to terrestrial services in all three Regions with regards to the BSS allocated in Region 2.

For transmitting earth stations in the fixed-satellite service with respect to Region 2 BSS in this band, the provisions of Article 4 of Appendix **30A** apply No. **9.19** through footnotes 4 and 15 against Sections 4.1.1 and 4.2.2, respectively.

5/7/2D.4.2.8 Frequency band 21.4-22 GHz

The decisions of WRC-12 with regards to Agenda item 1.13 will be reflected in Table 5-1 of Appendix **5**.

5/7/2D.4.2.9 Frequency band 74-76 GHz

This band should be listed in Table 5-1 for No. **9.19**.

5/7/2D.4.3 Frequency bands not listed in Table 5-1 of Appendix 5 for No. 9.11 or No. 9.19

5/7/2D.4.3.1 Frequency band 40.5-42.5 GHz

The BSS allocation in this band does not appear in the entries in Table 5-1 for either No. **9.11** or No. **9.19**. There are limits in Article **21** for BSS in this band, which means it is not necessary to apply No. **9.11**. However, this allocation does need to be added to the row for No. **9.19**.

5/7/2D.5 Method to satisfy Issue 2D

The method consists in modifying Table 5-1 of RR Appendix **5** for RR No. **9.11** based on the above analysis in order to render more accurate the frequency bands where this provision applies.

It is also proposed to modify Table 5-1 of RR Appendix **5** for RR No. **9.19** based on the above analysis in order:

– to replace the term “bands listed in No. **9.11**” with the actual list of the bands for RR No. **9.11**, and

– to make more accurate the frequency bands where this provision applies.

Advantages

– Remove inconsistencies and inaccuracies from Table 5-1 of Appendix **5**.

– Avoid misleading in the application of Nos. **9.11** and **9.19**.

Disadvantages

– None.

5/7/2D.6 Regulatory and procedural considerations for Issue 2D

To implement the proposed method, Appendix **5** could be modified as follows.

APPENDIX 5 (Rev.WRC-07)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-1 (WRC-07)

Technical conditions for coordination (see Article **9**)

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TABLE 5-1 (*continued*) (WRC-07)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.11** GSO, non-GSO/ terrestrial	A space station in the BSS in any band shared on an equal primary basis with terrestrial services and where the BSS is not subject to a Plan, in respect of terrestrial services	620-790 MHz (see Resolution **549 (WRC-07)**) 1 452-1 492 MHz 2 310-2 360 MHz (No. **5.393**) 2 535-2 655 MHz (Nos. **5.417A** and **5.418**) ~~12.5-12.75 GHz (Region 3)~~ 17.~~3~~7-17.8 GHz (Region 2) [21.4-22 GHz (Regions 1 and 3) TBD under AI 1.13] 74-76 GHz	Bandwidths overlap: The detailed conditions for the application of No. **9.11** in the bands 2 630-2 655 MHz and 2 605-2 630 MHz are provided in Resolution **539 (Rev.WRC-03)** for non-GSO BSS (sound) systems pursuant to Nos. **5.417A** and **5.418**, and in Nos. **5.417A** and **5.418** for GSO BSS (sound) networks pursuant to those provisions. ~~Resolution **549 (WRC-07)** applies in the band 620-790 MHz~~	Check by using the assigned frequencies and bandwidths	

TABLE 5-1 (*end*) (WRC-07)

Reference of Article 9	**Case**	**Frequency bands (and Region) of the service for which coordination is sought**	**Threshold/condition**	**Calculation method**	**Remarks**
No. **9.19** Terrestrial, GSO, non-GSO/ GSO, non-GSO	Any transmitting station of a terrestrial service or a transmitting earth station in the FSS (Earth-to-space) in a frequency band shared on an equal primary basis with the BSS, with respect to typical earth stations included in the service area of a space station in the BSS	~~Bands listed in No. **9.11**, the band~~ 620-790 MHz (see Resolution **549 (WRC-07)**) 1 452-1 492 MHz 2 310-2 360 MHz (terrestrial services in all three Regions in respect of BSS allocation in No. **5.393**) 2 520-2 670 MHz (see No. **5.416**) ~~and the band~~ 11.7-12.7 GHz (see Article 6 of Appendix **30**) 12.5-12.7 GHz (terrestrial services in Nos. **5.494** and **5.496** as well as in Regions 2 and 3, or transmitting earth station in the FSS (Earth-to-space) in Region 1, in respect of BSS allocation in Region 3) 12.7-12.75 GHz (terrestrial services in Nos. **5.494** and **5.496** as well as in Regions 2 and 3, or transmitting earth station in the FSS (Earth-to-space) in Regions 1 and 2, in respect of BSS allocation in Region 3) 17.7-17.8 GHz (terrestrial services in all three Regions in respect of BSS allocation in Region 2) 17.3-17.8 GHz (transmitting earth stations in the FSS (Earth-to-space) in respect of BSS allocation in Region 2) (see Article 4 of Appendix **30A**) [21.4-22 GHz (Regions 1 and 3) TBD under AI 1.13] 40.5-42.5 GHz 74-76 GHz	i) Necessary bandwidths overlap; and ii) the power flux-density (pfd) of the interfering station at the edge of the BSS service area exceeds the permissible level	Check by using the assigned frequencies and bandwidths	See also Article 6 of Appendix **30**

5/7/2E Issue 2E: Modification to advance publication of information (API) of a satellite network or system not subject to coordination procedure under Section II of Article 9

5/7/2E.1 Executive summary for Issue 2E

The Bureau has been receiving cases of modifications to satellite network filings not subject to coordination, which were likely to modify the interference environment. In these cases, as those modifications did not trigger a new application of the API procedure, administrations which believe that unacceptable interference may be caused to their existing or planned satellite networks or systems by these modifications did not have timely opportunity to comment and resolve potential difficulties as foreseen under RR Nos. **9.3** and **9.4** before the recording of the assignments in the Master International Frequency Register **(**MIFR).

Two methods are proposed to address this situation:

– Method A: Addition of a footnote to No. **11.28** and no change to No. **9.2** of the Radio Regulations.

– Method B: Need for new API in case of changes to certain elements of a satellite network.

5/7/2E.2 Background

As indicated in No. **9.2** of the Radio Regulations (RR), amendments to information in accordance with RR No. **9.1** shall be sent to the Radiocommunication Bureau (the Bureau) as soon as they become available. RR No. **9.2** also indicates that only amendments, which involve addition of frequency bands or modification of the orbital location for a GSO network beyond ±6 degrees of the original location, require the application of the advance publication procedure. In the case of Advance Publication Information (API) for a network not subject to coordination, RR Nos. **9.3** and **9.4** provide a mechanism for resolving potential difficulties between administrations.

As noted in the Director's Report to WRC-07, the Bureau has been receiving cases of modifications to satellite network filings not subject to coordination at the API stage or with the first notice for recording the assignments, as, e.g. increase of power density values, change of service area, addition of beams, etc., which were likely to modify the interference environment. In these cases, modifications to API were published and modified information was taken into account for the notification examination. However, as those modifications did not trigger a new application of the advance publication procedure, administrations which believe that unacceptable interference may be caused to their existing or planned satellite networks or systems by these modifications did not have timely opportunity to comment and resolve potential difficulties as foreseen under RR Nos. **9.3** and **9.4** before the recording of the assignments in the Master International Frequency Register **(**MIFR).

5/7/2E.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Because of the limited time to comment (theoretically 4 months but in practice 2 weeks because of the pace of IFIC publication) and the number of satellite networks to consider, comments under RR No. **9.3** are generally sent to other administrations based on the consideration of relatively few parameters: reference body, frequency bands, direction of transmission, associated service area and whether the space station emits only in visibility of the associated earth stations or not, which is sometimes provided by the notifying administration as a note to the advance publication. In its absence, a comment is issued based on the first four parameters only.

Among the five above-mentioned parameters, only a change in the frequency bands (more precisely a change outside of the initially filed band) currently triggers the need for a new advance publication and therefore offers the possibility for administrations to comment under RR No. **9.3**. A change of the reference body, in the direction of transmission or an increase of the associated service area currently does not trigger any new advance publication. When considering the initial API, administrations are therefore not in a position to definitely decide whether a comment should be issued or not in cases where these three parameters are crucial to determine the answer (i.e. there is a frequency overlap but the reference body is not the same, the direction of transmission is different or both service areas are distant enough).

It should be emphasized that, while a number of data elements are provided, only a few of them are actually used to determine whether a comment under RR No. **9.3** has to be sent or not. It does not mean that the other elements are useless (they are in fact used after the 4 month period to perform more in-depth interference analyses) but that changing these other elements does not in practice affect the decision of an administration to send a comment under RR No. **9.3**.

5/7/2E.4 Analysis of the results of studies

The drawbacks of the current situation were explained in the Director's Report to WRC-07, i.e. the impossibility for an administration to comment on changes to satellite networks that may affect its space services.

However, any solution to this regulatory situation - where almost all the parameters of a non-geostationary satellite network or system can be changed, provided it is not subject to coordination under Section II of RR Article **9** - must also take into account that the absence of coordination was decided on purpose. Indeed, this type of satellite systems (often including only one space station) does not require a complex coordination process to prevent interference to occur. Their use can almost be made compatible by considering their orbital parameters (especially the inclination angle) or their time passages (provided they do not transmit continuously but only in visibility of their associated earth stations). Therefore, it may seem extreme to require that any modification that could increase the interference potential or the protection requirements triggers the need for a new advance publication. In this case, there would be essentially no difference with a formal coordination under Section II of RR Article **9**.

Alternatives could be considered:

– either giving the opportunity to administrations to comment and subsequently discuss at the notification stage, while not delaying the processing of the notification of the changes; or

– identifying a set of a few additional elements (i.e. reference body, direction of transmission, service area, "continuous transmission" indicator), for which a change that would result in an increase of the interference potential would also trigger the need for a new advance publication, could be established. This set is suggested on the basis of an analysis of the data items that are practically used to comment under RR No. **9.3**.

It was noted that the second alternative would trigger the publication of a new advance publication and therefore another cost recovery invoice for the same satellite network (currently 570 CHF). The second alternative also involves an 8-to-10-month delay in the notification of modified characteristics (two to four months to be published plus six months after the publication).

5/7/2E.5 Methods to satisfy Issue 2E

5/7/2E.5.1 Method A: Addition of a footnote to No. 11.28 and no change to No. 9.2 of the Radio Regulations

Under this method, there is no need to modify the relevant provisions due to the fact that administrations have all opportunity to comment on the above-mentioned changes to the modified characteristics after the assignments are notified to the Bureau under RR Article **11**. The first instance that such opportunity is provided is at the time of receipt of notification data when the Bureau publishes the notified assignments under RR No. **11.28** in its BR IFIC. Moreover, due to the fact that such a comment does not have any regulatory implication/action to be implemented by the Bureau (the only examination carried out by the Bureau is that of conformity of the notified assignments with RR No. **11.31**). Consequently administrations believing that they might likely to be affected by the proposed modifications mentioned above may in fact make their comments at other opportunities.

However, in order to make the situation clear and allow the Membership to have the opportunity to comment on the modification of notified assignments for which Section **II** of RR Article **9** does not apply, a footnote may be introduced in No. **11.28** of Article **11** of the Radio Regulations.

However, it was noted that deferring the submission of its notice of frequency assignments under RR Article **11** to the Bureau for six months from the date of the publication of the BR IFIC containing this request under RR No. **9.2B** is impractical due to the following reasons:

1) Until the assignments are not notified to the Bureau, administrations would not be aware of any changes.

2) Once the assignments are notified the term "*defer the submission of its notice of frequency assignments under Article 11 to the Bureau for six months"* is meaningless due to the fact they are already submitted.

3) If the approach mentioned above is to "*defer their processing of notice of frequency assignments under Article 11 to the Bureau for six months"* that also does not help the other administrations at all. On the contrary it would delay the publication of the assignments under RR No. **11.28** and thus prevent other administrations' comments.

Advantages

– The new footnote allows any administration believing that its satellite networks or systems may be affected by the proposed notified changes can contact the notifying administration to discuss and resolve the potential difficulties.

– Changes can be made without paying additional API fees.

Disadvantages

– Administrations have less timely opportunity to comment and resolve potential difficulties in case of changes to an existing filing.

5/7/2E.5.2 Method B: Need for new API in case of changes to certain elements of a satellite network

In this method, a new advance publication would be required if:

– the reference body of the space station is changed;

– the direction of transmission is changed;

– the service area is increased;

– should WRC-12 decide to include new data elements as discussed under section 5/7/8, the “continuous transmission” indicator is changed from “No” to “Yes”.

Advantages

– Administrations have the possibility to comment under RR No. **9.3** if changes to a satellite network are likely to affect their space services.

Disadvantages

– Risk of indirectly promoting more generic submissions.

– Delay in the notification of the modified characteristics.

5/7/2E.6 Regulatory and procedural considerations for Issue 2E

It is worth to mention that under all above mentioned methods, the requirement for a new advance publication in case of a new frequency band would remain unchanged.

5/7/2E.6.1 Method A

To implement Method A, the following regulatory change is provided.

NOC

9.2

ADD

11.28.1 Administrations may provide comments, if any, on the proposed modification to the characteristics of the satellite networks or system not subject to coordination procedure under Section II of RR Article **9** published by the Bureau under RR No. **11.28**.

5/7/2E.6.2 Method B

A possible regulatory implementation of Method B is given below:

It should be noted that geostationary satellite networks are always subject to coordination (at least under RR No. **9.7**). However the case of an inter-satellite link between a geostationary space station and a non-geostationary space station when the latter is not subject to coordination is currently an exception via a Rule of Procedure. This may have cross-implications with this topic addressed in this section.

MOD

9.2 Amendments to the information sent in accordance with the provisions of No. **9.1** shall also be sent to the Bureau as soon as they become available. The use of an additional frequency band or modification of the orbital location by more than ±6° for a space station using the geostationary-satellite orbit will require the application of the advance publication procedure for this band or orbital location, as appropriate. Furthermore, where coordination is not required by Section II of Article **9**, the modification of the reference body, the modification of the direction of transmission, the modification resulting in the continuous transmission of the space station or the increase of the service area for a space station using a non-geostationary-satellite orbit will require the application of the advance publication procedure. (WRC-~~03~~12)

NOTE – The consideration related to “the modification resulting in the continuous transmission of the space station” is linked with the outcome of the proposal described in section 5/7/8.

However it was mentioned that based on the current Regulations which was adopted at WARC-ORB-88, the only item modified in advance publication requiring to publish a new API is the addition of a frequency band not covered by the initial API. Consequently, the above proposed method would be a departure from the principle agreed and in force from 1988.

5/7/3 Issues related to provisional recording of frequency assignments

5/7/3A Issue 3A: Application of RR Nos. 11.41 and 11.42 in respect of satellite networks (Provisional/definitive recording of frequency assignments)

NOTE – The Radiocommunication Bureau has highlighted the fact that RR Appendices **30**, **30A** and **30B** contain similar provisions to those discussed in this issue. In view of that, the Conference may wish to consider aligning those provisions with any changes made to RR Nos. **11.41** and **11.42**.

5/7/3A.1 Executive summary for Issue 3A

There are several provisions of the Radio Regulations (RR), which deal with provisional recording (i.e. RR Nos. **11.39E**, **11.41** and **11.47**), although in different contexts. The matter of provisional recording of frequency assignments that received unfavourable finding under RR No. **11.32A** or **11.33** is dealt with in RR No. **11.41**.

Provision RR No. **11.41** deals with provisional recording in the Master International Frequency Register (MIFR) of frequency assignments related to resubmitted notices for which the notifying administration insisted upon their reconsideration, despite the fact that the concerned frequency assignments received unfavourable findings with respect to the probability of harmful interference in the examinations under RR Nos. **11.32A** or **11.33** and the concerned notices were returned to the notifying administration. This provision specifies that the entry shall be changed from provisional to definitive recording in the Master Register only if the Radiocommunication Bureau is informed that the concerned assignment has been in use, together with the assignment which was the basis for the unfavourable finding, for at least four months without any complaint of harmful interference being made.

In its Report to the 2007 World Radiocommunication Conference (Document 4, Addendum 2, section 3.1.3.3), the Bureau indicated that there are insufficient indications in the Radio Regulations as to what would be the course of action by the Bureau if harmful interference is reported during or after the four-month period of simultaneous operation, by an administration responsible for the assignment that was the basis for the unfavourable finding under RR No. **11.32A** or **11.33,** with respect to a frequency assignment recorded under RR No. **11.41**.

At present, the Bureau has established a practice for how to handle cases of reported harmful interference caused by assignments recorded under RR No. **11.41**. Concerns have been raised that this practice would be inappropriate if it was to be applied in respect of satellite networks recorded under RR No. **11.41**.

To address the issue, seven methods were proposed to satisfy the issue.

5/7/3A.2 Background

The entry into force of RR No. **11.44.1** as from 1 January 2002 compels administrations to submit the first notice for recording of the assignments of a satellite network by the end of the nine or seven-year period, as appropriate. At the same time, the congestion in the geostationary arc, overfiling and the structure of the protection criteria in respect of satellite networks require administrations submitting notices for new satellite networks to seek the agreement of a very large number of administrations. Moreover, under the current Radio Regulations, only administrations with which coordination is required are identified, but the affected networks and assignments of that administration are not identified and more assignments or networks can be included by the affected administration at any time during the coordination process. As a consequence, more and more administrations are submitting notification filings for satellite networks with missing coordination agreements and are then requesting these filings to be recorded in the MIFR under RR No. **11.41**. Such provisional entries, in conjunction with provisional entries under RR No. **11.47** and with suspensions of use (envisaged by RR No. **11.49**), contribute considerably to the complexity of the issue, notably:

– The duration of the provisional entries under RR No. **11.41** may vary considerably, because it depends on the period of simultaneous operation of the concerned provisional entry with another assignment, which may either be recorded in the MIFR (on a definitive or on a provisional basis) or not yet notified, or with respect to a frequency assignment whose use may be suspended for a determined period of time. Therefore, the change of the status of the entry, from provisional to definitive, may take substantive period of time.

– During the period of provisional recording under RR No. **11.41**, the findings of concerned assignment are under permanent scrutiny with a view to possible application of RR No. **11.41A**.

– There are insufficient indications in the Radio Regulations as to what would be the course of action by the Bureau if harmful interference is reported during or after the four-month period of simultaneous operation, by an administration responsible for the assignment that was the basis for the unfavourable finding under RR Nos. **11.32A** or **11.33,** with respect to a frequency assignment recorded under RR No. **11.41**.

For a frequency assignment recording in the MIFR to be changed from provisional to definitive, the notifying administration has to “inform” the Bureau that the new incoming assignment has been in use, together with the existing assignment, which was the basis for the unfavourable finding, for at least four months without any complaint of harmful interference. Based on the information provided by the notifying administration, the Bureau changes the provisional entry to “definitive recording”, unless the Bureau is advised to the contrary by the other administration. Nevertheless, the Bureau preserves the indication of “**11.41**” in 13B1 remark column in the MIFR against the incoming assignment recorded under RR No. **11.41**, so as to indicate that the recording is under that provision and hence RR No. **11.42** is applicable any time in the future, as long as the existing assignment, which was the basis for the unfavourable finding, remains in the Master Register.

According to RR No. **11.42**, which stipulates that the administration responsible for the assignment recorded under RR No. **11.41** has an obligation to eliminate all future harmful interference to any recorded assignment which was the basis of unfavourable finding, it follows that the status of an incoming assignment recorded under RR No. **11.41**, even when recorded as “definitive”, remains always lower than the status of the existing assignment which was the basis for the unfavourable findings under RR No. **11.32A**.

5/7/3A.3 Summary of technical and operational studies and relevant ITU-R Recommendations

In its Report to the 2007 World Radiocommunication Conference (Document 4, Addendum 2, section 3.1.3.3), the Radiocommunication Bureau (BR) considered the case of recording provisional assignments under No. **11.41**. The BR indicated that there were insufficient “indications as what would be the course of action, by the Bureau, if harmful interference is reported, during the four-month period of simultaneous operation”.

At this stage, the Bureau follows the following approach.

When a complaint of harmful interference is received from the notifying administration of an "existing" assignment, the Bureau investigates the validity of the claim after establishing the formal dates of bringing into use of "existing" and "incoming" assignments, including confirmation that both involved assignments are operating within the envelope of their recorded characteristics and proceeds as follows:

A) Complaint of harmful interference is received by the Bureau after the period of four months indicated in RR No. **11.41**

a1) The Bureau requests the administration responsible for the "incoming" assignment (i.e. the one recorded under RR No. **11.41**) to eliminate the harmful interference immediately under RR No. **11.42**. The matter is thereafter dealt with in accordance with the procedures set forth in Article **15** of the Radio Regulations. These procedures also enable any administration to seek the assistance of the Bureau which may in turn also involve Radio Regulations Board (the Board or in short the RRB) to resolve the issue.

It should be noted that before the above course of action, the provisional entry has been changed to "definitive recording", and the indication of "**11.41**" has been preserved in 13B1 remark column in the MIFR against the incoming assignment.

B) Complaint of harmful interference is received during the period of four months indicated in RR No. **11.41**

b1) The Bureau requests the administration responsible for the "incoming" assignment (i.e. the one recorded under RR No. **11.41**) to eliminate the harmful interference immediately under RR No. **11.42**.

b2) If the administration responsible for the "existing" assignment informs the Bureau that the case was resolved, the Bureau changes the provisional entry to "definitive recording", and preserves the indication of "**11.41**" in 13B1 remark column in the MIFR against the incoming assignment recorded under RR No. **11.41**.

b3) If the administration responsible for the "existing" assignment informs the Bureau that the harmful interference persists, the Bureau requests again the administration responsible for the "incoming" assignment to immediately eliminate the reported harmful interference and to modify accordingly the characteristics of the recorded assignment.

b4) If the interference is not eliminated by the end of the four-month period envisaged for simultaneous operation, the Bureau cancels the "incoming" assignment (i.e. the one recorded under RR No. **11.41**) and informs the concerned administration accordingly.

5/7/3A.5 Methods to satisfy Issue 3A

5/7/3A.5.1 Method A

A) Complaint of harmful interference is received by the Bureau after the period of four months indicated in RR No. **11.41**

This method does not endorse the current practice of the Bureau if applied to satellite networks. In fact, here the legislator carefully considered the matter and required that the reported interference be immediately eliminated. Failure to the immediate elimination of the interference (after exchange of messages between the Bureau and the responsible administration for the interference), the Bureau shall proceed with the cancellation of the interfering assignment. However, it is proposed that a decision of the Bureau to cancel the subject entry in the MIFR in the event of persistence of the harmful interference shall be confirmed by the RRB before being implemented.

B) Complaint of harmful interference is received during the period of four months indicated in RR No. **11.41**

The current course of action outlined by the Bureau is endorsed with the following modification in step b4) as follows:

b4) If the interference is not eliminated by the end of the four-month period envisaged for simultaneous operation, the Bureau cancels the "incoming" assignment (i.e. the one recorded under RR No. **11.41**) and informs the concerned administration and the RRB accordingly.

Actions on the frequency assignment recorded on provisional basis in the MIFR in application of RR No. **11.41** pursuant to receiving the report of harmful interference during the four-month period referred to in that provision should be taken by the Bureau in informing the RRB and the administration concerned.

5/7/3A.5.2 Method B

The current BR practice, if applied to satellite networks, would give excessive power to the administration claiming interference, since there is no requirement to present any kind of evidence that harmful interference is actually occurring or that it is originating from the claimed assignment. Moreover, even if harmful interference actually exists, definitively establishing the source of interference may take considerable time and this would bring additional problems to the implementation of the BR proposal, especially if the complaint of harmful interference occurs towards the end of the four-month period.

The situation for satellite networks is substantially different from that of terrestrial networks amongst others in terms of coordination complexity, time horizon for networks, consequences of loss of a filing and possibilities to verify claims of interference. Consequently, under this method, the current BR practice in respect of terrestrial networks is not seen as appropriate in respect of satellite networks. Rather a procedure as outlined below would be seen as an appropriate approach to address cases of claimed persistent interference between satellite networks:

1) for satellite networks, harmful interference reported both within and after the four-month period of parallel operation specified in RR No. **11.41**, should not lead to an automatic cancellation of the assignments for the satellite network;

2) according to RR No. **11.42**, the status of an "assignment recorded under No. **11.41**, even when recorded as "definitive", remains always lower than the status of the existing assignment which was the basis for the unfavourable findings under RR No. **11.32A**" and therefore there is no reason for the cases of interference within or outside the four-month period to be treated differently;

3) requiring technical evidence from the complaining administration that substantiates the claim that interference to one of its networks is definitively being caused by frequency assignments of the incoming network and that the interference is harmful or requiring the Bureau to confirm the complaint of harmful interference before any action under RR No. **11.42** is taken;

4) initiate direct contact between the complaining administration and the administration claimed to be responsible for the interference to resolve the issue and the possible involvement of the Bureau or the Board if the bilateral discussions are unable to resolve the issue;

5) amendments to the Radio Regulations to specify the appropriate actions with respect to harmful interference reported to be caused by satellite networks recorded under RR

No. **11.41** should not necessitate any change of the practice in respect of terrestrial networks.

5/7/3A.5.3 Method C

Method C is similar to Method B in that: i) interference complaints received within or outside the four-month period referred to in No. **11.41** of the Radio Regulations should be treated similarly; ii) there should be no automatic cancellation of frequency assignments; iii) technical evidence of the interference should be provided by the complaining administration. Method C differs from Method B in the actions that are prescribed for the Bureau in the case where harmful interference is not resolved.

5/7/3A.5.4 Method D

Under this method, the Bureau's actions on the frequency assignment of a satellite network recorded on provisional basis in the MIFR in application of RR No. **11.41** pursuant to receiving the report of harmful interference after actions taken on RR No. **11.41**, are to consult with the responsible administration and if, after one month of consultation, the harmful interference persists the Bureau cancels the assignment. This decision to cancel is subsequently confirmed by the RRB.

5/7/3A.5.5 Method E

Under this method, the Bureau's actions on the frequency assignment of a satellite network recorded in the MIFR in application of RR No. **11.41** pursuant to receiving the report of harmful interference should be treated on a case-by-case basis, and based on a decision made by the RRB as appropriate. In addition, the application of RR Article **15** and the consultation between the Bureau and the responsible administration on the subject of elimination of harmful interference would be necessary.

5/7/3A.5.6 Method F

It should be understood that it is the obligation of the responsible administration who communicates a new coming satellite network to eliminate the harmful interference to other already recorded assignments which were the basis of the unfavourable finding of the responsible administration's satellite network assignments recorded under RR No. **11.41**. At the same time, however, the Method F noted that a complex situation may be involved and more time exceeding the four-months period may be needed for the resolution of the interference issue. This method further noted that the removal of assignments of a satellite network recorded under RR No. **11.41** from the MIFR will cause much serious impact to the satellite operator and its administration.

5/7/3A.5.7 Method G: No change to RR 11.41 and RR 11.42

The above provisions have functioned and been implemented so far without any difficulty. Therefore it seems there is no reason to modify them due to the complexity of these provisions and any possible unintended consequences that may occur, should these provisions be modified.

5/7/3A.6 Regulatory and procedural considerations for Issue 3A

5/7/3A.6.1 Method A

To implement Method A, the following provisions are added to Article **11** of the Radio Regulations:

ADD

11.42bis In application of No. **11.42** of the Radio Regulations in respect of satellite networks, should, beyond the four-month period indicated in No. **11.41**, a report/complaint of harmful interference be received by the Bureau indicating that the assignments which were recorded under No. **11.41** caused harmful interference to the assignment which was the basis of the recording under that provisions and if, after necessary actions taken by the Bureau, the reported harmful interference persists, the Bureau shall proceed with the cancellation of the interfering assignment. A decision of the Bureau to cancel the subject entry in the Master Register in the event of persistence of the harmful interference shall be confirmed by the Board before being implemented.

ADD

11.41*bis* Should, within the four-month period indicated in No. **11.41**, a report/complaint of harmful interference be received by the Bureau in respect of a satellite network, indicating that the assignments which were recorded under No. **11.41** above caused harmful interference to the assignment which was the basis of the recording under No. **11.41** and if, after necessary actions taken by the Bureau, the reported harmful interference persists, the Bureau shall proceed with the cancellation of the interfering assignment and inform the concerned administration and the Board accordingly.

Editorial Note: The texts of both **ADD 11.41*bis*** and **ADD 11.42*bis*** could be shortened once the concept is well understood.

5/7/3A.6.2 Method B

This method could be implemented with the following changes to Article **11** of the Radio Regulations:

MOD

11.42 Should harmful interference be caused by an assignment recorded under No. **11.41** to any recorded assignment which was the basis of the unfavourable finding, the station using the frequency assignment recorded under No. **11.41** shall, upon receipt of ~~advice thereof~~report of harmful interference, immediately eliminate this harmful interference. During the application of the above provisions in respect of satellite networks, administrations involved shall cooperate in elimination of harmful interference, using the course of action prescribed in Appendix **10** of the Radio Regulations.

ADD

11.42*bis* The administrations involved, for the cases of harmful interference reported in respect of satellite networks as mentioned above, if requesting the assistance of the Bureau, shall provide the Bureau with the technical and operational details as prescribed in Appendix **10** of the Radio Regulations together with the copy of the correspondence exchanged between the administrations involved, in order to enable the Bureau to take necessary follow up action.

ADD

11.42*ter* If, following the actions taken under No. **11.42** and **11.42*bis***, the harmful interference is not resolved, the Bureau shall prepare a report for consideration by the Board and any required action as appropriate.

ADD

11.42*quater* When applying Nos.**11.42** to **11.42*ter*** in respect of satellite networks, the provisional status of the assignments to the satellite network recorded under No. **11.41** shall be maintained pending the resolution of the matter**.**

5/7/3A.6.3 Method C

This method could be implemented with the following modifications to No. **11.42** of Article **11** of the Radio Regulations and the introduction of a new provision No. **11.42*bis***:

NOC

11.41

MOD

11.42 Should harmful interference be caused by an assignment recorded under No. **11.41** to any recorded assignment which was the basis of the unfavourable finding, the station using the frequency assignment recorded under No. **11.41** shall, upon receipt of a detailed report of harmful interference using to the maximum extent possible the format prescribed in Appendix **10** of the Radio Regulations,~~advice~~ ~~thereof~~ immediately eliminate this harmful interference. Administrations involved shall cooperate in the resolution of the harmful interference and may request assistance from the Bureau, as necessary.

ADD

11.42*bis* In respect of satellite networks, if the Bureau is informed that the harmful interference reported under No. **11.41** is resolved and the two assignments have been in use for at least four months without any complaint of harmful interference, the Bureau shall change the provisional entry recorded under No. **11.41** to definitive. If, after cooperation between the concerned administrations and the assistance of the Bureau, the harmful interference is not resolved, the Bureau shall cancel the provisional entry recorded under No. **11.41**, subject to confirmation by the Board, and shall inform the administrations concerned. Until the cancellation is confirmed by the Board, the Bureau shall maintain the provisional assignment in the MIFR.

5/7/3A.6.4 Method D

To implement Method D, the following regulatory example is provided:

ADD

11.42*bis* If, in respect of a satellite network, the Bureau is informed that there is still harmful interference after necessary action taken by the Bureau under No. **11.42**, the Bureau shall consult the responsible administration on the subject of elimination of harmful interference. The Bureau, subject to non-elimination of the harmful interference or in the event of non-response after the dispatch of two consecutive reminders, each within a one-month period, shall cancel the interfering assignments in the Master Register. A decision of the Bureau to cancel the interfering assignment shall be confirmed by the Board.

5/7/3A.6.5 Method E

To implement Method E, the following regulatory example is provided:

MOD

11.42 Should harmful interference be caused by an assignment recorded, either provisionally or definitively, under No. **11.41** to any recorded assignment which was the basis of the unfavourable finding, the station using the frequency assignment recorded under No. **11.41** shall, upon receipt of advice thereof under the provisions of Article **15**, immediately eliminate this harmful interference. In respect of a satellite network, during the process and on a case-by-case basis, a decision shall be taken by the Radio Regulations Board and subsequently applied by the Bureau after applying the provisions of Article **15**.

5/7/3A.6.6 Method F

To implement Method F, the following modification is proposed to RR No. **11.42**.

MOD

11.42 Should harmful interference be caused by an assignment recorded under No. **11.41** to any recorded assignment which was the basis of the unfavourable finding, the station using the frequency assignment recorded under No. **11.41** shall, upon receipt of advice thereof, immediately eliminate this harmful interference. In the case of satellite networks, should the harmful interference not be resolved and an agreement could not be reached between the administrations concerned, the Bureau shall, based on the information received from the administrations concerned, prepare a report on resolution of the matter and forward the report including its conclusions and recommendations to these administrations concerned for their prompt action or to the Board for its consideration and required action, as appropriate.

5/7/3A.6.7 Method G

To implement Method G, no modification is proposed to RR Nos. **11.41** and **11.42**.

NOC

11.41

NOC

11.42

5/7/3B Issue 3B: Status of frequency assignments initially recorded under RR No. 11.41 in cases where the required coordinations are completed after the assignments are recorded in the MIFR

5/7/3B.1 Executive summary for Issue 3B

In its Report to the 2007 World Radiocommunication Conference (Document 4, Addendum 2, section 3.1.3.3), the Radiocommunication Bureau (BR) considered issues concerning definitive and provisional recordings of frequency assignments and related articles of the Radio Regulations. An assignment receiving an unfavourable finding for not completing coordination and filing under RR No. **11.41** is considered as “provisional.” If no interference has occurred between the provisional assignment and any assignment which was the basis for the unfavourable finding during the four month period of simultaneous operation, then the provisional recording is changed to “definitive.” An assignment recorded under RR No. **11.41**, even if the status changes from provisional to definitive, is still considered by the BR as having a lower status to the assignment for which the unfavourable finding was based under RR No. **11.32A** (Document 4, Addendum 2, section 3.1.3.3.4). An assignment that is initially recorded under RR No. **11.41** and subsequently completes all of the requirements for coordination and successfully operates simultaneously for the four-month period with the assignment which was the basis for the initial unfavourable finding should then be recorded as definitive and enjoy the same status as the existing assignment. Therefore, an assignment initially recorded under RR No. **11.41** should be treated equally with respect to an existing assignment which was the basis for the unfavourable findings under RR No. **11.32A** if coordination with the latter is completed and should not be seen as “always lower”.

Continuing to consider the provisional assignment as having a lower status could be a disincentive to complete coordination.

5/7/3B.2 Methods to satisfy Issue 3B

5/7/3B.2.1 Method A

A modification to RR No. **11.41A** is proposed in order to ensure that the status of an assignment initially recorded under RR No. **11.41** is to be considered equal to the status of the existing assignment which was the basis for the unfavourable findings under RR No. **11.32A** if coordination is completed with respect to that existing assignment after the assignment has been initially recorded in the MIFR.

5/7/3B.2.2 Method B

A modification to RR No. **11.43C** is proposed in order to ensure that the status of an assignment initially recorded under RR No. **11.41** is to be considered equal to the status of the existing assignment which was the basis for the unfavourable findings under RR No. **11.32A** if coordination is completed with respect to that existing assignment.

5/7/3B.2.3 Method C

No change to the Radio Regulations.

5/7/3B.3 Regulatory and procedural considerations for Issue 3B

To implement the above-mentioned methods, the following regulatory change is provided.

ARTICLE 11

Notification and recording of frequency assignments[1, 2, 3, 4, 5, 6, 7] (WRC-07)

Section II – Examination of notices and recording of frequency assignments in the Master Register

5/7/3B.3.1 Method A

MOD

11.41A Should the assignments that were the basis of the unfavourable finding under Nos. **11.32A** or **11.33** not be brought into use within the period specified in Nos. **11.24**, **11.25** or **11.44**, ~~as appropriate,~~ then the finding of the assignments resubmitted under No. **11.41** shall be reviewed accordingly. <u>Should the coordination procedures specified in No. **11.32** be completed with administration(s) whose assignments were the basis of the recording under No. **11.41**, then any conditions related to the initial recording of assignments under No. **11.41** shall be removed.</u>

5/7/3B.3.2 Method B

MOD

11.43C Where the notifying administration resubmits the notice and the Bureau finds that the coordination procedures specified in No. **11.32** have been successfully completed with all administrations whose space or terrestrial radiocommunication stations may be affected, the assignment shall be recorded definitively in the Master Register. The date of receipt by the Bureau of the original notice shall be entered in the appropriate column of the Master Register. The date of receipt by the Bureau of the resubmitted notice shall be entered in the "Remarks" column for information purposes only and any condition(s) related to the initial recording under No. **11.41** shall be removed.

Reasons: To ensure the status of the resubmitted assignment initially recorded under RR No. **11.41** is treated equally, after its definitive recording, to the status of the existing assignment which was the basis for the unfavourable findings under RR No. **11.32A** if coordination procedures are later completed with respect to that existing assignment.

5/7/4 Issues related to suspension of use of assignments, due diligence, clarification of bringing into use and launch failure/delay

5/7/4A Issue 4A: Suspension period for Regions 1 and 3 List assignments of Appendices 30 and 30A

5/7/4A.1 Executive summary for Issue 4A

Currently there is no formal suspension period within Appendices **30** and **30A** for frequency assignments included in the List while there are formal suspension periods defined for unplanned frequency bands (No. **11.49**) and for the fixed-satellite service (FSS) allotment Plan contained in Appendix **30B** (§ 8.17 of Appendix **30B**). This allows administrations to suspend the use of frequency assignments in a prescribed manner on a temporary basis.

5/7/4A.2 Background

Additional use in Regions 1 and 3 are defined as use of assignments with characteristics different from those appearing in the Regions 1 and 3 Plan and which are capable of causing more interference than the corresponding entries in the Plan; and use of assignments in addition to those appearing in the Plan.

The Regions 1 and 3 Plan assignments differ from the List assignments in the sense that no bringing into use is required and the regulatory life time and validity are indefinite. Any additional use beyond a Plan assignment is subject to the provisions under Article 4.1 of Appendices **30** and **30A** as well as to Resolution 49 and has to be brought into use before the regulatory deadline of eight years.

After completion of the coordination of a Regions 1 and 3 List assignment and recorded in the Master Register the assignment is supposed to be in operation with no interruption in order to avoid cancellation. Recent discussions have raised concerns on what would happen if there would be an in-orbit failure.

Recent discussions within ITU-R highlighted that any proposed suspension rules should take into account modification of the initial Regions 1 and 3 Plan assignment of Appendices **30** and **30A**.

Implementation of suspension rules into Appendices **30** and **30A** could encourage more efficient use of the orbit spectrum resource. It could provide a clearer understanding and interpretation of the usage of a BSS assignment concerning requirement of continuous operations and permanently discontinued use. As there are no provisions for a suspension period for List assignments of Regions 1 and 3, one could interpret that there is an indefinite period where transmissions could be interrupted since it is only if an administration permanently discontinues the use of the assignment the Bureau shall be notified whereupon the entry shall be removed (see No. **5.3.2** of Appendices **30** and **30A**).

It is important to note that the situation for Regions 1 and 3 under Appendices **30** and **30A** is substantively different from that for Region 2. In Region 2, modifications to the Plan ultimately become part of the Plan itself and enjoy the same status as other assignments in the Plan. (See Sections 1.6 and 4.2.19 of Appendix **30**). In contrast, Regions 1 and 3 have a Plan of assignments created by a WRC and a separate List of additional uses. (See Sections 1.4, 1.7 and 1.8 of Appendix **30**) Any modifications of Plan assignments or additional uses become part of the List and do not become a part of the Regions 1 and 3 Plan itself.

5/7/4A.3 Summary of technical and operational studies and relevant ITU-R Recommendations

There are a variety of reasons why an administration may need to suspend an assignment for a period of time, including an in orbit failure or other issues such as the need to provide in-orbit back-up to another satellite because of technical issues on that satellite or to meet customer demand. In case of in-orbit failure the services offered at an orbital position are dramatically affected.

5/7/4A.4 Analysis of the results of studies

In order to restore the services, satellites operators have different options, most of which require an interruption of the transmissions during a certain period of time. Sometimes the operator may be able to relocate a satellite from its existing fleet. However, often it means that the operator has to either use a spare available on the ground, purchase or lease a satellite already in orbit, or in worst case procure and launch a new satellite.

In all cases, this means that there would not be any operations of the frequency assignments of the orbital location in question during a period of time ranging from a few months to a few years. It is therefore important for the notifying administration of the satellite operator to be able to suspend the use of a frequency assignment to a satellite network for a period and still continuing to enjoy the protection acquired by virtue of the coordination agreements already obtained.

5/7/4A.5 Method to satisfy Issue 4A

Under the Method to satisfy the issue, a maximum suspension period of two years is introduced under Article 5.2 of Appendices **30** and **30A** for Region 1 and 3 List assignments.

Adoption of suspension rules under Article 5.2 of Appendices **30** and **30A** for the Regions 1 and 3 List would be in line with current corresponding suspension rules defined for unplanned frequency bands (No. **11.49**) and for the fixed-satellite service (FSS) allotment Plan contained in Appendix **30B** (§ **8.17** of Appendix **30B**) rules that are included under the respective Notification section.

Advantages

– Adoption of an applicable suspension period for the Regions 1 and 3 List assignments of Appendices **30** and **30A** will allow an administration to resume its operations with a replacement satellite in case of in-orbit failure and still continue to enjoy the protection acquired by virtue of the coordination agreements obtained.

– Inclusion of suspension rules into Appendices **30** and **30A** for List assignments of Regions 1 and 3 will encourage more efficient use of the orbit spectrum resource.

– Considering that a single satellite usually carries several frequency bands, consistency would be achieved with the existing suspension periods in the unplanned FSS bands of Articles **9** and **11** and in the Appendix **30B** bands.

Disadvantages

– None identified.

5/7/4A.6 Regulatory and procedural considerations for Issue 4A

A possible modification to section 5.2 of Appendices **30** and **30A** for inclusion of suspension period for assignments in Regions 1 and 3 List is shown below.

APPENDIX 30 (Rev.WRC-07)*

Provisions for all services and associated Plans and List[1] for the broadcasting-satellite service in the frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5 GHz (in Region 1) and 12.2-12.7 GHz (in Region 2) (WRC-03)

(See Articles **9** and **11**) (WRC-03)

ARTICLE 5 (WRC-03)

Notification, examination and recording in the Master International Frequency Register of frequency assignments to space stations in the broadcasting-satellite service[18] (WRC-07)

5.2 Examination and recording

ADD

5.2.10 When an administration wishes to suspend the use of a recorded frequency assignment in the Master Register emanating from the Regions 1 and 3 List, the notifying administration shall inform the Bureau of the date on which such use was suspended within [X month/same period as in RR **11.49***] of the suspension, together with the date on which the assignment is to be brought back into regular use. The latter date shall not exceed two years from the date of suspension.

NOTE – The proposed period for RR **11.49 is six months.*

ADD

5.2.11 When a recorded frequency assignment in the Master Register emanating from the Regions 1 and 3 List suspended under § 5.2.10 is brought back into regular use, the notifying administration shall inform the Bureau as soon as possible but not more than [X month/should be aligned with other time-frame currently used by the BR] after the recommencement of operations.

ADD

5.2.12 The Bureau shall send a reminder to the notifying administration not later than [X month/should be aligned with other time-frame currently used by the BR for its reminder to the administrations] prior to the end of the suspension date under § 5.2.10 unless the recommencement of operations notification has already been received.

ADD

5.2.13 If a recorded frequency assignment stemming from the Regions 1 and 3 List is not brought back into use within two years from the date of suspension, the Bureau shall cancel the assignment from the Master Register and the assignment in the List, unless the assignment is one to which § 4.1.26 or § 4.1.27 is being applied.

APPENDIX 30A (Rev.WRC-07)*

Provisions and associated Plans and List[1] for feeder links for the broadcasting-satellite service (11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz[2] and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2 (WRC-03)

(See Articles **9** and **11**)) (WRC-03)

ARTICLE 5 (Rev.WRC-03)

Coordination, notification, examination and recording in the Master International Frequency Register of frequency assignments to feeder-link transmitting earth stations and receiving space stations in the fixed-satellite service[21, 22] (WRC-07)

5.2 Examination and recording

ADD

5.2.10 When an administration wishes to suspend the use of a recorded frequency assignment in the Master Register emanating from the Regions 1 and 3 feeder-link List, the notifying administration shall inform the Bureau of the date on which such use was suspended within [X month/same period as in RR **11.49***] of the suspension, together with the date on which the assignment is to be brought back into regular use. The latter date shall not exceed two years from the date of suspension.

NOTE* – The proposed period for RR **11.49 is six months.*

ADD

5.2.11 When a recorded frequency assignment in the Master Register emanating from the Regions 1 and 3 feeder-link List suspended under § 5.2.10 is brought back into regular use, the notifying administration shall inform the Bureau as soon as possible but not more than [X month/should be aligned with other time-frame currently used by the BR] after the recommencement of operations.

ADD

5.2.12 The Bureau shall send a reminder to the notifying administration not later than [X month/should be aligned with other time-frame currently used by the BR for its reminder to the administrations] prior to the end of the suspension date under § 5.2.10 unless the recommencement of operations notification has already been received.

ADD

5.2.13 If a recorded frequency assignment stemming from the Regions 1 and 3 feeder-link List is not brought back into use within two years from the date of suspension, the Bureau shall cancel the assignment from the Master Register and the assignment in the List, unless the assignment is one to which § 4.1.26 or § 4.1.27 is being applied.

Considering the above issue it should be noted that Appendices **30** and **30A** are not on the agenda of WRC-12, consequently appropriate mechanism(s), similar to those approaches used by previous WRCs, need to be studied in order to include the above text in Article **5** of Appendices **30** and **30A** once it is agreed by WRC-12.

5/7/4B Issue 4B: Clarification of bringing into use of assignments to satellite networks

5/7/4B.1 Executive summary

References to the bringing into use of a frequency assignment (e.g. No. **13.6** or Item A.2.a of Annex 2 to Appendix **4** of the Radio Regulations) associate it with bringing the frequency assignment into "regular operation". In many respects, there is ambiguity associated with the meaning of "regular operation", and it would be much better to have a clear definition of bringing into use.

Views were expressed that clarifying bringing into use should be considered together with clarifying suspension of assignments and improving the accuracy of due diligence data. Separate consideration and implementation of these issues, though valuable and useful in terms of improving the coordination and notification procedures, would not be as effective as the combined approach, since it would not remove uncertainties and would leave certain issues unclear.

5/7/4B.2 Background

Recent discussions within ITU-R have highlighted that there are a number of assignments recorded in the Master Register and declared in use which appear not to be in regular operation. This problem is often referred to as "virtual satellites." This has been highlighted in various fora. By issuing Circular Letter CR/301, the Bureau has been conducting a clean-up of the MIFR under RR No. **13.6**.

The lack of a clear definition in the Radio Regulations and the Rules of Procedure as to what constitutes regular use of assignments pertaining to a satellite network results in the application of different requirements by various administrations, and this may be a factor in the current situation. There was general agreement to resolve this problem in an appropriate manner, taking into account that previous World Radiocommunication Conferences, in spite of various attempts, did not clarify the meaning of "regular use". WRC-2000 expanded the RR Appendix **4** data element description for bringing into use. Currently, the membership relies upon the goodwill and diligence of administrations in the application of the Radio Regulations in this regard.

Views were expressed that the bringing into use issue should be linked with the following two other issues:

1) to ensure that once a minimum period of operation has passed, any subsequent period of non-operation is subject to appropriate provisions, which could be either suspension or cancellation of the assignment;

2) to ensure that the due diligence data associated with a satellite network is accurate and is maintained.

Under this view it is considered important that the linkage and relationship between the ideas be emphasized and maintained, so that the proposed improvements are considered as a package to be implemented together.

Under another view, it was considered that establishing a minimum period of operation does not resolve the issue of clarifying "regular operation".

5/7/4B.3 Methods to satisfy Issue 4B

Method A

It is proposed to introduce a new provision to the Radio Regulations stating explicitly that a frequency assignment to a GSO satellite network will be considered as having been brought into use, or as having been brought back into use, if a GSO space station with the capability of transmitting or receiving, as applicable, this frequency assignment has been deployed at the associated orbital location.

Advantages

– Clarification that is consistent with current ITU regulations.

– Improves the current procedure for access to spectrum/orbit resources by removing the existing ambiguity in the current regulatory text.

– The method presents a clear and explicit definition of bringing into use that will not cause unintended consequences.

Disadvantages

– No minimum period of deployment is required.

– No actual operation of the satellite beyond TT&C is required.

Method B

It is proposed to introduce a new Resolution that would apply to frequency assignments to geostationary-satellite networks in the bands 3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz, 10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz, 17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75]*-25.25 GHz and 27.5-30 GHz and that would define what constitutes a bringing into use or a resumption of regular operation in case of a suspension, notably by defining a minimum period of operation.

It is also proposed that this method be applied in conjunction with Method B of Issue 4C and Method B of Issue 4D.

**Editorial note: The inclusion of 24.65 GHz or 24.75 GHz depends on the outcome of WRC-12 Agenda item 1.13.*

Advantages

– Provides a detailed definition of what constitutes bringing into use and resumption of operations after suspension.

– Harmonizes practices of individual Member States with regard to bringing into use and resumption of operations after suspension.

– Improves the current procedure for access to the spectrum/orbit resources.

Disadvantages

– Would result in different treatment with respect to bands not in the method leading to consequences and implementation that are unclear, particularly with respect to spacecraft that include frequency bands that are both within and outside the scope of the Resolution.

– Not referenced in Article 11, Appendices **30**, **30A** and **30B**.

– Will increase the number of appeals from administrations due to the rigidity of the requirement.

NOTE – The above lists of advantages and disadvantages are based on the descriptions of the methods in this section and do not address the example regulatory text provided in section 5/7/4B.4.

5/7/4B.4 Regulatory and procedural considerations for Issue 4B

5/7/4B.4.1 Method A

A possible implementation of Method A is provided below:

ADD

11.44J A frequency assignment to a GSO space station will be considered as having been brought into use (Nos. **11.44** and **11.47**), or as having been brought back into use (No. **11.49**), if a GSO space station, with the capability of transmitting or receiving that frequency assignment, is deployed at the notified orbital location. The deployment may be made by the notifying administration, or on behalf of the notifying administration; however, the notifying administration shall have the responsibility to inform the Bureau that the frequency assignment has been brought into use.

Appendix 4, Item A.2.a

MOD

A.2.a	the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use The date of bringing into use denotes the date at which a GSO space station, with the capability of transmitting or receiving that frequency assignment, is deployed at the notified orbital location. The deployment may be made by the notifying administration, or on behalf of the notifying administration. ~~the frequency assignment is brought into regular operation~~* ~~to provide the published radiocommunication service with the technical parameters within the technical characteristics notified to the Bureau~~ Whenever the assignment is changed in any of its basic characteristics (except in the case of a change under A.1.a, the date to be given shall be that of the latest change (actual or foreseen, as appropriate) * ~~Pending further studies by ITU-R on the applicability of the term "regular operation" to non-geostationary satellite networks, the condition of regular operation shall be limited to geostationary satellite networks~~This condition is only applicable to GSO networks. Conditions applicable to non-GSO systems require further study.

5/7/4B.4.2 Method B

A possible implementation of Method B is provided below:

Implement the changes proposed in sections 5/7/4C.4.2 and 5/7/4D.4.2 together with the addition of the following Resolution:

ADD

DRAFT RESOLUTION [A7_BIU] (WRC-12)

Bringing into use of frequency assignments to geostationary-satellite networks in certain radiocommunication services and frequency bands

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;

b) that a more precise definition of what constitutes a regular bringing into use has the potential to improve the accuracy of the Master Register;

c) that such precisions are expected to produce more gains in frequency bands currently used by most of satellite operators to provide telecommunication and broadcasting applications;

d) that experience may need to be gained in the application of a more precise definition of the concept of bringing into use,

noting

that the expression "notifying administration" may also refer to an administration acting on behalf of a group of named administrations,

resolves

1 that this Resolution applies to frequency assignments to geostationary-satellite networks in the fixed-satellite, broadcasting-satellite and mobile-satellite services in the following bands:

3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz,

10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz,

17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75]*-25.25 GHz, 27.5-30 GHz;

**Editorial note: The inclusion of 24.65 GHz or 24.75 GHz depends on the outcome of WRC-12 Agenda item 1.13.*

2 that such frequency assignments are considered brought into use or their use is considered to be resumed when:

i) a duly authorized space station that is technically capable of operating the assignments in accordance with their notified characteristics has been operating in, and continuously located at, the notified orbital location of the satellite network for a period of at least [thirty-ninety] days; and

ii) either the commencement of operation in cases of the first bringing into use occurs before the end of the regulatory period referred to:

- for frequency assignments not subject to a Plan, in Nos. **11.44** and **11.44.1**; or
- for frequency assignments subject to the provisions of Appendices **30** and **30A**, in §§ 4.1.3, 4.1.3*bis*, 4.2.6 and 4.2.6*bis* of Article 4 of these Appendices; or

– for frequency assignments subject to the provisions of Appendix **30B**, in § 6.1 of Article 6 of this Appendix;

iii) or the resumption of use following a suspension occurs before the end of the regulatory period referred to:

– for frequency assignments not subject to a Plan, in No. **11.49**; or

– for frequency assignments subject to the provisions of Appendix **30B**, in § 8.17 of Article 8 of this Appendix;

*Editorial note: Should explicit provisions for suspension be included in RR Appendices **30** and **30A**, there would be a need to update resolves 2iii) accordingly.*

Editorial note: The possibility of an extension of the "minimum period" beyond the 7-year deadline is linked with the length of this period.

Editorial note: The case of bringing into use and suspension within the 7-year period in the case where the end of the suspension period occurs before the end of the 7-year period should be considered.

3 that, in cases where the period of operation as defined in *resolves* 2i) ends before the end of the regulatory periods as described in *resolves* 2ii) and iii), the notifying administration shall inform the Bureau of the bringing into use, or resumption of use, of such frequency assignments only after the completion of the period of operation, by providing the date of commencement, or resumption, of use and the period of operation within thirty days after the end of the period of operation defined in *resolves* 2i);

4 that, in cases where the period of operation as defined in *resolves* 2i) ends after the end of the regulatory periods as described in *resolves* 2ii) and iii), the notifying administration shall inform the Bureau of the date of commencement, or resumption, of use within thirty days after such date. It shall subsequently confirm the bringing into use, or resumption of use, by providing to the Bureau the period of operation of the frequency assignments, within thirty days after the end of the period of operation defined in *resolves* 2i);

5 a space station meeting the requirements set forth in *resolves* 2i) with the exception of the length of the period of operation because of a failure of the space station during the [30-90]-day period shall also be deemed to have brought into use the relevant frequency assignments. In this case, the associated frequency assignments shall be suspended as from the date of failure,

instructs the Radiocommunication Bureau

1 in cases referred to in *resolves* 3:

i) to promptly examine the completeness of information provided by the notifying administration. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information;

ii) in cases where the complete information is not received before the end of the periods as described in *resolves* 2ii),

a) to act according to No. **11.44** for frequency assignments not subject to a Plan, as if the frequency assignments were not brought into use; or

b) to act according to §§ 4.1.3, 4.1.3*bis*, 4.2.6 and 4.2.6*bis* of Article 4 and to §§ 5.1.3 of Article 5 of Appendices **30** and **30A** for frequency assignments subject to the provisions of these Appendices, as if the frequency assignments were not brought into use; or *c)* to act according to § 6.33 of Article 6 and § 8.16 of Article 8 of Appendix **30B** for frequency assignments subject to the provisions of this Appendix, as if the frequency assignments were not brought into use;

iii) in cases where the complete information is not received before the end of the periods as described in *resolves* 2iii),

a) to act according to No. **11.49** for frequency assignments not subject to a Plan, as if use of the frequency assignments was not resumed; or

b) to act according to § 6.33 of Article 6 and § 8.17 of Article 8 of Appendix **30B** for frequency assignments subject to the provisions of this Appendix, as if use of the frequency assignments was not resumed;

2 in cases referred to in *resolves* 4,

i) to promptly publish the date of commencement or resumption of use in a special section of the BR IFIC;

ii) to promptly publish the period of operation in a special section of the BR IFIC;

iii) in cases where the complete information is not received before the end of the periods referred to in *resolves* 4,

a) to act according to No. **11.44** or No. **11.49** for frequency assignments not subject to a Plan, as if the frequency assignments were not brought into use or their use was not resumed; or

b) to act according to §§ 4.1.3, 4.1.3*bis*, 4.2.6 and 4.2.6*bis* of Article 4 and to §§ 5.1.3 of Article 5 of Appendices **30** and **30A** for frequency assignments subject to the provisions of these Appendices, as if the frequency assignments were not brought into use; or

c) to act according to § 6.33 of Article 6 and § 8.16 or § 8.17 of Article 8 of Appendix **30B** for frequency assignments subject to the provisions of this Appendix, as if the frequency assignments were not brought into use or their use was not resumed,

Editorial note: The case of bringing into use and suspension within the 7-year period in the case where the end of the suspension period occurs before the end of the 7-year period should be considered.

instructs the Director of the Radiocommunication Bureau

1 to maintain a webpage on which data pertaining to the bringing into use of frequency assignments associated with specific satellite networks are displayed;

2 to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

5/7/4C Issue 4C: Clarification of the application of RR No. 11.49

5/7/4C.1 Executive summary for Issue 4C

There is a lack of clarity on the application of the 24-month suspension period allowed in RR No. **11.49** which has led to many assignments not being in operation for periods in excess of the intended 24-month period.

The point at which an assignment should be declared suspended should be clarified.

Views were expressed that clarifying suspension should be considered together with clarifying bringing into use of assignments and improving the accuracy of due diligence data. Separate consideration and implementation of these issues, though valuable and useful in terms of improving the coordination and notification procedures, would not be as effective as the combined approach, since it would not remove uncertainties and would leave certain issues unclear.

5/7/4C.2 Background

Whilst the actions to be taken at the end of the period of suspension are detailed in the Rule of Procedure on RR No. **11.49**, the point at which an assignment should be declared suspended is not clear. There are a number of scenarios in which operation of an assignment can be ceased or interrupted, including relocation of the satellite and the occurrence of an anomaly. The suspension provision in RR No. **11.49** has hitherto not been widely used, although recently, there has been an increase in the number of assignments declared as suspended. Some assignments have not been in operation for some time prior to being suspended, resulting in these assignments not being in operation for a period in excess of 24 months.

It is proposed to clarify the point at which an assignment which has ceased to be in operation is to be declared as suspended.

5/7/4C.3 Methods to satisfy Issue 4C

Method A

It is proposed to clarify the point at which an assignment which has ceased to be in operation is to be declared as suspended in order to avoid suspensions lasting longer than the intended 24 months.

Advantages

– Clarification that is consistent with current ITU regulations.

– Not overly cumbersome with respect to the many reasons why a suspension could occur.

Disadvantages

– None were identified.

Method B

It is proposed to define the maximum period without operation after which an assignment must be declared as suspended. A notification of suspension would only be required if the entire space station was not operational. It is also proposed that this Method be applied in conjunction with Method B of Issue 4B and Method B of Issue 4D.

Advantages

– Provides detailed conditions for suspension and resumption of operations after suspension.

– Harmonizes practices of individual Member States with regards to suspension and resumption of operations after suspension.

– Improves administrations’ ability to get access to the orbit/spectrum resource.

Disadvantages

– Adds complexity by requiring repeat of bringing into use test for resumption of use.

– Short reporting deadline increases burden for Bureau and administrations as compared to longer reporting period (when problem leading to suspension may have been resolved).

– No requirement to suspend assignments for a payload that is no longer operational if it is part of a multi-payload spacecraft unless the entire spacecraft was not operational.

NOTE – The above lists of advantages and disadvantages are based on the descriptions of the methods in this section and do not address the example regulatory text provided in section 5/7/4C.4.

5/7/4C.4 Regulatory and procedural considerations for Issue 4C

5/7/4C.4.1 Method A

For implementation of Method A, the following modification to RR **11.49** is proposed.

MOD

11.49 Where the use of a recorded assignment to a space station is suspended ~~for a period not exceeding eighteen months~~, the notifying administration shall, as soon as possible but no later than six months from the date on which the use was suspended, inform the Bureau of the date on which such use was suspended and the date on which the assignment is to be brought back into regular use. This latter date shall not exceed two years from the date of suspension.

5/7/4C.4.2 Method B

For implementation of Method B, the following is proposed:

Implement the changes proposed in sections 5/7/4B.4.2 and 5/7/4D.4.2 together with the following modification to RR No. **11.49**:

MOD

11.49 Where ~~the use of~~ a ~~recorded assignment to a~~ space station is ~~suspended~~ not in operation for a period ~~not~~ exceeding [thirty-ninety] days with the notified orbital parameters~~eighteen~~ ~~months~~, the notifying administration shall~~, as soon as possible,~~ either cancel the associated frequency assignments, or, no later than thirty days from the end of the [thirty-ninety]-day period, inform the Bureau of the date on which such use was suspended. ~~and the date on which the~~ Any suspended assignment which is ~~to be~~ not brought back into ~~regular~~ use~~. This latter date shall not exceed~~ within two years from the date of suspension shall be cancelled by the Bureau. The Bureau shall inform the notifying administration accordingly.

5/7/4D Issue 4D: Resolution 49 (Rev.WRC-07)

5/7/4D.1 Executive summary

Due diligence information is considered a valuable requirement to present how frequency assignments of a satellite network were brought into use or that the launch of a satellite was actually a failure. In this respect, it should be continued as a means to reflect the real utilization of spectrum and satellite orbit resources and to eliminate those recorded frequency assignments which were not actually brought into use.

Views were expressed that improving the accuracy of the due diligence information and reinforcing the link between assignments to geostationary-satellite networks and the spacecrafts used in certain frequency bands would improve administrations' ability to access the radio-frequency spectrum and orbital resources. It was also considered that such changes should be considered together with clarifying suspension of assignments and definition of bringing into use since separate consideration and implementation of these issues would not be as effective as the combined approach.

Other views were expressed that such changes may not be necessary.

5/7/4D.2 Background

Resolution **49** has been subject of extensive discussions immediately after its adoption at WRC-97. Various options to improve it were proposed and debated. Additionally, the usefulness or otherwise of submitting the information called for in the Resolution was also debated at almost every WRC after WRC-97. The end results are that there have been very little changes, although several deficiencies were reported.

While fully appreciating the problem of "virtual satellites" and the impact they have on administrations' ability to access to the orbit/spectrum resource and noting the sensitivity and history surrounding due diligence information, the following concerns should be considered with regard to modifying Resolution **49 (Rev.WRC-07)** or developing a new resolution addressing due diligence:

– requiring more information from an administration or requiring an administration to provide updates would not improve accuracy nor seem to facilitate the implementation of the resolution;

– introducing a requirement for "evidence" to substantiate the bringing of a satellite into use may create an atmosphere of mistrust between administrations and the BR whereas the ITU environment is based upon the word of an administration, goodwill, mutual respect, collaboration, and cooperation as given in Article **1** of the Constitution;

– RR No. **13.6** provides a means to conduct consultations based on reliable information as to whether or not an administration has a satellite operating in accordance with the notified characteristics. The BR is making use of this provision in reconciling the MIFR and the RRB is addressing the application of RR No **13.6** issue under Resolution **80 (Rev.WRC-07)**. That work is ongoing.

5/7/4D.3 Methods to satisfy Issue 4D

Method A

No change to the Radio Regulations.

Under this method there would be no changes to Resolution **49 (Rev.WRC-07)**. Administrations would continue to submit due diligence information and the Bureau would continue to publish Resolution **49 (Rev.WRC-07)** special sections and update information on its website regarding the bringing into use, suspension of operation, and resumption of operation of satellite networks.

Advantages

– Simple; provisions already exist and have proven effective at clearing paper satellite filings.

Disadvantages

– Based on an *a priori* declaration of what is intended to be used instead of the declaration of what has been used.

Method B

It is proposed to introduce a new Resolution that would replace Resolution **49 (Rev.WRC-07)** for frequency assignments to geostationary-satellite networks in the bands 3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz, 10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz, 17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75]*-25.25 GHz and 27.5-30 GHz and that would:

– expand the due diligence data to be provided;

– ensure that the due diligence data associated with a satellite network is timely updated each time a spacecraft is launched, relocated or de-orbited.

It is also proposed that Resolution **49 (Rev.WRC-07)** no longer apply to geostationary-satellite networks in the bands 3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz, 10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz, 17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75][*]-25.25 GHz and 27.5-30 GHz but would continue to apply to geostationary-satellite networks in other frequency bands and to non-geostationary-satellite networks that are currently subject to Resolution **49 (Rev.WRC-07)**.

It is finally proposed that this Method be applied in conjunction with Method B of Issue 4B and Method B of Issue 4C.

[*]*Editorial note: The inclusion of 24.65 GHz or 24.75 GHz depends on the outcome of WRC-12 Agenda item 1.13.*

Advantages

– Connects the due diligence data more closely with the actual characteristics of the spacecraft.

– Ensures that the due diligence data associated with a given satellite network is maintained and timely updated.

– Improves administrations' ability to get access to the orbit/spectrum resource.

Disadvantages

– Mechanism already exists in RR Nos. **13.5** and **13.6** for the Bureau to investigate and for administrations to substantiate the status of filings.

– Creates complexity by establishing three schemes for administrative due diligence.

– Creates an additional burden on the Bureau and administrations.

NOTE – The above lists of advantages and disadvantages are based on the descriptions of the methods in this section and do not address the example regulatory text provided in section 5/7/4D.4.

5/7/4D.4 Regulatory and procedural considerations for Issue 4D

5/7/4D.4.1 Method A

NOC

RESOLUTION 49 (Rev.WRC-07)

5/7/4D.4.2 Method B

A possible implementation of Method B is provided below:

Implement the changes proposed in section 5/7/4B.4.2 and 5/7/4C.4.2 together with the following changes:

MOD

RESOLUTION 49 (Rev.WRC-~~07~~12)

Administrative due diligence applicable to some satellite radiocommunication services

...

resolves

MOD

1 that the administrative due diligence procedure contained in Annex 1 to this Resolution shall be applied as from 22 November 1997 for a satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service for which the advance publication information under No. **9.2B**~~, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *b)* of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *a)* of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area, or for which the request for additional uses in Regions 1 and 3 under § 4.1 of Article 4 of Appendices **30** and **30A**, or for which the submission of information under supplementary provisions applicable to additional uses in the planned bands as defined in Article 2 of Appendix **30B** (Section III of Article 6)~~ has been received by the Bureau from 22 November 1997, ~~or for which submission under Article 6 of Appendix **30B (Rev.WRC-07)** is received on or after 17 November 2007, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[1] for inclusion in the Appendix **30B** Plan~~with the exception of geostationary-satellite networks in the fixed-satellite, broadcasting-satellite and mobile-satellite services in the following bands:

3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz;

10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz;

17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75]-25.25 GHz, 27.5-30 GHz[1];

MOD

2 that for a satellite network or satellite system within the scope of § 1~~ or 3~~ of Annex 1 to this Resolution not yet recorded in the Master International Frequency Register (MIFR) by 22 November 1997, for which the advance publication information under No. **1042** of the Radio Regulations (Edition of 1990, revised in 1994) or for the application of Section III of Article 6 of Appendix **30B** has been received by the Bureau before 22 November 1997, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 21 November 2004, or before the expiry of the notified period for bringing the satellite network into use, plus any extension period which shall not exceed three years pursuant to the application of No. **1550** of the Radio Regulations (Edition of 1990, revised in 1994) or the dates specified in the relevant provisions Article 6 of Appendix **30B**, whichever date comes earlier. If the date of bringing into use, including extension specified above, is before 1 July 1998, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 1 July 1998;

SUP

2*bis* that for a satellite network or satellite system within the scope of § 2 of Annex 1 to this Resolution not recorded in the MIFR by 22 November 1997, for which the request for a modification to the Plans of Appendices **30** and **30A** has been received by the Bureau before 22 November 1997, the responsible administration shall submit to the Bureau the complete due

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~~1 See § 2.3 of Appendix **30B (Rev.WRC-07)**.~~

1 Such satellite networks are subject to the procedures contained in Resolution **[SATELLITE.DECLARATION].**

diligence information in accordance with Annex 2 to this Resolution as early as possible before the end of the period established as a limit to bringing into use in accordance with the relevant provisions of Article 4 of Appendix **30** and the relevant provisions of Article 4 of Appendix **30A**;

MOD

3 that for a satellite network or satellite system within the scope of § 1, ~~2 or 3~~ of Annex 1 to this Resolution recorded in the MIFR by 22 November 1997, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 21 November 2000, or before the notified date of bringing the satellite network into use (including any extension period), whichever date comes later;

MOD

4 that six months before the expiry date specified in *resolves* 2~~ or 2*bis*~~ above, if the responsible administration has not submitted the due diligence information, the Bureau shall send a reminder to that administration;

MOD

5 that if the due diligence information is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information. In any case, the complete due diligence information shall be received by the Bureau before the expiry date specified in *resolves* 2 ~~or 2*bis* ~~above,~~ as appropriate,~~ and shall be published by the Bureau in the International Frequency Information Circular (BR IFIC);

MOD

6 that if the complete due diligence information is not received by the Bureau before the expiry date specified in *resolves* 2~~ or 2*bis* above~~, the request for coordination or request for a modification to the Plans of Appendices **30** and **30A** or for application of Section III of Article **6** of Appendix **30B** as covered by *resolves* 1 above submitted to the Bureau shall be cancelled. Any modifications of the Plans (Appendices **30** and **30A**) shall lapse and any recording in the MIFR as well as recordings in the Appendix **30B** List shall be deleted by the Bureau after it has informed the concerned administration. The Bureau shall publish this information in the BR IFIC,

ANNEX 1 TO RESOLUTION 49 (Rev.WRC-~~07~~12)

MOD

1 With the exception of geostationary-satellite networks in the fixed-satellite, broadcasting-satellite and mobile-satellite services in the following bands:

3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz;

10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz;

17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75]*-25.25 GHz, 27.30 GHz[2],

~~Aany~~ satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service with frequency assignments that are subject to coordination under

[2] Such satellite networks are subject to the procedures contained in Resolution **[SATELLITE.DECLARATION].**

Nos. **9.7**, **9.11**, **9.12**, **9.12A** and **9.13** and Resolution **33 (Rev.WRC-03)** shall be subject to these procedures.

[*]*Editorial note: The inclusion of 24.65 GHz or 24.75 GHz depends on the outcome of WRC-12 Agenda item 1.13.*

SUP

2 Any request for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions or for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area or request for additional uses in Regions 1 and 3 under the relevant provisions of Article 4 of Appendices **30** and **30A** shall be subject to these procedures.

SUP

3 Any submission of information under Article 6 of Appendix **30B (Rev.WRC-07)**, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[3] for inclusion in the Appendix **30B** Plan, shall be subject to these procedures.

SUP

5 An administration requesting a modification of the Region 2 Plan or additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above shall send to the Bureau as early as possible before the end of the period established as a limit to bringing into use in accordance with the relevant provisions of Article 4 of Appendix **30** and the relevant provisions of Article 4 of Appendix **30A**, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in Annex 2 to this Resolution.

SUP

6 An administration applying Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above shall send to the Bureau as early as possible before the end of the period established as a limit to bringing into use in § 6.1 of that Article, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in Annex 2 to this Resolution.

MOD

7 The information to be submitted in accordance with § 4~~, 5 or 6~~ above shall be signed by an authorized official of the notifying administration or of an administration that is acting on behalf of a group of named administrations.

MOD

8 On receipt of the due diligence information under § 4~~, 5 or 6~~ above, the Bureau shall promptly examine that information for completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within 30 days.

MOD

9 If the information is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information. In all cases, the complete due diligence

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3 See § 2.3 of Appendix **30B (Rev.WRC-07)**.

information shall be received by the Bureau within the appropriate time period specified in § 4~~, 5 or 6~~ above, as the case may be, relating to the date of bringing the satellite network into use.

MOD

10 Six months before expiry of the period specified in § 4~~, 5 or 6~~ above and if the administration responsible for the satellite network has not submitted the due diligence information under § 4~~, 5 or 6~~ above, the Bureau shall send a reminder to the responsible administration.

MOD

11 If the complete due diligence information is not received by the Bureau within the time limits specified in this Resolution, the networks covered by § 1~~, 2 or 3~~ above shall no longer be taken into account and shall not be recorded in the MIFR. The provisional recording in the MIFR shall be deleted by the Bureau after it has informed the concerned administration. The Bureau shall publish this information in the BR IFIC.

~~With respect to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above, the modification shall lapse if the due diligence information is not submitted in accordance with this Resolution.~~

~~With respect to the request for application of Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above, the network shall also be deleted from the Appendix **30B** List. When an allotment under Appendix **30B** is converted into an assignment, the assignment shall be reinstated in the Plan in accordance with § 6.33 *c)* of Article 6 of Appendix **30B (Rev.WRC-07)**~~.

MOD

12 An administration notifying a satellite network under § 1, ~~2 or 3~~ above for recording in the MIFR shall send to the Bureau, as early as possible before the date of bringing into use, the due diligence information relating to the identity of the satellite network and the launch services provider specified in Annex 2 to this Resolution.

Reasons: This modification is consequential to the replacement of requirements under Resolution **49** by those set forth in the proposed Resolution **[A7-SATELLITE DECLARATION]**. Resolution **49** remains applicable to other satellite networks and systems not covered by the proposed Resolution **[A7-SATELLITE DECLARATION]**.

*Editorial note: Consequential changes to update references in RR Articles **9**, **11**, RR Appendices **30**, **30A** and **30B** will also be needed.*

ADD

DRAFT RESOLUTION [A7- SATELLITE DECLARATION] (WRC-12)

Information about the use of frequency assignments to geostationary-satellite networks in certain radiocommunication services and frequency bands

The World Radiocommunication Conference (Geneva, 2012), *considering*

a) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;

b) that a due diligence process was first adopted by WRC-97 with a view of providing as early as possible information on the industrial project behind a satellite network submitted to the ITU;

c) that providing information required under this due diligence process was a prerequisite to qualifying for a two-year extension of the regulatory period to bring into use a satellite network in non-planned bands;

d) that WRC-03 decided to remove the two-year extension by setting the regulatory period to bring into use a satellite network in non-planned bands to seven years;

e) that data concerning the manufacturer, launch service provider and launch date of a satellite will be more accurate and useful if submitted after the launch of the satellite,

resolves

1 that, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[1] for inclusion in the Appendix **30B** Plan, this Resolution applies to geostationary-satellite networks in the fixed-satellite, broadcasting-satellite and mobile-satellite services in the following bands:

3 400-4 200 MHz, 4 500-4 800 MHz, 5 725-7 075 MHz;

10.7-12.75 GHz, 12.75-13.25 GHz, 13.75-14.8 GHz;

17.3-20.2 GHz, 21.4-22 GHz, [24.65/24.75][*]-25.25 GHz, 27.5-30 GHz;

[*]*Editorial note: The inclusion of 24.65 GHz or 24.75 GHz depends on the outcome of WRC-12 Agenda item 1.13.*

2 that, for frequency assignments to such satellite networks for which the confirmation of the date of bringing into use was not received by the Bureau before 17 February 2012 or which were suspended at that date, the procedures contained in Annex 1 to this Resolution shall be applied:

i) at the time of first bringing into use; or

ii) when resuming use after a suspension;

3 that for frequency assignments to satellite networks as described in *resolves* 1 for which the confirmation of the date of bringing into use was received by the Bureau before 17 February 2012, the notifying administration shall submit to the Bureau not later than [17 August 2012] the complete information related to the operational situation as of 17 February 2012, in accordance with Annex 2 to this Resolution;

4 that, if the complete information specified in *resolves* 3 is not received by the Bureau before [17 August 2012], the corresponding frequency assignments shall be cancelled by the Bureau,

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[1] See § 2.3 of Appendix **30B (Rev.WRC-07)**.

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of this Resolution.

ANNEX 1 TO DRAFT RESOLUTION [A7-SATELLITE DECLARATION] (WRC-12)

1 Any frequency assignments to satellite networks referred to in *resolves* 1 shall be subject to these procedures either when their first bringing into use is declared or at the resumption of use following a suspension.

2 Within thirty days after the actual commencement, or resumption, of use of the frequency assignments to a satellite network subject to these procedures, the notifying administration shall send to the Bureau the information specified in Annex 2 to this Resolution.

3 On receipt of the information under § 2 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months.

4 If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within thirty days.

5 A minimum of [thirty-ninety] days after the receipt of the complete information under § 2 above, the notifying administration may apply appropriate measures under § 6, if required.

[*Editorial note: There is a link between this period of days and the one in § 2.*]

6 The information submitted in accordance with § 2 and *resolves* 2 above shall be updated and resubmitted to the Bureau by the notifying administration not later than thirty days after the end of life or the relocation of the spacecraft associated with the submission under § 2 above.

7 In case of end of life of a spacecraft already submitted under this Resolution, the notifying administration shall inform accordingly the Bureau within thirty days after the event. The corresponding ITU number associated to such a spacecraft shall no longer be used.

8 On receipt of the information under § 6 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months.

9 If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within thirty days.

10 If the complete information specified in § 6 above is not received by the Bureau within the time-limits specified in this Resolution under §§ 6 and 9 above, the frequency assignments to the satellite network shall be considered as invalid. The Bureau shall immediately inform the notifying administration and take appropriate measures under § 11, if required.

11 After the end of the period referred to in No. **11.44** [add all relevant provisions (suspension, Appendices **30**/**30A** and **30B**)], if the complete information under this Resolution is not received by the Bureau, the corresponding frequency assignments shall be cancelled by the Bureau.

ANNEX 2 TO DRAFT RESOLUTION [A7-SATELLITE DECLARATION] (WRC-12)

Information to be submitted

1) Identity of the satellite network

a) Identity of the satellite network

b) Name of the notifying administration

c) Orbital characteristics

d) Reference to the advance publication information or to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A**; or reference to the information processed under Article 6 of Appendix **30B (Rev.WRC-07)**

e) Reference to the request for coordination, where applicable

f) Frequency band(s) included in the relevant special sections of the satellite network

g) Regulatory status

– Satellite network under operation (only data listed in § 2 shall be provided), or

– Satellite network suspended (only data listed in § 3 shall be provided)

2) Identity of the spacecraft[2,3] (if satellite network filing is under operation)

a) ITU ID number, or

a) Spacecraft manufacturer

– Name of the spacecraft manufacturer

b) Launch services provider

– Name of the launch vehicle provider

– Name of the launch vehicle

– Name and location of the launch facility

– Launch date

c) Frequency band(s) present on board the spacecraft (i.e. frequency bands that are able to be received or transmitted by a transponder located on-board the spacecraft).

3) Suspension information (if satellite network filing is suspended)

a) Date of suspension

b) Reason of suspension:

– Spacecraft moved to another orbital position, or

– In-orbit failure of the spacecraft, or

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[2] If data about the spacecraft are submitted for the first time under this Resolution, items "Spacecraft manufacturer", "Launch services provider" and "Frequency band(s) present on-board on the spacecraft" shall be provided. Otherwise, if data about the spacecraft were already submitted under this Resolution, the ID number given by the Bureau to this spacecraft at that time shall be indicated.

[3] More than one spacecraft may be associated with a satellite network at the same orbital location.

– Spacecraft de-orbited.

5/7/4E Issue 4E: Provide limited and qualified extensions of the regulatory time-limit for bringing into use assignments in accordance with Appendix 30B due to launch failures

5/7/4E.1 Executive summary

The unplanned FSS frequency bands are highly utilized worldwide. In fact, it is becoming more and more difficult for a new operator to have access to satellite communication resources in the conventional unplanned FSS frequency bands, e.g. 14/11 GHz bands. As a result, use of the Appendix **30B** FSS bands has become more attractive, especially for developing countries and new satellite operators. In the process of deploying a satellite network, if an administration misses the BIU deadline of its satellite network, due to a launch failure, it would result in a great financial loss for the satellite operator and have an adverse impact on the deployment of the communications infrastructure for that administration. The consequential removal of the associated satellite network filing from the Master Register and List would nullify resources spent in all aspects of the implementation of the satellite network, including the ITU coordination efforts to receive international protection for the satellite network, for reasons totally out of the control of the administration and the satellite operator. This, together with the associated significant financial impact, would result in a severe impact on the ability of the affected administration to access orbital resources for its communication requirements. It is noted that Appendices **30/30A** include provisions to protect the satellite operator in case of launch failures.

5/7/4E.2 Background

Appendices **30** and **30A** of the Radio Regulations contain provisions (§ 4.1.3*bis* and § 4.2.6*bis*) to protect satellite operators in case of launch failures and there is a need to align the BIU extension procedures in these Appendices with Appendix **30B** in order to account for potential satellite launch failures. Such action would provide equitable treatment of the Appendix **30B** planned FSS bands with those of Appendices **30** and **30A** planned BSS bands and associated feeder links. It is noteworthy that the November 2010 meeting of the Special Committee agreed that similar provisions for suspension as contained in § 8.17 of Appendix **30B,** should be provided for Appendices **30** and **30A** and communicated this information in its Report to the CPM. It is, therefore, important that WRC-12 consider this issue, to ensure the "rational, efficient, and economical use of radio frequencies and any associated orbits" (Article 44 of the Constitution and Resolution 86 (PP-06)).

5/7/4E.3 Methods to satisfy the issue

Method A: Proposes to align the Appendix **30B** with the existing Appendices **30/30A** provisions that address an extension in the BIU date of frequency assignments in the case of a launch failure. The advantage of this method is consistency among important provisions in Appendices **30/30A** and **30B**. Similar courses of action already agreed by the previous WRC for Appendices **30/30A** would be applied for Appendix **30B**. There are no known disadvantages to this method.

Method B: No change. A disadvantage to this method is that problems faced by some administrations cannot be addressed.

5/7/4E.4 Regulatory and procedural considerations

Method A: Example regulatory modification to Appendix 30B

MOD

APPENDIX 30B (Rev.WRC-~~07~~12)

Provisions and associated Plan for the fixed-satellite service in the frequency bands 4500-4800 MHz, 6725-7025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz

ARTICLE 6 (WRC-~~07~~12)

Procedures for the conversion of an allotment into an assignment, for the introduction of an additional system or for the modification of an assignment in the List [1, 2] (WRC-~~07~~12)

ADD

6.31*bis* The regulatory time-limit in § 6.31 for bringing into use of an assignment to a space station of a satellite network may be extended once by not more than three years due to launch failure in the following cases:

– the destruction of the satellite intended to bring the assignment into use;

– the destruction of the satellite launched to replace an already operating satellite which is intended to be relocated to bring another assignment into use; or

– the satellite is launched, but fails to reach its assigned orbital location.

For this extension to be granted, the launch failure must have occurred at least five years after the date of receipt of the complete Appendix 4 data. In no case shall the period of the extension of the regulatory time-limit exceed the difference in time between the three-year period and the period remaining from the date of the launch failure to the end of the regulatory time-limit. In order to take advantage of this extension, the administration shall have, within one month of the launch failure or one month after 17 February 2012, whichever comes later, notified the Bureau in writing of such failure, and shall also provide the following information to the Bureau before the end of the regulatory time-limit of § 6.31:

– date of launch failure;

– due diligence information as required in Resolution **49 (Rev.WRC-07)**, if this resolution applies to the satellite network in which the space station is to operate, for the assignments with respect to the satellite that suffered the launch failure, if that information has not already been provided.

If, for a satellite network or satellite system to which Resolution **49 (Rev.WRC-07)** applies, the administration has not provided to the Bureau updated Resolution **49 (Rev.WRC-07)** information for the new satellite under procurement within one year of the request for extension, the related frequency assignments shall lapse.

MOD

6.32 Thirty days prior to the date of bringing into use under § 6.31, <u>and thirty days prior to the date of bringing into use under any extension granted pursuant to § 6.31*bis*,</u> the Bureau shall dispatch a reminder telegram or fax to the notifying administration which has not brought its assignment into use, bringing the matter to its attention.

MOD

6.33

When:

i) an assignment is no longer required; *or*

ii) an assignment recorded in the List and brought into use has been suspended for a period exceeding two years and ending after the expiry date specified in § 6.31; *or*

iii) an assignment recorded in the List has not been brought into use within the eight-year period following the receipt by the Bureau of the relevant complete information under § 6.1 <u>(or the extended period following receipt by the Bureau of the relevant complete information under § 6.1 in the event of an extension under § 6.31*bis*)</u>, with the exception of assignments submitted by new Member States where § 6.35 and 7.7 apply,

the Bureau shall:

a) publish in a Special Section of its BR IFIC the cancellation of the related Special Sections and the assignments recorded in the Appendix **30B** List;

b) if the cancelled assignment is the result of a conversion of an allotment without modification, reinstate the allotment in the Appendix **30B** Plan;

c) if the cancelled assignment is the result of the conversion of an allotment with modifications, reinstate the allotment with the same orbital location and technical parameters of the cancelled assignment except for its service area, which shall be the national territory of the administration whose allotment is being reinstated; *and*

d) update the reference situation for the allotments of the Plan and the assignments of the List.

MOD

6.34 When a proposed new or modified frequency assignment has not fulfilled all the requirements for entering the List, in accordance with § 6.23 or 6.25, by the expiry date specified in § 6.31 <u>or § 6.31*bis* in the event of an extension under that provision</u>, the Bureau shall publish in a Special Section of the BR IFIC the cancellation of the related Special Sections.

MOD

6.36 Should the assignments mentioned in § 6.35 over the national territory of the administration not be brought into use within the eight years following the receipt by the Bureau of the relevant complete information under § 6.1 <u>or within the extension period under § 6.31*bis*</u>, they would be retained in the List until the end of the World Radiocommunication Conference immediately following the successful completion of the procedure referred to in § 6.35.

MOD

6.28 Should the assignments that were the basis of the unfavourable finding not be brought into use within the period specified in § 6.1 <u>or within the extension period under § 6.31*bis*</u>, then the status of the assignment in the List shall be reviewed accordingly.

ARTICLE 8 (WRC-~~07~~12)

Procedure for notification and recording in the Master Register of assignments in the planned bands for the fixed-satellite service[11, 12] (WRC-~~07~~12)

MOD

8.13 A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under § 8.8 and 8.9 as appropriate. Any changes to the characteristics of an assignment, that has been notified and confirmed as having been brought into use, shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been notified but not yet brought into use shall be brought into use within the period provided for in § 6.1 or 6.31 or by the end of the extension period provided for in § 6.31*bis* in the event of an extension under that provision of Article **6**. (WRC-~~07~~12)

MOD

8.16 All frequency assignments notified in advance of their being brought into use shall be entered provisionally in the Master Register. Any frequency assignment provisionally recorded under this provision shall be brought into use no later than the end of the period provided for in § 6.1 or § 6.31*bis* in the event of an extension under that provision. Unless the Bureau has been informed by the notifying administration of the bringing into use of the assignment, it shall, no later than 15 days before the end of the regulatory period established under § 6.1, and no later than 15 days before the end of the regulatory period established under § 6.31*bis* in the event of an extension under that provision send a reminder requesting confirmation that the assignment has been brought into use within the regulatory period. If the Bureau does not receive that confirmation within 30 days following the period provided under § 6.1 or § 6.31*bis* in the event of an extension under that provision, it shall cancel the entry in the Master Register. In the event that an extension was requested under § 6.31*bis* but the Bureau determines that the conditions for an extension under § 6.31*bis* are not met, the Bureau shall inform the administration of its findings and cancel the entry in the Master Register. (WRC-~~07~~12)

5/7/4F Issue 4F: Provide limited and qualified extensions of the regulatory time-limit for bringing into use satellite frequency assignments due to launch delays beyond the control of the notifying administration

5/7/4F.1 Executive summary

For technical and economic reasons, many satellite launches in both planned and unplanned bands occur toward the end of the bringing-into-use periods afforded by the Radio Regulations. As the utilization of dual-payload launches becomes more common, the possibility of a launch delay of a dual-payload launch vehicle caused by lack of readiness of one of the co-passenger satellites on the intended vehicle increases. Such a delay could result in a situation where an administration that was on track to meet the ITU regulatory requirements of its BIU time-limit could miss the BIU deadline of its satellite network. This situation would result in a great financial loss for the satellite operator and have an adverse impact on the deployment of the communication infrastructure for that administration. The consequential removal of the associated satellite network filing from the Master Register and List would nullify resources spent in all aspects of the implementation of the satellite network, including the ITU coordination efforts to receive international protection for the satellite network, for reasons totally out of the control of the administration and the satellite operator. This, together with the associated significant financial impact, would result in a severe impact on the ability of the affected administration to access orbital resources for its communication requirements. It is, therefore, important that WRC-12 consider this issue, to ensure the “rational, efficient, and economical use of radio frequencies and any associated orbits” (Article 44 of the Constitution and Resolution 86 (PP-06)).

5/7/4F.2 Background

The trend toward the use of dual-payload launch vehicles to reduce the cost of a satellite network, which is especially important for developing countries to have access to space, continues to grow. The issue addressed here is that of postponements of satellite launches due solely to delays associated with the co-passenger satellite scheduled for the same launch vehicle which could become more prevalent due to growing use of dual-payload launches. This would thus force a notifying administration – despite having had its satellite ready for a timely launch - to miss its bringing-into-use regulatory time-limit for frequency assignments for reasons outside of its control.

Prior to WRC-03, the regulatory time-limit in Article **11** to bring into use a satellite network was five years and this date could be extended by no more than two years, but only on specific conditions (e.g. launch failure or delay, satellite design modification due to coordination, financial circumstances, *force majeure*). Given that the experience of the Bureau was that these conditions were always met, leading to a quasi-automatic extension of up to two years, WRC-03 decided to remove these provisions from Article **11** and established instead a regulatory time-limit of seven years. This was thought to address the general need for extensions, including those related to launch delays. However, the specific issue of launch delay caused by a second satellite scheduled for the same multiple-satellite launch vehicle was not discussed. Since then, WRCs have addressed specific bringing into use issues of an administration on a case-by-case basis, including issues related to a launch delay caused by a second satellite scheduled for the same multiple-satellite launch vehicle.

5/7/4F.3 Methods to satisfy the issue

Method A: Propose a new resolution that would allow an extension of up to one year to the bringing-into-use regulatory time-limit for frequency assignments to a satellite network where the need for the extension arises from a scheduled launch that is delayed from a launch date prior to the bringing-into-use deadline to a new date after the bringing-into-use deadline, due to the delay in the delivery of the co-passenger satellite scheduled for the same launch vehicle. Recognizing the need to ensure the proper use of such extensions, the Resolution **[AI7-Second PAYLOAD DELAY]** avoids potential misuse of the Resolution by requiring that an administration would have to submit a Resolution **49** due diligence information package, supplemented by a statement from the satellite manufacturer that the subject spacecraft was timely delivered to the launch site in anticipation of the originally-scheduled launch date/window and a statement from the launch supplier to the effect that a launch delay has occurred due to the delays associated with the scheduled co-passenger satellite, unrelated to the subject spacecraft, that was scheduled for launch on the same launch vehicle.

This method has the advantage of filling a void in the regulatory BIU framework in a way that will not be subject to abuse or unnecessary uncertainty. The disadvantage to this method is that it sets a precedent for the consideration of other modifications to the regulations to create new extensions at WRC-12 and future WRC conferences.

Method B: No change, noting that administrations can still bring these issues to a WRC on a case-by-case basis. The advantage of this method is that it is consistent with decisions to eliminate general BIU extension provisions in Article 11 taken at WRC-03, and allows WRCs to continue to address case-by-case requirements.

Disadvantage: This would create additional issues to be dealt with at a WRC. Absence of a procedure would require future conferences to deal with such issues on a case-by-case basis. Problems raised by administration may not be addressed, depending upon the timing and decisions of the conference.

5/7/4F.4 Regulatory and procedural considerations

Method A

ADD

DRAFT RESOLUTION [AI7-SECOND PAYLOAD DELAY] (WRC-12)

One-year extension of the regulatory time-limits in Article 11, and Appendices 30, 30A, and 30B for bringing into use frequency assignments to one satellite network due to a launch delay caused by a second satellite scheduled for the same multiple-satellite launch vehicle

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that it is a trend in the commercial satellite launch industry to include multiple satellites on a single launch vehicle;

b) that this use of multiple-satellite launch vehicles reduces the per-satellite launch costs to levels below those of single-satellite launch vehicles, and therefore facilitates access to space for new, emerging satellite operators and developing countries;

c) that it is possible that a satellite scheduled for launch on a shared launch vehicle is timely manufactured and ready for launch, but the planned co-passenger satellite for that launch vehicle is not ready on time for delivery to the launch site;

d) that a launch delay of a satellite that has been timely manufactured and delivered for the reason given in *considering c)* above could result in the frequency assignments to that space station not being timely brought into use under No. **11.44**, or §§ 4.1.3 and 4.2.6 of Appendix **30**, or §§ 4.1.3 and 4.2.6 of Appendix **30A**, or § 6.31 of Appendix **30B** for reasons beyond the responsible administration's control;

e) that it would be inequitable to cancel the frequency assignments to a space network where the satellite that had been manufactured and readied for launch in sufficient time to meet the applicable regulatory time-limit of the applicable provisions listed in *considering d)* above,

further considering

that including the possibility of a brief extension of the regulatory bringing into use deadline for frequency assignments to a satellite network in the event of a launch delay resulting from a delay in the manufacture or delivery to the launch site of another satellite scheduled for the same launch vehicle would continue to promote the "rational, efficient, and economical use of radio frequencies and any associated orbits" (Art. 44 of the Constitution and Resolution 86 (Rev.Marrakesh, 2002)),

recognizing

that Resolution **86 (WRC-03)** specifies that the scope and criteria of Resolution 86 (Rev.Marrakesh, 2002) of the Plenipotentiary Conference to be considered by future WRCs includes consideration of proposals that deal with deficiencies in the advance publication, coordination and notification procedures of the Radio Regulations for space services which have either been identified by the Board and included in the Rules of Procedure or which have been identified by administrations or by the Radiocommunication Bureau, as appropriate, and to ensure that these procedures, characteristics and appendices reflect the latest technologies, as far as possible,

resolves

1 that the regulatory time-limits under No. 11.44, or §§ 4.1.3 and 4.2.6 of Appendix **30**, or §§ 4.1.3 and 4.2.6 of Appendix **30A**, or § 6.31 of Appendix **30B** for bringing into use any frequency assignment to a space station of a satellite network may be extended under this Resolution only one time, by not more than one year, if all of the following conditions are met:

a) a satellite that is capable of using any assignment for which an extension is sought was fully constructed, and ready to be shipped and delivered to a launch provider's launch facility in advance of the applicable regulatory time-limit;

b) a binding contract for the launch of the satellite referred to in *resolves* 1a) above is in effect at the time that the extension is requested, and that the contract establishes a launch date that is in advance of the applicable regulatory time-limit;

c) that the contract referred to in *resolves* 1b) above specified that a second satellite was to accompany the satellite referred to in *resolves* 1a) above into orbit on the same launch vehicle; and

d) that for reasons beyond the control of the operator and administration of the satellite referred to in *resolves* 1a) above: i) the second satellite referred to in *resolves* 1c) above was either not delivered to the launch facility, or, once at the launch facility was not readied, in time to permit placement of the satellite referred to in *resolves* 1a) above into orbit and the frequency assignments to be brought into use by the applicable regulatory time-limit; and ii) the launch provider did not substitute an alternative satellite for the second satellite in time to permit placement of the satellite referred to in *resolves* 1a) above into orbit and to bring its frequency assignments into use by the applicable regulatory time-limit;

2 that, in order to obtain this extension, the administration shall have provided the following information to the Bureau before the end of the regulatory time-limit of No. **11.44**, or §§ 4.1.3 and 4.2.6 of Appendix **30**, or §§ 4.1.3 and 4.2.6 of Appendix **30A**, or § 6.31 of Appendix **30B**, as applicable:

a) a written description of the circumstances of the launch delay that encompasses all of the elements of *resolves* 1 above that includes i) a written statement from the satellite manufacturer that the subject satellite was timely manufactured and readied for shipment and delivery to the launch site in anticipation of the originally-scheduled launch date; and ii) a written statement from the launch provider to the effect that a launch delay has occurred due to the delay of a second satellite that was scheduled to be launched into orbit on the same launch vehicle; and

b) the information specified in the Annex to this Resolution for the satellite referred to in *resolves* 1a) above;

3 that if, regarding a satellite for which an administration was granted a one-year extension of the regulatory time-limit of No. **11.44**, or §§ 4.1.3 and 4.2.6 of Appendix **30**, or §§ 4.1.3 and 4.2.6 of Appendix **30A**, or § 6.31 of Appendix **30B** pursuant to this Resolution, the responsible administration has not confirmed to the Bureau that some or all of the subject frequency

assignments to the subject space station have been brought into use within the extension period, any frequency assignments not having been brought into use shall lapse,

instructs the Director of the Radiocommunication Bureau

to publish, in the IFIC, any new regulatory time-limit under No. **11.44**, or §§ 4.1.3 and 4.2.6 of Appendix **30**, or §§ 4.1.3 and 4.2.6 of Appendix **30A**, or § 6.31 of Appendix **30B** that is established by reason of this Resolution for bringing into use the frequency assignments to a space station.

ANNEX TO
DRAFT RESOLUTION [AI7-SECOND PAYLOAD DELAY] (WRC-12)

A Identity of the satellite network

a) Identity of the satellite network

b) Name of the administration

c) Country symbol

d) Reference to the advance publication information

e) Reference to the request for coordination

f) Frequency band(s)

g) Name of the operator

h) Name of the satellite *i)*

Orbital characteristics.

B Spacecraft manufacturer*

a) Name of the spacecraft manufacturer

b) Date of execution of the contract

c) Contractual “delivery window”

d) Number of satellites procured.

C Launch services provider

a) Name of the launch vehicle provider

b) Date of execution of the contract

c) Launch or in-orbit delivery window

d) Name of the launch vehicle

e) Name and location of the launch facility.

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* NOTE – In cases where a contract for satellite procurement covers more than one satellite, the relevant information shall be submitted for each satellite.

5/7/5 Issues requiring no action by WRC-12

5/7/5A Issue 5A: Application of No. 5.510 of the Radio Regulations

5/7/5A.1 Executive summary for Issue 5A

Provision No. **5.510** of the Radio Regulations (RR) limits the use of the band 14.5-14.8 GHz by the fixed-satellite service (FSS) (Earth-to-space) to feeder links for the broadcasting-satellite service (BSS) for countries outside Europe, which means that such use is authorized in Region 2. This allocation was made at WARC-79 with the view to provide feeder links to the 12 GHz broadcasting-satellite service for the three Regions. Article 2 of RR Appendix **30A** indicates that the provisions of this Appendix applies to FSS feeder links in the band 14.5-14.8 GHz in Region 1 (outside Europe) and Region 3 for BSS in Regions 1 and 3, but there is no mention of the same application in Region 2. Articles 4 and 7 of RR Appendix **30A** do not include the regulatory procedures to deal with the possible sharing situation between FSS feeder-link networks for BSS in Region 2 and Regions 1 and 3 BSS feeder-link Plan (outside Europe) in the 14.5-14.8 GHz band. Taking account of the above context, and in order to clarify the situation, it was proposed to consider further studying the alternative approach below:

1) either to authorize FSS allocation limited to feeder links for the BSS, outside Europe but including Region 2 in the band 14.5-14.8 GHz (as currently mentioned in RR No. **5.510**) and to modify accordingly RR Appendix **30A** to establish coordination procedures between FSS feeder-link networks for BSS in Region 2 and Regions 1 and 3 BSS feeder-link Plan (outside Europe); or

2) to modify RR No. **5.510** to exclude Region 2 from its scope of application.

If the Bureau was to receive a submission of feeder links in Region 2 in this frequency band, it would treat it in accordance with the coordination procedures to be established by the Radio Regulations Board.

5/7/5A.2 Method to satisfy Issue 5A

Taking into account that this issue was brought to the attention of WRC-03 and WRC-07, both of which concluded that no action was required for RR No. **5.510,** it was concluded that no action/modification is required in that respect at this stage.

5/7/5B Issue 5B: Harmonizing the text of the footnotes to Article 5 of the Radio Regulations referring to RR No. 9.11A

5/7/5B.1 Executive summary for Issue 5B

Footnotes referring to the application of RR No. **9.11A** to different services/frequency bands have been introduced in RR Article **5** since WARC-92 with different texts according to the Conference and the Radio Regulations in force at that time. Generally, these footnotes indicate that "the use of a [band] by a [specific service] is subject to coordination under RR No. **9.11A**" (e.g. No. **5.208**). For some footnotes, it is just stated "the provisions of RR No. **9.11A** apply" (e.g. RR No. **5.403**). Such wording, of a general nature, is not referring precisely to the forms of coordination under RR No. **9.11A** that apply to the service/frequency band, e.g. RR Nos. **9.12**, **9.12A**, **9.13** and/or **9.14**, information which is currently indicated in the Rule of Procedure on RR No. **9.11A**. Some footnotes also indicate that "the allocation of the [band] to a [specific service] is subject to coordination under RR No. **9.11A**." (e.g. RR No. **5.414**), when in fact it is the use of such a band by a service which is subject to the application of RR No. **9.11A**. Taking the above into account, it was suggested to consider harmonizing the text of the footnotes to Article **5** of the Radio Regulations referring to No. **9.11A**.

5/7/5B.2 Method to satisfy Issue 5B

It is concluded that harmonization of the text of the footnotes to the Table of Frequency Allocations in the Article **5** of the Radio Regulations referring to RR No. **9.11A** is not necessary and no action/modification is required in this regard taking in to account the following reasons:

a) no problem or difficulties have been encountered by the Bureau and administrations in the application of these footnotes;

b) there is no agreed text to harmonize them;

c) such agreed texts if existed should be brought to the attention of the Conference;

d) time constrains at WRC-12 and other WRCs does not justify any action to be taken in this regard, taking into account that the matter was reported to WRC-03 and WRC-07 and both WRCs concluded that such a harmonization was not an absolute necessity.

5/7/5C Issue 5C: Harmonization of the text of the future proposed footnotes to Article 5 of the Radio Regulations

5/7/5C.1 Executive summary for Issue 5C

A proposal was received to consider harmonization of the text of the future proposed footnotes to RR Article **5** in accordance with *resolves* 4 of Resolution **26 (Rev.WRC-07)**, which states "that footnotes serving a common purpose should be in a common format, and, where possible, be grouped into a single footnote with appropriate references to the relevant frequency bands".

5/7/5C.2 Method to satisfy Issue 5C

With respect to the need to harmonize the future (new or modified) footnotes, it is concluded that pursuant to *resolves* 4 of Resolution **26 (Rev.WRC-07)**, every effort should be made that these footnotes should be clear, concise and easy to understand and should be aligned and harmonized with the existing footnotes of the Radio Regulations.

Moreover during the discussion it was felt that there is no need to harmonize or align the text of the current footnotes of RR Article **5**, due to the fact that the text of the existing footnotes to RR Article **5** as they appear in the current Radio Regulations have not caused any problem to any administrations and that no specific difficulties have been reported by the Bureau.

5/7/6 Other considerations

5/7/6A Interim procedures for notification and recording of complementary ground components of integrated MSS systems in the 1 525-1 559 MHz and 1 626.5-1 660.5 MHz bands

During the CPM11-2 meeting, Document CPM11-2/152 addressing notification and recording of the Complementary Ground Components ("CGC") of integrated MSS systems was considered. The issue and views of administrations are summarized below.

Recommendation **206 (WRC-07)** recognized that some administrations are implementing integrated MSS systems. Recommendation **206 (WRC-07)** also invited the ITU-R to perform studies on sharing, technical and regulatory issues regarding these integrated systems. These studies are ongoing. Nos. **11.2** and **11.3** of the Radio Regulations indicate that *any* frequency assignment to a transmitting station shall be notified to the ITU Radiocommunication Bureau if the station is capable of causing harmful interference. Therefore, through Document CPM11-2/152, modifications to RR Appendix **4** and the introduction of a new Resolution were proposed for notifying and recording CGC stations as part of an integrated MSS system. Additionally, modifications to Recommendation **206 (WRC-07)** were proposed to reference this new Resolution, to recommend a definition for integrated MSS systems, to invite ITU-R to complete compatibility studies by the 2015 Radiocommunication Assembly in the same and adjacent bands (taking into account existing systems and those proposed to be used soon, as specified in the Recommendation), and to invite administrations to include CGC stations in bilateral and multilateral consultations.

One view was that it is desirable to provide interim notification and recording procedures in the Radio Regulations to take account of CGC deployment in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz and to provide such procedures for administrations, who are not the notifying administration of the corresponding integrated MSS system, having CGC on their territory.

Another view was that it is premature to consider this matter as technical studies in ITU-R Working Party 4C are not complete due to the lack of technical characteristics of the terrestrial component (base stations and terminals). Further, under this view it was noted that operation of CGC of integrated MSS systems is a national matter. It should also be noted that there is no definition for "integrated" MSS systems in RR Article **1** to accommodate such systems.

5/7/6B FSS/BSS interregional sharing in RR Appendix 30 (the limits in Annex 7 of RR Appendix 30)

Document CPM11-2/157 referred to Resolution **86 (Rev.WRC-07)** and discussed the impact that the restrictions of use of some slots in the orbital arc in Section A3 of Annex 7 of RR Appendix **30** has placed on use by Region 1 BSS. The Annex does not allow Regions 1 and 3 countries to submit modifications to the Regions 1 and 3 List for certain slots in the orbital arc of 37.2° W to 10° E, listed in Table 1, for BSS Plan bands in the frequency band 11.7-12.2 GHz over Region 1. The rationale used during the initial development of the BSS Plan in 1977 and at WRC-2000 was to protect access to this arc by FSS systems for provision of service over Region 2 countries.

Document CPM11-2/157 proposed either to suppress Section A3 of Annex 7 of RR Appendix **30** in its entirety, or modify the limits given in the Annex permitting the arc between 10° W to 10° E for use by new or modified BSS networks submitted under Article 4 of RR Appendix **30** for use by Regions 1 and 3 countries.

CPM11-2, in preparation for WRC-12, recognized that ITU-R has not recently studied this issue and noted that Working Party 4A could investigate if such a change in the restrictions of use of some slots in the orbital arc in Section A3 of Annex 7 of RR Appendix **30** can be done while still respecting the principle under which Region 2 FSS systems have access to this band.

5/7/6C Application of Nos. 23.13, 23.13A, 23.13B and 23.13C of RR Article 23

In provision RR No. **23.13** reference is made to the "*radiation over the territory of other countries unless an agreement has been previously reached*" whereas in RR No. **23.13B** and RR No. **23.13C**, which were approved/adopted at WRC-2000, such language is not used. Instead, WRC-2000 decided to require that the satellite network's service area be modified in the event of a disagreement to include another administration's territory. As a result, the reception of the satellite network's signal would not be protected on that administration's territory. There is one difference between RR No. **23.13B** and RR No. **23.13C**; they are applied at different time-frames. RR No. **23.13B** is applied within the four months from the date of publication of the BSS Special Section and RR No. **23.13C** is applied at any time after the above-mentioned four months if so requested.

Some administrations believe that this needs to be corrected to align the text of RR No. **23.13B** and RR No. **23.13C** with that of RR No. **23.13** in order that the consistency between various provisions of RR Article **23** is achieved and so the agreement of administrations to be included in the coverage area is obtained at the beginning of the process, i.e. before the satellite being manufactured and launched. In that case there would be no difficulty to implement the objectives of RR No. **23.13**, i.e. minimizing the radiation over the territory of an administration which has not given its agreement.

Some other administrations opposed opening up RR No. **23.13** and its sub-provisions again, given the extensive discussions on the topic at WRC-95, WRC-97 and WRC-2000. WRC-2000 reached a difficult compromise between concerned administrations by adding sub-provisions RR Nos. **23.13A** through **23.13C** that explain how it is applied. These administrations find the specific proposals technically unworkable. These administrations were of the view that it is not technically possible to modify the physical coverage area of a satellite after the satellite is ordered and it may also be difficult to exclude one country while covering its neighbours.

CHAPTER 6

Future work programme and other issues

(Agenda items 1.2, 1.19, 2, 4, 8.1, 8.2)

CONTENTS

AGENDA ITEM 1.2

*1.2 taking into account the ITU-R studies carried out in accordance with Resolution **951 (Rev.WRC-07)**, to take appropriate action with a view to enhancing the international regulatory framework;*

Resolution **951 (Rev.WRC-07)**: *Enhancing the international spectrum regulatory framework*

6/1.2/1 Executive summary

ITU-R carried out studies in accordance with Resolution **951 (Rev.WRC-07)**. General allocation or procedural issues relating to general spectrum management solutions for enhancing the Radio Regulations (RR) have been examined to meet the demands of current, emerging and future radio applications, while taking into account existing services and usage. Extensive ITU-R studies were undertaken and various solutions have been developed which reflect the differing views. Beyond the general analysis of the four options in Resolution **951 (Rev.WRC-07)**, different studies related to the issue(s) of convergence and how to reflect current and future technologies in the international spectrum regulatory framework have been addressed. These studies reviewed the current regulatory framework with the view to address the objectives in specific (Issue A) or generic (Issue B) manner. The attempt to develop broad regulatory changes that would apply across a significant portion of the Radio Regulations has been challenging.

Two categories of approaches were developed, one dealing with specific radiocommunication services and the other dealing with general principles. Under the specific service approach, four methods are proposed to accommodate convergence between applications of the FS and MS. Method A1 proposes to keep the current practice and introduces no change to the RR. Method A2 proposes changes to the definitions to the FS, fixed station, mobile station and land station, as well as related provisions in the RR (Appendix **4**). Method A3 proposes changes to the definition of the FS and fixed station and other related provisions in the RR (Article **11** and Appendix **4**). Method A4 proposes modifications of Appendix **4** of the RR related to the FS without proposing any changes to the definitions. Under the general principles approach, the agenda item is addressed in terms of spectrum allocation principles. Two methods are proposed: Method B1 proposes to keep the current practice and introduces no change to the RR, and Method B2 proposes a WRC Resolution on "Principles for the allocation of frequency bands" complementing the existing provisions in the RR. Under Method B2 several different options are provided addressing issues in addition to the basic principles outlined above.

6/1.2/2 Background

Resolution **951 (Rev.WRC-07)** calls for studies to be undertaken to examine general allocation or procedural issues relating to general spectrum management solutions for enhancing the Radio Regulations (RR) to meet the demands of current, emerging and future radio applications, while taking into account existing services and usage.

There is a growing interest over a number of years to review current spectrum management practices because of a number of factors, including a trend towards convergence of radio technologies and increasing use of digital technologies. In order to ensure that spectrum regulation is keeping pace with this trend, whilst ensuring the effective and efficient use of spectrum and allowing the operation of radio systems to be free from harmful interference, ITU-R studies were initiated.

In spite of different definitions for the fixed and mobile (except aeronautical and maritime) services, in most frequency bands where one of the two services is allocated, the other one is also allocated. This may indicate that convergence is already achieved in the RR Table of Frequency Allocations, except in some frequency bands, where allocations to both services may be considered on a band-by-band basis by future WRCs, as required.

Approaches to address the agenda item

Two different approaches were identified with regard to addressing WRC-12 Agenda item 1.2.

In the first approach, the objectives of this agenda item are addressed in a specific manner in terms of radiocommunication services (terrestrial and space). This approach was further divided into the aspects of terrestrial service convergence, e.g. FS and MS, and space service convergence, e.g. FSS and MSS, taking into account the different provisions in the RR.

In the second approach, the objectives of this agenda item are addressed in a general manner in terms of general allocation principles.

It should be noted that these two approaches are not mutually exclusive.

6/1.2/3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R SM.1131, ITU-R SM.1132-2, ITU-R SM.1133 and ITU-R SM.1265-1.

ITU-R carried out several studies during the current study cycle. These studies reviewed the current regulatory framework with regard to the following aspects within the approach that addresses the objectives in a specific manner:

– terrestrial studies in relation to convergence (FS and LMS[1]);

– satellite convergence.

Considering the general analysis of the four options in Resolution **951 (Rev.WRC-07)**, these studies addressed the issue(s) of convergence (fixed and mobile services)[2] and how to reflect current and future technologies in the international spectrum regulatory framework. Convergence, in the context of one of these studies, refers to the way in which the same radio application operates under more than one radiocommunication service, particularly the FS and MS. Currently the FS and MS are defined according to the physical mobility of their stations, but with new and emerging technologies the distinction between stationary versus mobile is becoming less clear. Therefore the need or not to modify certain definitions related to the FS and/or MS in RR Article **1** is examined. Moreover, radio stations under the current definitions of the FS or MS were assessed to determine whether they are better defined based on the principle of radio station (transmitter or receiver) location being specified or unspecified rather than physical mobility. Any potential consequential changes in the RR, including coordination, notification and terrestrial assignment recording procedures were also assessed.

[1] It is understood, unless explicitly stated otherwise, that all references to the mobile service in this document exclude maritime and aeronautical mobile service.

[2] See Study 1 in Annex 1 of Report ITU-R SM.[WRC-12-AI-1.2].

Additionally, frequency bands above 30 MHz allocated to one or more of the FS, MS or BS are examined in order to evaluate if they could be allocated to all three services[3]. The condition for the "new" broadcasting allocations (either an allocation for the BS or a new composite service) is that they shall not be considered for planning and that the same procedures as for MS and FS should apply.

Studies related to satellite convergence were limited to FSS, BSS and MSS[4].

Further information regarding the studies is to be found in Report ITU-R SM.[WRC-12-A.I.-1.2]; some of these studies are ongoing and the Report is intended to be completed in 2011[5]. It has to be noted that not all of the studies led to the development of a method in section 6/1.2/5.

6/1.2/4 Analysis of the results of studies

There were contributions regarding the first approach which provide studies on two separate issues, convergence between terrestrial services and convergence between space services.

With regard to the second approach to address the agenda item (see section 6/1.2/2) in a general manner, ITU-R received other contributions.

The following considerations with regard to all solutions should be noted:

The WRC process to enhance specific parts of the Radio Regulations is well known and established. It provides means to discuss and study specific issues under specific agenda items. Agenda items are developed at the previous WRC based on proposals from administrations, and the final agenda is then established in accordance with No. 118 of the ITU Convention.

Furthermore, ITU-R is continuously conducting studies related to Questions on different radio service matters resulting in the development of ITU-R Recommendations, Reports or Handbooks that are not necessarily related to a WRC agenda item.

6/1.2/4.1 Result of studies with regard to convergence between terrestrial services (fixed and mobile)

An analysis of RR Article **5** shows that a joint allocation to the FS and MS is already in place in most cases. This condition appears to be necessary but may not be sufficient to accommodate convergence. Based on this analysis further assessments resulted in two proposed solutions to address issues related to convergence between terrestrial services. Any changes need to be undertaken with care to protect allocated services and ensure that coordination, notification and recording issues are addressed.

6/1.2/4.1.1 Results of the studies to modify the definition of the fixed service and fixed station

One solution considers a modification of the FS definition in RR Article **1** in order to clarify that between fixed stations, one remains at a specified fixed point, while the other(s) could be at a specified fixed point or at any fixed point in a specified area. This would address the case of point-to-area applications of the FS. In terms of notification process under RR Appendix **4**, the receiving area of fixed stations could be defined currently as a polygon. This solution proposes to allow notification of a circular receiving area similarly to the current possibilities for stations of the MS.

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[3] See Study 2 in Annex 1 of Report ITU-R SM.[WRC-12-AI-1.2].

[4] See Study 3 in Annex 2 of Report ITU-R SM.[WRC-12-AI-1.2].

[5] The Report is intended to be submitted to Study Group 1 for consideration and possible approval in its 2011 meeting.

This solution proposes also that, in bands not allocated to space services (space-to-Earth direction), notification provisions of a receiving fixed station at a specified fixed location for reception from transmitting fixed stations in an area are aligned with the notification provisions of receiving land stations (of the MS). Otherwise, the notification of transmitting fixed stations in an area remains on a specified location basis (i.e. with individual P-P transmission links).

This solution changes two definitions in RR Article **1** as well as one provision in RR Article **11** and related data items in RR Appendix **4** and is expected to have limited impact on the current software and database (e.g. TerRaSys).

It proposes the way the FS and fixed station definitions in the RR could be defined and applied while maintaining the existing overlap between applications of the FS and MS.

6/1.2/4.1.2 Results of the study to modify the definitions of the *fixed service, fixed station, mobile station,* and *land station*

A second solution considers the modification of the RR Article **1** definitions of *fixed service*, *fixed station, mobile station,* and *land station*. Under these revised definitions, radio applications involving stations that only operate at specified fixed points (known location with geographical coordinates) would fall under the FS, while radio applications involving stations that operate in motion or at unspecified locations would fall under the MS.

Coordination and notification procedures in the RR will have to be aligned to this distinction, as necessary.

In this context, radiocommunication systems under the FS would have to be coordinated and notified on a known location basis, whereas radiocommunication systems under the MS would have to be coordinated and notified on an area basis.

It is ensured that the proposed definition of mobile stations encompasses the use in motion and during halts at unspecified locations and, at the same time, captures stations which are stationary in nature but operating at unknown locations within a given area.

An analysis of the potential impact of this solution to the RR shows that there are some consequential changes or enhancements to other provisions of the RR (e.g. Appendix **4**) related to FS and MS that would be needed.

In addition, there will be a need to review the master register with regard to the recorded assignments to fixed stations that were notified with a receiving area.

It proposes the way the FS definition in the RR could be defined and applied by making a clear distinction whether applications fall under the FS or MS.

In most cases the sharing environment between terrestrial services and other services will not change. Nevertheless the sharing environment may improve for bands allocated to the FS and space services. The sharing environment for the MS remains unchanged. This solution will have an impact on some bands allocated to the FS only or allocated to the FS and MS with a different status and will impact also the current practice to notify a fixed receiving station on an area basis. It will have an impact on what types of applications could be classified as an FS.

6/1.2/4.1.3 Results of the study to keep the current definitions in RR Article 1 unchanged and modify RR Appendix 4

A third solution proposes, without changes to the definition of the FS in RR Article **1**, to modify Table 1 of Appendix **4** of the RR to ensure that fixed stations, transmitting or receiving, are at fixed specified points. As a consequence, notification of stations in the FS is limited to stations where geographical coordinates for each station can be submitted. Point-to-point and point-to-multipoint networks, with emissions in either direction, can be established when the specific location of each station can be notified, but transmitting or receiving stations without a specified location (e.g. fixed stations within a geographical area) cannot be notified within the FS.

This solution would require that radiocommunication systems under the FS would have to be coordinated and notified on a known location basis. This solution would involve no changes to RR Article **1**, would change some items in Appendix **4** of the RR and is expected to have limited impact on the current software and database structure (e.g. TerRaSys). However, there will be a need to review the master register with regard to the recorded assignments to fixed stations that were notified with a receiving area.

This solution intends to provide enhanced compatibility between the FS and other services sharing the band and ease notification of stations of other services by limiting the types of applications that can be included in future filings under the FS.

6/1.2/4.2 Results of studies with regard to space services (FSS, MSS and BSS)

One study examined the impact on space services from adding an additional FS, MS or BS allocation to the frequency bands that are already allocated to one or two of these terrestrial services and are also allocated to FSS or BSS.

The study concluded that this would need to be carried out on a case-by-case basis, in particular in frequency bands already allocated to FSS or BSS. In particular, obtaining technical compatibility between terrestrial and space services and coordination between them would be impractical when stations of terrestrial or space services or of both of them are intended to be deployed in a ubiquitous manner (e.g. MS in bands allocated to space services).

Another study examined the impact of adding an additional FSS, MSS or BSS allocation in a frequency band already allocated to one or two of these space services on terrestrial services.

This study concluded that it may introduce an additional burden on the terrestrial services in the frequency bands currently shared only with the FSS, in that they would need to accept interference from “typical” transmitting earth stations from anywhere within the service area of the MSS satellite network and would need to protect “typical” receiving earth stations located anywhere within the service area of the BSS and MSS satellite networks. This situation could be compared to the case of sharing with only the FSS, where such interference acceptance and protection is only with respect to “specific” FSS earth stations at specified locations.

The impact on the existing space service allocations from adding an additional FSS, MSS or BSS allocation to a frequency band, if that frequency band is already allocated to one or two of these space services, was also studied. This study noted that some applications in FSS, MSS and BSS allocations are fundamentally different in nature. Technical studies indicate that the consequence of adding allocations or merging definitions of FSS, BSS and/or MSS in the same band may lead to more inhomogeneous technical parameters and protection requirements within the same frequency band. This in turn would result in satellite networks with significantly different characteristics in the same frequency band which could lead to inefficient use of orbit spectrum resources and increased difficulties in the introduction of new satellite networks. Ultimately, this may adversely impact the future development of satellite networks in the existing satellite service over an added satellite service. Moreover, regulatory regimes, including coordination and notification procedures are different for the FSS, BSS and MSS, which lead to further difficulties.

Therefore the ITU-R study regarding satellite services recommends that there should be no changes to the satellite service definitions in response to WRC-12 Agenda item 1.2.

6/1.2/4.3 Considerations with regard to the impact of other solutions

6/1.2/4.3.1 Keeping the current practice

A solution applicable to both approaches (see section 6/1.2/2) is to keep the current practice (as developed in Option 1 to Resolution **951** (**Rev.WRC-07**)). Under this solution, it is considered that there is sufficient flexibility within the present Radio Regulations and the WRC process to meet any current or likely future requirements within the time-frame typically set forth for WRCs.

The current service definitions in RR Article **1** appear to have generally enabled the Radio Regulations to be adapted dynamically to latest technology evolution.

In spite of different definitions for the fixed and mobile (except aeronautical and maritime) services, in most frequency bands where one of the two services is allocated, the other one is also allocated. This may indicate that convergence is already achieved in the RR Table of Frequency Allocations, except in some frequency bands, where allocations to both services may be considered on a band-by-band basis by future WRCs, as required.

Under this solution no other changes in the RR provisions would be necessary to accommodate convergence and this solution considers also that national regulation may properly accommodate the changing environment.

6/1.2/4.3.2 Impact of a WRC Resolution on allocation principles

A solution that was considered was to propose a WRC Resolution, which encourages ways that may make future spectrum allocations more flexible and able to meet the needs of emerging applications and technologies, including consideration of making allocations to the broadest set of services. This solution could also provide a long-term framework for future allocations.

Nevertheless it should also be taken into account that this approach may have a prolonging effect due to the more complicated sharing studies, which may result in additional technical and regulatory restrictions in order to ensure compatibility with existing services.

6/1.2/5 Methods to satisfy the agenda item

In dealing with this agenda item any method aimed to provide technical and operational flexibility in relation with the enhancement of the international regulatory framework indicates its impact on the interference environment, if any, associated with that method.

The following methods are related to the two approaches (i.e. specific and general) as described in section 6/1.2/2. One or more of these methods could be applied or considered to satisfy this agenda item.

During the consideration of Agenda item 1.2, views were expressed on whether or not to include the advantages and disadvantages of each method, due to the broad scope this agenda item and its complexity.

After lengthy discussions, it was felt necessary by certain participants to include the advantages and disadvantages in the CPM Report. Other participants were of the view that the advantages and disadvantages included in the draft CPM text did not thoroughly reflect the situation and thus should not be included in the CPM Report.

In view of the above, it was felt appropriate to refer to the advantages and disadvantages contained in the relevant parts of the following documents for the information of the membership, as appropriate: Documents CPM11-2/39, 62, 103, 136 and 1B/267.

6/1.2/5.1 Issue A – Convergence between terrestrial services (fixed and mobile)

Issue A deals with methods to address convergence of applications of the FS and MS.

6/1.2/5.1.1 Method A1

This method proposes to keep the current practice (as developed in Option 1 to Resolution **951** (**Rev.WRC-07**)). This method also proposes no change under this agenda item to the RR. It retains the current definitions, including those for the FS and MS and associated station definitions, in RR Article **1** as it considers that the RR have been and are able to adapt to technology evolution. It is considered that there is sufficient flexibility within the present RR and the WRC process to meet any current or likely future requirements of the FS and MS within the time-frame typically set forth for WRCs.

6/1.2/5.1.2 Method A2

Method A2 proposes to modify existing definitions of the FS, fixed station, mobile station and land station in RR Article **1** to make a clear distinction between the MS and FS and their associated stations. Under these revised definitions, radio applications involving stations that operate in motion or at unspecified fixed locations would fall under the MS and radio applications involving stations that operate at specified fixed points would fall under the FS. Consequential changes are also proposed to RR Appendix **4**.

Additionally, in implementing this method, it may be necessary to consider changes to the current procedures of coordination and notification, as well as to include transitional arrangements to deal with existing assignments in the MIFR and possible modifications to the current BR database structure (see section 6/1.2/4.1).

6/1.2/5.1.3 Method A3

Method A3 proposes to modify the definitions of the FS and a fixed station in RR Article **1** to clarify that between two fixed stations, one of the two could be at a specified fixed point or at any fixed point in a specified area in order to address the case of point-to-area applications of the FS. In any case, the other one remains at a specified fixed point. This method proposes also to modify accordingly different provisions of the RR (RR No. **11.9**) and Table 1 of RR Appendix **4**. To meet convergence between FS and MS this method allows point-to-area systems to operate and be notified under the FS or the MS. However there is some limitation with respect to the use of the network topology under the FS.

Under this method, an area in which receiving fixed stations operate can be defined as a circular zone in addition to a polygon. This method proposes also that, in bands not allocated to space services (space-to-Earth direction), notification provisions of a receiving fixed station at a specified fixed location for reception from transmitting fixed stations in an area are aligned with the notification provisions of receiving land stations (of the MS). Otherwise, the notification of transmitting fixed stations in an area remains on a specified location basis (i.e. with individual P-P transmission links). Individual notices are also required for fixed stations concerned by the application of RR Nos. **21.2** and **21.4**.

Additionally, in implementing this method, it may be necessary to consider changes to the current procedures of coordination and notification, as well as to include transitional arrangements to deal with existing assignments in the MIFR and possible modifications to the current BR database structure (see section 6/1.2/4.1).

6/1.2/5.1.4 Method A4

Method A4 proposes without changes to the definition of the FS in RR Article **1** to modify Table 1 of RR Appendix **4** to ensure that fixed stations, transmitting or receiving, are at fixed specified points.

As a consequence, under this method, notification of stations in the FS is limited to stations where geographical coordinates for each station can be submitted. Point-to-point and point-to-multipoint networks, with emissions in either direction, can be established when the specific location of each station can be identified, but transmitting or receiving stations without a specified location (e.g. fixed stations within a geographical area) cannot be notified within the FS under this method.

Additionally, in implementing this method, it may be necessary to consider changes to the current procedures of coordination and notification, as well as to include transitional arrangements to deal with existing assignments in the MIFR and possible modifications to the current BR database structure (see section 6/1.2/4.1).

6/1.2/5.2 Issue B – General allocation issues

Issue B consists of proposals with regard to principles of allocating spectrum, which are intended to enhance the Radio Regulations.

6/1.2/5.2.1 Method B1

This method proposes to keep the current practice (as developed in Option 1 to Resolution **951** (**Rev.WRC-07**)). This method also proposes no change under this agenda item to the Radio Regulations. It considers that the RR have been and are able to adapt to technology evolution and it is considered that there is sufficient flexibility within the present RR and the WRC process to meet any current or likely future requirements within the time-frame typically set forth for WRCs.

It is also considered that national regulation may properly accommodate the changing environment.

6/1.2/5.2.2 Method B2

Method B2 proposes a WRC Resolution on additional principle(s) of allocating spectrum, so that whenever possible:

– frequency bands are allocated to the most broadly defined services[6] with a view to providing the maximum flexibility to administrations in spectrum use;

– frequency bands are allocated on a worldwide basis (aligned services, categories of service and frequency band limits in all Regions) taking into account the safety, technical, operational, economic and other relevant factors.

These additional principles complement the existing provisions in the RR such as equality of right to operate among different services of the same category in adjacent Regions, sub-Regions (see RR No. **4.8**).

This will also accommodate current or future requirements and enhance the international regulatory framework.

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[6] An example of relationship between radio services in terms of "broader and narrower definitions" is depicted in Figure 1 of Recommendation ITU-R SM.1133. However some administrations require further clarification with regard to the term "most broadly defined services", some other administrations are of the view that there is no need to further clarify the term "most broadly defined services". (This footnote is not part of Method B2.)

The example regulatory text for this method provides a Resolution with baseline principles for the allocation of frequency bands. There are two possible additions to the Resolution, shown as Options A and B in the Resolution, which are described below:

Option A invites WRC-15 to review the studies by ITU-R as a general matter and consider revision of the Radio Regulations as appropriate.

Option B proposes to review the use of footnotes indicating frequency bands for systems and applications in the Table of Frequency Allocations as well as consideration of this matter at future WRCs.

Method B2 provides these principles for consideration by administrations in developing their proposals under this agenda item as well as the possible additional options.

6/1.2/6 Regulatory and procedural considerations

6/1.2/6.1 Issue A – Convergence between terrestrial services (fixed and mobile)

6/1.2/6.1.1 Method A1

NOC to the Radio Regulations.

6/1.2/6.1.2 Method A2

ARTICLE 1

Terms and definitions

MOD

1.20 *fixed service:* A *radiocommunication service* between ~~specified fixed points~~*fixed stations*.

NOC

1.24 *mobile service:* A *radiocommunication service* between *mobile* and *land stations*, or between *mobile stations* (CV).

MOD

1.66 *fixed station:* A *station* that operates at a specified fixed point in the *fixed service*.

MOD

1.67 *mobile station:* A *station* in the *mobile service* ~~intended to be used~~that operates while in motion or ~~during halts~~ at unspecified fixed points.

MOD

1.69 *land station:* A *station* in the *mobile service* ~~not intended to be used while in motion~~that operates at a specified fixed point on land.

MOD

TABLE 1 OF ANNEX 1 TO APPENDIX 4

TABLE 1

Characteristics for terrestrial services

		Notice related to / **Description of data items and requirements**								
…										
5		**LOCATION OF THE RECEIVING ANTENNA(S)**								
5.1	**5A**	the name of the locality by which the receiving station is known or in which it is situated In the case of a transmitting station, required for an associated receiving station in the fixed service ~~if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5A**
5.2	**5B**	the code of the geographical area in which the receiving station(s) is located (see the Preface) In the case of a transmitting station, required for an associated receiving station in the fixed service ~~if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5B**
5.3	**5C**	the geographical coordinates of the site of the receiving station Latitude and longitude are provided in degrees, minutes and seconds In the case of a transmitting station, required for an associated receiving station in the fixed service ~~if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5C**

		Notice related to / Description of data items and requirements								
5.4		**For an area in which receiving stations operate:**								
5.4.1	**5CA**	the geographical coordinates of a given reception zone A minimum of 3 geographical coordinates are to be provided. All geographical coordinates (latitude and longitude) are provided in degrees, minutes and seconds ~~For an associated receiving station in the fixed service, required if the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) are not provided~~ For all ~~other~~ services, except <u>the fixed service or</u> where the assignment is subject to the GE06 Agreement, required if neither a circular area (5E and 5F) nor a geographical area or standard defined area of reception (5D) is provided			+					**5CA**
…										

6/1.2/6.1.3 Method A3

ARTICLE 1

Terms and definitions

MOD

1.20 *fixed service:* A *radiocommunication service* between a *fixed station* at a specified fixed point~~s~~ and one or more fixed stations at given locations; a given location may be a specified fixed point or any fixed point within a specified area.

MOD

1.66 *fixed station:* A *station* that operates at a fixed point in the *fixed service*.

ARTICLE 11

Notification and recording of frequency assignments

MOD

11.9 Similar notification shall be made for a frequency assignment to a receiving earth station or space station, or to a receiving high altitude platform station in the fixed service using the bands mentioned in Nos. **5.543A** and **5.552A** or to a land station for reception from mobile stations or, for bands not allocated in Article **5** to space services in the space-to-Earth direction of transmission, to a fixed station for reception from multiple fixed stations[1],
when: (WRC-~~07~~12)

ADD

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1 **11.9.1** For the conditions mentioned in No. **21.2** or No. **21.4** or in frequency bands allocated to space services (space-to-Earth), individual notices of frequency assignments of fixed stations are necessary.

MOD

TABLE 1 OF ANNEX 1 TO APPENDIX 4

TABLE 1

Characteristics for terrestrial services

		Notice related to **Description of data items and requirements**								
...										
4.7		**For an area in which transmitting stations operate:**								
4.7.1	**4CC**	the geographical coordinates of the centre of the circular zone, in which mobile transmittin stations associated with a receiving land station, or transmitting fixed stations at an unspecified location associated with the same receiving fixed station or a typical transmitting station are operating Latitude and longitude are provided in degrees, minutes and seconds In the case of a receiving land station, or receiving fixed stations from stations at fixed point within a specified area, required: – for the maritime radionavigation service; and – for other services if neither the code of a geographical area or standard defined area (4E) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided In the case of a typical transmitting station, required if neither a geographical area or standard defined area (4E) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided				+	+			**4CC**

		Notice related to / Description of data items and requirements								
4.7.2	**4D**	the nominal radius, in km, of the circular zone, in which mobile transmitting stations associated with a receiving land station, or transmitting fixed stations at an unspecified location associated with the same receiving fixed station or a typical transmitting station are operating In the case of a receiving land station, or receiving fixed stations from stations at fixed point within a specified area, required: – for the maritime radionavigation service; and – for other services if neither the code of a geographical area or standard defined area (4E) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided In the case of a typical transmitting station, required if neither a geographical area or standard defined area (4E) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided				+	+			**4D**
4.7.3	**4E**	the code of the geographical area or standard defined area (see the Preface) *Note* – The standard defined area for a receiving land station in the maritime mobile service may be a maritime zone. The standard defined area for a maritime mobile frequency allotment is the allotment area In the case of a receiving land station or receiving fixed station from stations at a fixed point within a specified area, for all services, except the maritime radionavigation service, required if neither a circular zone (4CC and 4D) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided In the case of a typical transmitting station, required if neither a circular zone (4CC and 4D) nor the geographical coordinates of a given emission zone (4F) is ~~not~~ provided				+	+	**X**		**4E**

		Notice related to / Description of data items and requirements								
4.7.4	**4F**	the geographical coordinates of a given emission zone in which mobile transmitting stations associated with a receiving land station, or transmitting fixed stations at an unspecified location associated with receiving fixed station or a typical transmitting station are operating A minimum of 3 geographical coordinates are to be provided. All geographical coordinates (latitude and longitude) are provided in degrees, minutes and seconds In the case of a receiving land station, or a receiving fixed station from stations at an unspecified fixed point within a specified area, required for all services other than the maritime radionavigation service if neither the code of a geographical area or standard defined area (4E) nor a circular zone (4CC and 4D) is provided In the case of a typical transmitting station, required if neither a geographical area or standard defined area (4E) nor circular zone (4CC and 4D) is provided				±	±			**4F**
...										
5		**LOCATION OF THE RECEIVING ANTENNA(S)**								
5.1	**5A**	the name of the locality by which the receiving station is known or in which it is situated In the case of a transmitting station, required for an associated receiving station in the fixed service if neither the geographical coordinates of a given reception zone (5CA) nor a circular receiving area (5E and 5F) nor the code of the geographical area or standard defined area of reception (5D) are ~~not~~ provided			+	**X**				**5A**
5.2	**5B**	the code of the geographical area in which the receiving station(s) is located (see the Preface) In the case of a transmitting station, required for an associated receiving station in the fixed service if neither the geographical coordinates of a given reception zone (5CA) nor a circular receiving area (5E and 5F) nor the code of the geographical area or standard defined area of reception (5D) are ~~not~~ provided			+	**X**				**5B**

		Notice related to / Description of data items and requirements								
5.3	**5C**	the geographical coordinates of the site of the receiving station Latitude and longitude are provided in degrees, minutes and seconds In the case of a transmitting station, required for an associated receiving station in the fixed service if neither the geographical coordinates of a given reception zone (5CA) nor a circular receiving area (5E and 5F) nor the code of a geographical area or standard defined area of reception (5D) are ~~not~~ provided			+	**X**				**5C**
5.4		**For an area in which receiving stations operate:**								
5.4.1	**5CA**	the geographical coordinates of a given reception zone A minimum of 3 geographical coordinates are to be provided. All geographical coordinates (latitude and longitude) are provided in degrees, minutes and seconds For an associated receiving station in the fixed service, required if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) nor a circular receiving area (5E and 5F) nor a geographical area or standard defined area of reception (5D) are ~~not~~ provided For all other services, except where the assignment is subject to the GE06 Agreement, required if neither a circular area (5E and 5F) nor a geographical area or standard defined area of reception (5D) is provided			+					**5CA**

		Notice related to / Description of data items and requirements								
5.4.2	**5D**	the code of the geographical area or standard defined area of reception (see the Preface) *Note* – The standard defined area of a transmitting station may be represented by a maritime zone or aeronautical zone. The standard defined area of a maritime mobile frequency allotment is a maritime zone. The standard defined area of an HF broadcasting station subject to Article **12** is represented by a CIRAF zone In the case of a transmitting station, except transmitting stations in the ~~fixed service,~~ maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement, required if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed stations nor a circular receiving area (5E and 5F) nor geographical coordinates of a given reception zone (5CA) is provided			+			**X**	**X**	**5D**
5.4.3	**5E**	the geographical coordinates of the centre of the circular receiving area Latitude and longitude are provided in degrees, minutes and seconds Required: – for the maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement; and – for all other services~~, except the fixed service~~, if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed stations nor a geographical area or standard defined area of reception (5D) nor the geographical coordinates of a given reception zone (5CA) is provided			+					**5E**

		Notice related to / Description of data items and requirements								
5.4.4	**5F**	the radius, in km, of the circular receiving area Required: – for the maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement; and – for all other services~~, except the fixed service~~, if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed stations nor the geographical area or standard defined area of reception (5D) nor the geographical coordinates of a given reception zone (5CA) is provided			+					**5F**
...										
8		**POWER CHARACTERISTICS**								
...										
8.3	**8AA**	the power delivered to the antenna, in dBW In the case of a transmitting station, required for an assignment: – in the bands below 28 MHz, in all services except the radionavigation service; or – in the bands above 28 MHz shared with space services; or – in the bands above 28 MHz not shared with space services: – in the aeronautical mobile service, meteorological aids service; or – in all other services, if the radiated power is not supplied In the case of a receiving land station or a receiving fixed station from stations at a fixed point within a specified area, required if the associated transmitting station's radiated power is not supplied In the case of a typical transmitting station, required if the radiated power is not supplied			+	+	+	**X**		**8AA**
...										

		Notice related to **Description of data items and requirements**								
8.5	**8AC**	the maximum power density (dB(W/Hz)) averaged over the worst 4 kHz band, calculated for the maximum effective radiated power *Note* – For a receiving land station or a receiving fixed station from stations at a fixed point within a specified area, the maximum power density refers to the associated transmitting station In the case of a VHF/UHF broadcasting station, required for assignments subject to § 5.1.3 of the GE06 Regional Agreement In the case of a transmitting station, a receiving land station, or a typical transmitting station, required for assignments subject to the GE06 Regional Agreement	+		+	+	+			**8AC**
...										
12		**OPERATING ADMINISTRATION OR AGENCY**								
...										
12.2	**12B**	the symbol for the address of the administration responsible for the station and to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the circuit (see Article **15**, also the Preface) In the case of a VHF/UHF broadcasting station, transmitting station, or a receiving land station or a receiving fixed station from stations at a fixed point within a specified area, required for application of Article **11**	+	**X**	+	+	**X**		**X**	**12B**
...										

6/1.2/6.1.4 Method A4

MOD

TABLE 1 OF ANNEX 1 TO APPENDIX 4

TABLE 1

Characteristics for terrestrial services

		Notice related to / **Description of data items and requirements**								
...										
5		**LOCATION OF THE RECEIVING ANTENNA(S)**								
5.1	**5A**	the name of the locality by which the receiving station is known or in which it is situated In the case of a transmitting station, required for an associated receiving station in the fixed service~~ if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5A**
5.2	**5B**	the code of the geographical area in which the receiving station(s) is located (see the Preface) In the case of a transmitting station, required for an associated receiving station in the fixed service~~ if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5B**
5.3	**5C**	the geographical coordinates of the site of the receiving station Latitude and longitude are provided in degrees, minutes and seconds In the case of a transmitting station, required for an associated receiving station in the fixed service~~ if the geographical coordinates of a given reception zone (5CA) are not provided~~			+	**X**				**5C**

		Notice related to / Description of data items and requirements								
5.4		**For an area in which receiving stations operate:**								
5.4.1	**5CA**	the geographical coordinates of a given reception zone A minimum of 3 geographical coordinates are to be provided. All geographical coordinates (latitude and longitude) are provided in degrees, minutes and seconds ~~For an associated receiving station in the fixed service, required if the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) are not provided~~ For all ~~other~~ services, except the fixed service and except where the assignment is subject to the GE06 Agreement, required if neither a circular area (5E and 5F) nor a geographical area or standard defined area of reception (5D) is provided			+					**5CA**
5.4.2	**5D**	the code of the geographical area or standard defined area of reception (see the Preface) *Note* – The standard defined area of a transmitting station may be represented by a maritime zone or aeronautical zone. The standard defined area of a maritime mobile frequency allotment is a maritime zone. The standard defined area of an HF broadcasting station subject to Article **12** is represented by a CIRAF zone In the case of a transmitting station, except transmitting stations in the ~~fixed service,~~ maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement, required if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed stations nor a circular receiving area (5E and 5F) nor geographical coordinates of a given reception zone (5CA) is provided			+			**X**	**X**	**5D**

		Notice related to / Description of data items and requirements								
5.4.3	**5E**	the geographical coordinates of the centre of the circular receiving area Latitude and longitude are provided in degrees, minutes and seconds Required: – for the maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement; and – for all other services~~, except the fixed service~~, if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed station nor a geographical area or standard defined area of reception (5D) nor the geographical coordinates of a given reception zone (5CA) is provided			+					**5E**
5.4.4	**5F**	the radius, in km, of the circular receiving area Required: – for the maritime radionavigation service, aeronautical radionavigation service subject to the GE85-MM-R1 Regional Agreement or the maritime mobile service subject to the GE85-MM-R1 Regional Agreement; and – for all other services~~, except the fixed service~~, if neither the name of the locality (5A), geographical area (5B) and geographical coordinates (5C) for fixed station nor the geographical area or standard defined area of reception (5D) nor the geographical coordinates of a given reception zone (5CA) is provided			+					**5F**
...										
8		**POWER CHARACTERISTICS**								
...										

		Notice related to **Description of data items and requirements**								
8.3	**8AA**	the power delivered to the antenna, in dBW In the case of a transmitting station, required for an assignment: – in the bands below 28 MHz, in all services except the radionavigation service; or – in the bands above 28 MHz shared with space services; or – in the bands above 28 MHz not shared with space services: – in the aeronautical mobile service, meteorological aids service; or – in all other services, if the radiated power is not supplied In the case of a receiving land station or a receiving fixed station from stations at a fixed point within a specified area, required if the associated transmitting station's radiated power is not supplied In the case of a typical transmitting station, required if the radiated power is not supplied			+	+	+	**X**		**8AA**
...										
8.5	**8AC**	the maximum power density (dB(W/Hz)) averaged over the worst 4 kHz band, calculated for the maximum effective radiated power *Note* – For a receiving land station or a receiving fixed station from stations at a fixed point within a specified area, the maximum power density refers to the associated transmitting station In the case of a VHF/UHF broadcasting station, required for assignments subject to § 5.1.3 of the GE06 Regional Agreement In the case of a transmitting station, a receiving land station, or a typical transmitting station, required for assignments subject to the GE06 Regional Agreement	+		+	+	+			**8AC**
...										
12		**OPERATING ADMINISTRATION OR AGENCY**								
...										

		Notice related to / **Description of data items and requirements**								
12.2	**12B**	the symbol for the address of the administration responsible for the station and to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the circuit (see Article **15**, also the Preface) In the case of a VHF/UHF broadcasting station, transmitting station, or a receiving land station or receiving fixed station from stations at fixed point within a specified area, required for application of Article **11**	+	**X**	+	+	**X**		**X**	**12B**
...										

6/1.2/6.2 Issue B – General allocation issues

6/1.2/6.2.1 Method B1

NOC to the Radio Regulations.

6/1.2/6.2.2 Method B2

SUP

RECOMMENDATION 34 (WRC-95)

Principles for the allocation of frequency bands

ADD

DRAFT RESOLUTION [A12-B2] (WRC-12)

Principles for the allocation of frequency bands

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that ITU should maintain an international Table of Frequency Allocations covering the usable radio-frequency spectrum;

b) that it may be desirable, in certain cases, to allocate frequency bands to the most broadly defined services of Article **1** and adopt associated regulatory provisions in order to improve flexibility of use but without detriment to other services;

c) that the development of common worldwide allocations is desirable in order to improve and harmonize utilization of the radio-frequency spectrum;

d) that adherence to these principles for the allocation of spectrum will allow the Table of Frequency Allocations to focus on matters of regulatory significance while enabling greater flexibility in spectrum use;

e) that ITU should promote the introduction of new applications to address issues such as emerging technologies, climate change (e.g. collection of Earth observation data), disaster management and other socio-economic matters;

f) that flexibility and harmonization of spectrum usage are important factors to support bridging the digital divide and bringing the benefits of ICTs to all citizens;

g) that ensuring connectivity to schools, rural communities and health facilities is vital to economic development and to making effective use of ICTs and that increased deployment of affordable broadband will help facilitate this;

h) that wireless applications, either terrestrial or satellite, are often the most cost-effective and practicable means of delivering advanced ICT in many countries;

i) that satellite systems and networks can provide wireless broadband applications, including meeting the particular needs of developing countries and providing emergency and disaster recovery communications;

j) that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;

Editor's Note: Option B

k) that the footnote to the Table of Frequency Allocations, *inter alia*, refers to allocation of frequency bands to services, and in certain cases refers to the use of the frequency band for systems and applications,

Editor's Note: End of Option B

further considering

a) that many radiocommunication stations and systems today are capable of and provide more than one radiocommunication service and that this convergence of radiocommunication applications operating from a single station on the same frequency or different frequencies is expected to grow;

b) that the convergence of multiple radiocommunication applications operating from a single station may warrant the consideration of new service definitions or modification of existing service definitions if they do not adequately support this convergence,

recognizing

a) that in adjacent Regions, sub-Regions or countries, when a frequency band is allocated to different services of the same category, the basic principle is the equality of right to operate among different services of the same category (see No. **4.8**);

b) that the limitation of the use of footnotes to allocate frequency bands to services and effective guidelines for addition, modification and deletion of footnotes are defined by Resolution **26 (Rev.WRC-07)**;

c) that previous conferences have adopted regulatory provisions, including on an interim or provisional basis, to allow implementation of emerging technologies in an expeditious manner taking into account existing services,

resolves to invite future world radiocommunication conferences

1 to allocate, wherever possible, frequency bands to the most broadly defined services and adopt associated regulatory provisions, if needed, with a view to providing the maximum flexibility to administrations in spectrum use, taking into account all relevant factors, including safety, technical (including compatibility and sharing studies), operational, and economic elements;

Editor's Note: for broadly defined services see Footnote 6 in section 6/1.2/5.2.2

2 to allocate, wherever possible, frequency bands on a worldwide basis (aligned services, categories of service and frequency-band limits) taking into account all relevant factors, including appropriate regulatory provisions between Regions, safety, technical (including compatibility and sharing studies), operational, and economic elements;

3 to allocate frequency bands by including the name of a service in the Table of Frequency Allocations of Article **5** and to the extent possible not by footnotes;

4 to take into account relevant studies by the Radiocommunication Sector including report(s) of the relevant Conference Preparatory Meeting(s) (CPM) and technical and operational developments, forecasts and usages contributed by the members in applying *resolves* 1, 2 and 3;

5 to take into account the use of radiocommunications in achieving national, regional and global priorities, including relevant ITU Plenipotentiary Conference and WRC Resolutions on addressing the digital divide, emerging technologies, climate change (e.g. collection of Earth observation data), disaster management and other socio-economic issues;

Editor's Note: Option B

6 to review the use of footnotes indicating frequency bands for systems and applications,

invites ITU-R

1 to identify areas for study and to undertake the studies necessary to determine the impact on existing services of those agenda items of future competent world radiocommunication conferences which involve broadening the scope of existing service allocations;

2 when carrying out technical studies relating to a frequency band, to examine the compatibility of a broadly defined service with the existing utilizations and the possibility of aligning allocations on a worldwide basis, having regard to *considering a)* to *k),* and *resolves* 1 to 6 above;

3 to report the results of these studies, through the Director of the Bureau, to future world radiocommunication conferences,

Editor's Note: End of Option B

Editor's Note: Option A

resolves to invite WRC-15

1 to review the results of studies called for under *resolves to invite ITU-R* and consider revision of the Radio Regulations as appropriate,

resolves to invite ITU-R

to conduct technical, regulatory and operational studies on appropriate application of the principles outlined in *resolves* with a view towards facilitating introduction of new wireless technologies and applications,

Editor's Note: End of Option A

invites administrations

to take account of this Resolution when making proposals to the competent world radiocommunication conference,

instructs the Secretary-General

to communicate this Resolution to ICAO, IMO, WMO and other international organizations concerned.

AGENDA ITEM 1.19

*1.19 to consider regulatory measures and their relevance, in order to enable the introduction of software-defined radio and cognitive radio systems, based on the results of ITU-R studies, in accordance with Resolution **956 (WRC-07)**;*

Resolution **956 (WRC-07)**: *Regulatory measures and their relevance to enable the introduction of software-defined radio and cognitive radio systems*

6/1.19/1 Executive summary

After the review and analysis of the agenda item, it was concluded that there is no need to modify the Radio Regulations for the implementation of software-defined radios (Method A). For cognitive radio systems, there were two views. The first view was that no changes were needed to the Radio Regulations (Method B1 Option A); however, there is an option to develop an ITU-R Resolution to provide guidance to the ITU-R for future studies on cognitive radio systems (Method B1 Option B). The second view (Method B2) supported the development of a WRC Resolution to provide guidance for future studies and guidance for the implementation of cognitive radio systems and with no further changes to the Radio Regulations. All methods support the suppression of Resolution **956 (WRC-07)**.

6/1.19/2 Background

Resolution **956** (**WRC-07**) resolves to invite the ITU-R to study whether there is a need for regulatory measures related to the application of software defined radio (SDR) and cognitive radio system (CRS) technologies.

SDR and CRS technologies are expected to provide additional flexibility and offer improved efficiency to the overall spectrum use. These technologies can be combined or can be deployed independently and can be implemented in systems of any radiocommunication service and the RAS. Any system that uses SDR or CRS technologies must operate in accordance with the provisions of the Radio Regulations.

The implementation of SDR and CRS may introduce specific and unique challenges of a technical or operational nature.

SDR technology is currently operating in some systems and networks in the LMS, MMS, BS, BSS, FSS and MSS. It offers flexibility in radio system design and may help with forward compatibility.

Cognitive radio systems are a field of research activity and applications are under study and trial. Systems which use some cognitive features have already been deployed and some administrations are authorizing these systems. These administrations have national equipment approval processes to protect existing services from harmful interference. A radio system implementing CRS technology may, however, have an impact on neighbouring countries and coordination may be needed. Should there be applications in which CRS technology is implemented on a non-interference and non-protection basis, the concerned administration should desirably satisfy itself that interference will not be actually generated.

The implementation of CRS technology towards its full-fledged concept may progress stepwise due to a number of technical challenges coupled with the current state of the technology. The CRS technology may also provide additional capabilities to radiocommunication systems, such as dynamic spectrum access.

6/1.19/3 Summary of technical and operational studies and relevant ITU-R Recommendations

The following definitions for SDR and CRS have been proposed within the ITU-R and published in Report ITU-R SM.2152.

*“**Software-defined radio (SDR)** is a radio transmitter and/or receiver employing a technology that allows the RF operating parameters including, but not limited to, frequency range, modulation type, or output power to be set or altered by software, excluding changes to operating parameters which occur during the normal pre-installed and predetermined operation of a radio according to a system specification or standard.”*

*“**Cognitive radio system (CRS)** is a radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained.”*

The studies have identified important aspects related to the introduction of SDR and CRS. In the case of LMS, spectrum is getting congested, e.g. due to the rapidly increasing Internet/data traffic and the need of broader bandwidth. CRS technologies may yield significant benefits by providing increased spectral efficiency of existing spectrum and mitigate the problem of congestion (e.g. capacity gain). IMT systems may, for example, in the future employ CRS and utilize the benefits of CRS such as mitigation of congested spectrum usage.

A common concern within the ITU-R is the protection of existing services from potential interference from the services implementing CRS technology, especially from the dynamic spectrum access capability of CRS.

In addition, a service using SDR and/or CRS should not adversely affect other services in the same band with the same or higher status. Thus, the introduction and operation of stations using SDR and/or CRS technologies in systems of any radiocommunication service should not impose any additional constraints to other services sharing the band.

For example, the introduction of SDR and/or CRS in a frequency band(s) shared between terrestrial and space services should not adversely affect either of these services by either imposing any additional constraints to the operation of terrestrial or space services.

Any system of a specific service using SDR and/or CRS in a frequency band allocated to that service should be operated in accordance with the provisions of the Radio Regulations and administration rules governing the use of the bands and the protection criteria defined in the relevant ITU-R Recommendations.

Relevant ITU-R Recommendations: ITU-R F.1094, ITU-R F.1108, ITU-R F.1190, ITU-R F.1495, ITU-R S.523, ITU-R S.671, ITU-R S.735, ITU-R S.1323, ITU-R S.1432, ITU-R M.1313, ITU-R M.1460, ITU-R M.1461, ITU-R M.1462, ITU-R M.1463, ITU-R M.1464, ITU-R M.1465, ITU-R M.1466, ITU-R M.1638, ITU-R M.1644, ITU-R M.1652, ITU-R M.1849, ITU-R BS.412, ITU-R BT.655, ITU-R BT.1368, ITU-R BO.1297, ITU-R BO.1444, ITU-R M.687, ITU-R M.1073, ITU-R M.1388, ITU-R SM.851, ITU-R M.1183, ITU-R M.1231, ITU-R M.1232, ITU-R M.1234, ITU-R M.1478, ITU-R SA.609, ITU-R SA.1157, ITU-R SA.1155, ITU-R SA.1396, ITU-R SA.363, ITU-R BO.1773, ITU-R RS.1263, ITU-R SA.514, ITU-R SA.1026, ITU-R SA.1160, ITU-R SA.1163, ITU-R RS.1029, ITU-R RS.1166, ITU-R RA.769, ITU-R BS.1660, ITU-R BS.216, ITU-R BS.1786, ITU-R BT.1786 and ITU-R BS.560 and any other future relevant Recommendation providing new protection criteria being developed and in force at the time of consideration of SDR and/or CRS stations. In reality, the obligation to respect an ITU-R

Recommendation not incorporated by reference in the RR is dependent upon whether its text is reflected in the various national spectrum management policies.

Relevant ITU-R Reports: ITU-R M.2115, ITU-R M.2117, ITU-R SM.2152, ITU-R [LMS.CRS].

6/1.19/3.1 Issue A: SDR

Report ITU-R M.2117 identified two specific issues that appear to be independent of the type of the radiocommunication service:

i) An SDR station, part of any system in a radiocommunication service, can be remotely reprogrammed and can gain the capability to transmit within a frequency band in which there is no allocation to the radiocommunication services under which it normally operates or there is an allocation to the radiocommunication service under which it operates but there is no assignment[7] of radio frequency or radio frequency channel for this SDR station.

ii) Issues related to SDR software to ensure that the station operates within its allowable parameters (e.g. in-band and unwanted emission levels) to avoid harmful interference.

The above issues are related to the particular hardware and software implementation and software reliability and security.

Software reliability and security relate to the risk for harmful interference and/or unauthorized use of frequency bands resulting from intentional or unintentional behaviour of the software running on a SDR station. It is important to note that a risk of the same nature exists with hardware defined radio despite established national certification/licensing regime for radio stations, allowing the verification of the compliance with the existing rules (both national and international) post manufacturing and prior to the date of bringing into use of the radio station. SDRs allow a level of security against unauthorized manipulation comparable to that of previous generation radios. Moreover, relevant authorities will have to assess the risks associated with possibility of simultaneous unauthorized manipulation of multiple-SDR networks.

6/1.19/3.2 Issue B: CRS

Studies within the ITU-R consider various scenarios for the use of CRS technology.

Within ITU-R, Report ITU-R [LMS.CRS] is being developed. This Report includes descriptions of applications of cognitive radio systems and gives several possible deployment scenarios.

CRS may be implemented in radio systems in a specific radiocommunication service operating in a band or several bands or may be implemented in radio systems in a specific radiocommunication service that share the band with other radio systems in any radiocommunication service.

6/1.19/3.2.1 Deployment scenarios

The following possible scenarios for CRS, which are not exhaustive, nor mutually exclusive, have been identified:

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[7] In this context, assignment has the same meaning as the one given in RR No. **1.18**.

6/1.19/3.2.1.1 Use of CRS technology to guide reconfiguration of connections between terminals and multiple radio systems[8]

In this scenario, multiple radio systems employing different radio access technologies are deployed on different frequencies to provide wireless access.

Two possible examples of this scenario are identified.

In one example, some terminals are reconfigurable and can adjust their operational parameters and protocols to use different radio access technologies. Such terminals can autonomously make decisions on these adjustments based on obtained knowledge required for making these decisions. Also, radio systems may assist terminals in obtaining knowledge and guide terminals in their reconfiguration decisions (e.g. using Cognitive Pilot Channel (CPC)).

In another example, some terminals have the capability to communicate with different radio systems, e.g. based on the subscriptions, but they cannot reconfigure their operational parameters and protocols to use different radio access technologies. Additional stations can be deployed to serve as a bridge between multiple radio systems and terminals. Such stations can obtain knowledge about the operational environment, and adjust their operational parameters and protocols to connect to one or more different radio systems simultaneously while providing connection to terminals using one radio access technology.

6/1.19/3.2.1.2 Use of CRS technology by an operator of radiocommunication systems to improve the management of its assigned spectrum resources[8]

To illustrate this scenario, consider an operator who already owns a network and operates in assigned spectrum and decides to deploy another network, based on a new generation radio interface technology in the same or other assigned spectrum, covering the same geographical area. Taking into consideration the non-uniform nature of radiocommunication needs within this area, an operator having more than one network based on different radio technologies could dynamically and jointly manage the deployed resources, in order to adapt the configuration of the networks to maximize the overall network capacity.

6/1.19/3.2.1.3 Use of CRS technology as an enabler of cooperative spectrum access[8]

In this scenario, information on spectrum use is exchanged amongst the systems in order to avoid mutual interference.

Two examples are identified for cooperative spectrum access:

– Example one: there may be variations in the occupancy of the assigned spectrum in a specific location at a specific time. Thus, in order to improve the efficiency of the spectrum use, it may be possible to take advantage of parts of the unused spectrum resulting from these variations. The capability to predict these variations in advance or to exchange information amongst systems/networks on the usage of their respective assigned spectrum may allow operators to share their respective assigned spectrum resources.

– Example two: in a network (public or private), the base stations are deployed according to the operator plan; such plan in many cases leaves coverage holes and areas lacking capacity. These cases may be solved by deploying additional base stations using CRS technology managed by the same operator or by new entrant operators, when allowed

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[8] The extent to which this scenario can be implemented is dependent on the national and international regulations governing the use of the spectrum.

by regulator body. In fact such networks may suffer from mutual interference due to the fact that they are using the same frequency band. The CRS technology may allow collaboration between these networks to resolve the interference issue.

6/1.19/3.2.1.4 Use of CRS technology as an enabler of opportunistic spectrum access[8]

In this scenario, information on spectrum use aimed to avoid mutual interference is not exchanged amongst the systems.

Compared to example one of the previous scenario, in this scenario there is no "*a priori*" determination of the spectrum to be eventually accessed by an interested party. In this scenario CRS may access parts of unused spectrum in bands shared with other radio systems without causing harmful interference. In this case, the selection of the spectrum to be eventually accessed is made on a real time basis following, amongst other things, a radio scene analysis.

6/1.19/3.2.2 CRS challenges and opportunities

Administrations considering the introduction of CRS technology to enable dynamic spectrum access may benefit from detailed considerations of operating characteristics of the incumbent stations. In particular the protection requirements for stations of any radiocommunication service and the RAS with an allocation in the targeted band should be considered to ensure an environment free of harmful interference, especially when the CRS technology only relies on a spectrum sensing technique to identify the use of the band(s).

Some concerns were expressed with respect to the use of the CRS technology to dynamically access the spectrum.

Spectrum exclusively allocated to passive services, where stations are only receiving could be a concern when considering the use of CRS for dynamic spectrum access. Another concern expressed by satellite operators in the EESS using passive sensors is the possibility of CRS attempting to operate in bands not exclusively allocated to passive services (RAS, SRS (passive) or EESS (passive)) on a worldwide basis, as such systems could identify those bands as free of any other active system and therefore ideal for usage. Furthermore, the SRS and EESS operate satellite links in frequency bands shared with other services. If one of these services plans to implement CRS technology, it will be necessary to take into account the regular but quasi sporadic operation of these links. For example, an EESS earth station may track a satellite in a low-Earth orbit. The satellite would then start transmitting towards the Earth station as soon as it has reached an elevation of typically 5 degrees above the local horizon. Any CRS station operating as part of the other services sharing the frequency band may have sensed that the particular frequency channel of the satellite link is unused and have occupied it. CRS stations might still cause harmful interference to the EESS station sharing the same frequency band. Similarly, some administrations have established local quiet or coordination zones around their radio astronomy stations, restricting emissions at frequencies outside the usually-allocated passive service bands. CRS relying on spectrum-sensing alone might misinterpret the lack of signal in locally-protected radio astronomy bands. Therefore, CRS may require both geo-location capabilities and knowledge of local spectrum regulations. In addition, all emissions, including those of CRS stations, are prohibited in passive bands listed in RR No. **5.340**.

CRS using dynamic frequency search operations in the FSS or BSS bands will need to consider that many earth terminals do not transmit continuously or are receive-only terminals and the downlink signals are at low power flux-densities. The detection of FSS and BSS receivers by a CRS may represent technical issues that may need to be studied. The use of data bases that would contain the locations and frequencies of the earth terminals could be a solution, especially in countries where the number of earth stations is not very large and the required information could be collected.

However, in countries where the deployment is ubiquitous and where the location of an earth station may be temporary, the use of database is challenging. Furthermore, the data base may need to contain information that an FSS/BSS operator would consider sensitive and not want to disclose.

Other satellite services (e.g. EESS, RDSS, MetSat and MSS) that use downlink receive-only terminals or have low power signals will also need special consideration and studies for the implementation of CRS. In addition it should be noted that RNSS is fully operational at all times in all locations on Earth and CRS devices that dynamically search for spectrum do not appear to be appropriate for use in RNSS frequency bands.

The BS could be susceptible to interference resulting from the application of CRS technology. The BS is often planned on a noise-limited basis. As such, broadcast receivers are expected and are frequently called upon to operate at or near noise limits. Consequently, the non-detection of a broadcast signal by a sensing device in one location may not indicate that a frequency allocated to the BS is available for other users. Furthermore, broadcast receivers are particularly sensitive to interference from signals in adjacent, multiple adjacent, local oscillator and image channels. However, some administrations have demonstrated compatibility and authorized the use of available spectrum in the UHF bands through licence-exempt devices which operate on a non-interference and non-protection basis. The use of a geo-location capability and capability to access a database enables CRS to avoid interference with other users in the TV UHF band.

Frequency bands allocated to the BS are also utilized by electronic news gathering (ENG) systems such as wireless audio and video transceivers. The use of cognitive techniques to locate these ENG devices and to avoid their operating frequencies may be difficult. However, these difficulties may be addressed by administrations.

Any use of SDR or CRS technologies in bands used for safety-of-life operations needs careful consideration.

Fading and shadowing effects may result in the hidden node problem, in which CRS stations/terminals may not be able to detect the presence of a protected station, and hence bring interference to them. A database solution, in which the location information of the protected stations as well as other data will be employed, is one of the possible choices to avoid the hidden node problem.

These issues need to be addressed by further ITU-R studies on the deployment and use of CRS.

In response to these concerns and as per its definition, CRS is a policy-based adaptive radio system. With respect to implementation, the term means that policies including national and international regulations are translated into radio behaviour controls. For instance, despite the fact that receive-only bands (e.g. the bands covered by RR No. **5.340**) may appear as vacant spectrum, CRS will not only be aware that these bands cannot be accessed for transmissions, but appropriate radio behaviour controls will ensure that no transmissions occur. It is also important to note that one of the implicit assumptions made in the various concerns expressed above is the absence of a need for a CRS station to obtain the proper authorization from the relevant Administration prior to the use of the spectrum. In fact, RR Article **18** (RR No. **18.1**) and national regulations do not permit any unauthorized access to the spectrum, even when unused.

6/1.19/3.2.3 CRS capabilities and their applicability to facilitate coexistence in shared bands

The ITU-R has identified a basic, but not exhaustive, range of capabilities of CRS that may facilitate coexistence with existing systems. The following elements could be considered as examples of capabilities of CRS:

– spectrum sensing capability including collaborative and cooperative sensing;

– positioning capability of the transmitters and receivers (geo-location);
– access to information on the spectrum usage, local regulatory requirements and policies, e.g. through access to a database or access to a logical or physical cognitive pilot channel;
– capabilities to adjust operational parameters based on the obtained knowledge.

It is important to note that these CRS capabilities do not prevent CRS to be operated as any other existing systems under a predetermined allocation and assignment regime.

In fact, these capabilities of CRS may help improve coexistence amongst radiocommunication systems deployed under the current regulatory regime (predetermined allocation and assignment). For example, in bands allocated to both active services and RAS, CRS technology can be incorporated in a RAS station (receive-only station) taking advantage of any intermittent emissions from the stations of the active services. The RAS also makes increasing use of interference mitigation techniques. In bands shared with active services, some techniques rely on knowing the nature of the signals that they are attempting to mitigate and could be thwarted by changes in modulation scheme. For such circumstances radio astronomy interference mitigation algorithms may fail, or work with significantly degraded effectiveness.

There are already examples where CRS features have been employed.

In the MS, the radio local area networks (RLAN) in 5 GHz use spectrum sensing capability in the form of dynamic frequency selection (DFS), as described in Recommendation ITU-R M.1652, Report ITU-R M.2115 and Resolution **229 (WRC-03)**, to allow the system to obtain knowledge of its environment, in order to avoid interference to RLS using the same band.

Some administrations are authorizing license exempt devices to access the bands below 1 GHz shared with BS. A set of CRS capabilities is needed to ensure sharing with BS without causing harmful interference.

In conclusion, there are challenges to sharing through cognitive technologies that should be considered before administrations authorize them in particular services. However, the capabilities of cognitive radio systems, particularly with devices querying a database in which parameters (such as locations, frequencies, regulations and policies, etc.) for protected stations are registered, not only have the potential to make more efficient use of spectrum, but to also offer more versatility and flexibility, through the increased ability to adapt their operations based on internal and external factors. Cognitive radio systems may have a profound effect on many aspects of communications, including interoperability, as well as on spectrum utilization and allocation.

6/1.19/3.2.4 Relationship between SDR and CRS

SDR is recognized as an enabling technology for the CRS. SDR does not require characteristics of CRS for operation. Either technology can be deployed/implemented without the other.

In addition, SDR and CRS are at different phases of development, i.e., radiocommunication systems using applications of SDR have been already utilized and CRS are now being researched and applications are under study and trial.

6/1.19/4 Analysis of the results of studies

6/1.19/4.1 Issue A: SDR

With SDR technology, users/operators would be in a position to download and install software making the reconfiguration of a radio station only dependent on the availability of software and the user/operator interest. It is important to note that the application of ITU regulatory mechanisms will

continue to depend essentially upon the capability of administrations to be aware of the spectrum use within their borders and provide the relevant information in a timely manner to the ITU. It also should be noted that a change of assignment due to reconfiguration of a radio station is possible and provisions in the Radio Regulations already account for this (see for example RR No. **8.1.1**).
The response to the issue of software reliability issue may be found in the modernization of the equipment certification and licensing regime which fall under national prerogatives. Furthermore, the issue of software reliability or security does not fall under the purview of the ITU-R.

6/1.19/4.2 Regulatory implications for SDR

Any radio station that has been reconfigured must continue to meet the regulatory requirements in the Radio Regulations applicable to the radio service in which the radio station belongs. Whether the reconfiguration is made by hardware or software means does not negate that requirement. Therefore it becomes clear that the existing Radio Regulations can encompass the implementation of SDR without any modification to the Radio Regulations. For implementation issues within a radiocommunication service, appropriate ITU-R Recommendation or Reports can be developed to address these individual issues. The study concluded that there is no need for modification of the Radio Regulations for the introduction of SDR technology.

6/1.19/4.3 Issue B: CRS

The potential benefits and applicability of CRS technologies to various radiocommunication services is recognized as well as the fact that CRS would be introduced in some services.

From the scenarios considered in section 6/1.19/3.2.1, it has been recognized that the implementation of CRS will have to be in accordance with the Radio Regulations but also with national regulations. Whether CRS technology is used as an enabler of cooperative spectrum access amongst system operators or of opportunistic spectrum access, administrations issue the authorization for a station to use a radio frequency or radio frequency channel under specified conditions (see RR No. **1.18**).

As shown in section 6/1.19/3.2.2 there are open issues and specific concerns related to several radiocommunication services that need further studies. Especially, the applicability of the CRS capabilities and the feasibility of deploying CRS in the bands shared between several services needs to be studied.

There would be a need for further studies on CRS technology, addressing especially dynamic and/or opportunistic spectrum access.

6/1.19/4.4 Regulatory implications for CRS

The use of CRS in some bands used by particular radiocommunication services may require the development of ITU-R Recommendations and Reports to address these issues. However, the study concluded that there is no need for modification to the Radio Regulations for this agenda item for the introduction of CRS technology.

6/1.19/5 Methods to satisfy the agenda item

6/1.19/5.1 Issue A: SDR

The method to satisfy the agenda item related to SDR is as follows:

6/1.19/5.1.1 Method A

No change to the Radio Regulations.

Under this method, technical and operational considerations related to the SDR technologies implemented in any stations of a radiocommunication service would be addressed in ITU-R texts as appropriate.

Advantages

– Allows administrations to facilitate implementation of SDR.

Disadvantages

– None.

6/1.19/5.2 Issue B: CRS

The methods to satisfy the agenda item related to cognitive radio systems (CRS) are as follows:

6/1.19/5.2.1 Method B1

No change to the Radio Regulations.

6/1.19/5.2.1.1 Option A: No change to the Radio Regulations

Under this method, technical and operational considerations related to the CRS technologies implemented in any systems of a radiocommunication service could be developed in ITU-R Recommendations and Reports as appropriate.

Advantages

– Allows administration to facilitate implementation of CRS.

Disadvantages

– Does not provide guidance for the studies and provisions for the implementation of CRS.

6/1.19/5.2.1.2 Option B: No change to the Radio Regulations and an ITU-R Resolution providing guidance for further studies on CRS

Under this method an ITU-R Resolution[9] is developed to provide a framework in order to facilitate studies on technical and operational considerations related to the implementation of CRS technologies to ensure coexistence and sharing among radiocommunication services are addressed leading to ITU-R Recommendations and Reports as appropriate.

Advantages

– Allows administrations to facilitate implementation of CRS.

– Resolution provides a framework for guidance on further studies.

Disadvantages

– Does not provide provisions for the implementation of CRS.

6/1.19/5.2.2 Method B2

Add a WRC Resolution providing guidance for further studies and guidance for the use of CRS and no other changes to the Radio Regulations.

Under this method a WRC Resolution is developed to provide a framework for guidance of the studies on technical and operational considerations related to the CRS technologies implemented in

[9] Resolution ITU-R [CRS] is contained in Annex 6 to Document 1B/267.

any systems of a radiocommunication service leading to ITU-R Recommendations and Reports as appropriate as well as guidance to administration for use of the CRS. This method does not propose a new agenda item at the next conference.

Advantages

– Allows administrations to facilitate implementation of CRS.

– Resolution provides a framework for guidance on further studies.

– Provides guidance to administrations for the use of CRS.

Disadvantages

– Does not provide provisions for the implementation of CRS.

6/1.19/6 Regulatory and procedural considerations

6/1.19/6.1 Issue A: SDR

6/1.19/6.1.1 Method A

NOC to the Radio Regulations.

SUP

RESOLUTION 956 (WRC-07)

Regulatory measures and their relevance to enable the introduction of software-defined radio and cognitive radio systems

6/1.19/6.2 Issue B: CRS

6/1.19/6.2.1 Method B1 (Options A and B)

Same text as in section 6/1.19/6.1.1.

6/1.19/6.2.2 Method B2

Same text as in section 6/1.19/6.1.1 plus a draft Resolution **[A119-CRS-METHOD-B2]** on "Studies on deployment and use of cognitive radio systems (CRS)", an example of which is provided below.

ADD

DRAFT RESOLUTION [A119-CRS-METHOD-B2] (WRC-12)

Studies on deployment and use of cognitive radio systems (CRS)

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that a cognitive radio system is defined as *a radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters* *and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained* (Report ITU-R SM.2152);

b) that pre-cognitive technologies employing some cognitive features, such as RLANs in the 5 GHz spectrum bands utilizing dynamic frequency selection are already in use (Recommendation ITU-R M.1652 and Resolution **229 (WRC-03)**);

c) that cognitive radio systems are expected to provide additional flexibility and improved efficiency to the overall spectrum use;

d) that ITU-R is studying such radio technology, its functionalities, technical characteristics, requirements, performance and benefits in the mobile service (Question ITU-R 241-1/5);

e) that international standards organizations have initiated related work on CRS;

f) that the implementation of CRS technology in systems under a specific radiocommunication service may require studies on this technology;

g) that the range of capabilities of CRS may facilitate coexistence with existing systems and may allow sharing in bands where it was previously considered as not feasible;

h) that a particular set of capabilities may need to be employed specific for the services with which the band is shared,

recognizing

a) that CRS is a technology, not a radiocommunication service;

b) that there are plans to employ CRS in some radiocommunication services;

c) that there are concerns about the feasibility of the deployment of CRS in some shared bands;

d) that a service using CRS should not adversely affect other services in the same band with the same or higher status;

e) that studies need to take into account challenges associated with the capability of CRS to dynamically access frequency bands, for example bands shared with passive services;

f) that further studies are needed for the implementation of CRS within a radiocommunication service and in bands shared with other radiocommunication services,

resolves

1 that any radio system implementing CRS technology within any radiocommunication service shall operate in accordance with the provisions of the Radio Regulations applicable for that specific service in the related frequency band;

Some administrations support the following text for *resolves* 2:

2 to urge administrations when authorizing operation of CRS within a service, to take all possible measures to avoid harmful interference in bands shared with radiocommunication services with equal or higher status, such as space services (space-to-Earth), radiodetermination service, passive services (radio astronomy, Earth exploration-satellite service and space research service) and safety services,

Other administrations support the following text for *resolves* 2:

2 to urge administrations when authorizing operation of CRS within a service, to take all possible measures to avoid harmful interference in bands shared with radiocommunication services with equal or higher status,

resolves to invite ITU-R

1 to study the implementation and use of CRS in any radiocommunication service that intends to employ CRS, addressing requirements, technical characteristics, performance and benefits;

2 to study the applicability of the cognitive capabilities and technical conditions to facilitate sharing between the services intending to deploy CRS and other radiocommunication services and the radio astronomy service;

3 to develop relevant Recommendations and/or Reports based on the aforementioned studies as appropriate,

invites administrations

1 to participate actively in the studies by submitting contributions to ITU-R;

2 to take into account, in their bilateral and multilateral negotiations with the concerned administrations the results of ITU-R studies when implementing cognitive radio systems.

AGENDA ITEM 2

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution ***28 (Rev.WRC-03)****, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex 1 to Resolution* ***27 (Rev.WRC-03)***

Resolution 27 (Rev.WRC-07)

Use of incorporation by reference in the Radio Regulations

Resolution 28 (Rev.WRC-03)

Revision of references to the text of ITU-R Recommendations incorporated by reference in the Radio Regulations

6/2/1 ITU-R Recommendations incorporated by reference in the Radio Regulations which have been revised and approved since WRC-07

According to Resolution **28** (**Rev.WRC-07**), the Director of the Radiocommunication Bureau is instructed to provide, for inclusion in the CPM Report, a list of those ITU-R Recommendations containing texts incorporated by reference in the Radio Regulations (RR) for which a revision has been approved during the elapsed study period since WRC-07.

The list of those ITU-R Recommendations is shown below.

- Recommendation ITU-R P.526-10 “Propagation by diffraction”;
- Recommendation ITU-R M.585-4 “Assignment and use of maritime mobile service identities”;
- Recommendation ITU-R M.633-3 “Transmission characteristics of a satellite emergency position-indicating radio beacon (satellite EPIRB) system operating through a satellite system in the 406 MHz band”;
- Recommendation ITU-R SM.1138-1 “Determination of necessary bandwidths including examples for their calculation and associated examples for the designation of emissions”;
- Recommendation ITU-R M.1583 “Interference calculations between non-geostationary mobile-satellite service or radionavigation-satellite service systems and radio astronomy telescope sites”.

Administrations are invited to examine the most recent versions of the above ITU-R Recommendations, namely ITU-R P.526-11, ITU-R M.585-5, ITU-R M.633-4, ITU-R SM.1138-2 and ITU-R M.1583-1 with a view to considering the possible updating of the relevant references in the RR.

It should be noted that draft revisions of some other ITU-R Recommendations, also incorporated by reference in the RR, may still be in the course of the ITU-R approval process to be ended before WRC-12. Further information about the approval or otherwise of these Recommendations will be provided later on.

6/2/2 Cross-reference table between ITU-R Recommendations incorporated by reference and RR provisions and footnotes where they are referenced

Table 2-1 contains cross-reference between ITU-R Recommendations, incorporated by reference and contained in RR Volume 4, and RR provisions, footnotes and Resolutions which incorporate by reference these Recommendations.

During the CPM11-2, it was generally agreed that:

– A cross-reference table in this manner would be useful for general reference purposes and, by including such a list in Volume 4 of the RR, would also assist administrations in their preparatory work for this agenda item prior to future CPMs and WRCs;

– Also, by including such a list in Volume 4, the preparation of the BR Director's Report to the CPM may be facilitated.

Such a table would need to be revised and finalized at each WRC and appropriate instructions would need to be provided to the Bureau and General Secretariat for its inclusion in Volume 4 of the subsequent edition of the RR. To implement these changes, some revisions to Resolution **27 (Rev.WRC-07)** are required. An example text for these revisions is provided in this section.

Furthermore, in order to avoid any ambiguities of as to whether the referenced ITU-R Recommendation were to be included in Volume 4 or not, it may be appropriate, for each WRC, to approve the contents of Volume 4, i.e. which referenced Recommendations are incorporated by reference, in a standard manner (in certain Conference document, or with a specific decision by the Plenary recorded in the Minutes of the Plenary) in accordance with Annex 3 to Resolution **27 (Rev.WRC-07)**.

TABLE 2-1

Cross-reference between ITU-R Recommendations, incorporated by reference and contained in RR Volume 4, and RR provisions, footnotes and Resolutions where they are referenced

ITU-R Recommendations incorporated by reference and contained in RR Volume 4	**RR provisions and footnotes with mandatory references to ITU-R Recommendations contained in RR Volume 4**
Rec. ITU-R TF.460-6	No. **1.14**
Rec. ITU-R M.476-5	Nos. **19.83, 19.96A, 51.41**
Rec. ITU-R M.489-2	Nos. **51.77, 52.231,** Appendix **18** (*General notes e)*)
Rec. ITU-R M.492-6	No. **56.2**
Rec. ITU-R P.525-2	No. **5.444B** (via Resolution **748 (WRC-07)**)
Rec. ITU-R P.526-10	No. **5.444B** (via Resolution **748 (WRC-07)**)
Rec. ITU-R M.541-9	Nos. **51.35, 52.112, 52.149, 52.153, 54.2**
Rec. ITU-R M.585-4 (Annexes 1 to 5)	Nos. **19.99, 19.102, 19.111**
Rec. ITU-R M.625-3	Nos. **19.83, 51.41**
Rec. ITU-R M.633-3	No. **34.1**
Rec. ITU-R S.672-4	TABLE **22-2** (and No. **22.5D.3**), TABLE **22-3** (and No. **22.5F.3**)
Rec. ITU-R M.690-1	Appendix **15** (Table 15-2)
Rec. ITU-R P.838-3	Appendix **30A** (Annex 3 § 2.2 Step 6)
Rec. ITU-R M.1084-4 (Tables 1 and 3 of Annex 4)	Appendix **18** (NOTE B) (prior to the table)
Rec. ITU-R SM.1138-1	Appendix **1** (§ 1 and § 2)
Rec. ITU-R SA.1154	No. **5.391**
Rec. ITU-R M.1171	Nos. **52.192, 52.195, 52.213, 52.224, 52.234, 52.240, 57.1**
Rec. ITU-R M.1172	No. **19.48**
Rec. ITU-R M.1173	Nos. **52.181, 52.229,** Appendix **17** (Part B, § 2 and § 6)
Rec. ITU-R M.1174-2	Nos. **5.287, 5.288**
Rec. ITU-R M.1187-1	Appendix **4** (Annex 2 item C.11.b)
Rec. ITU-R S.1256	No. **22.5A**
Rec. ITU-R RS.1260-1	No. **5.279A**
Rec. ITU-R BO.1293-2	Appendix **30A** (Annex 3 § 3.3), Appendix **30** (Annex 5 § 3.4)
Rec. ITU-R S.1340	No. **5.511C**
Rec. ITU-R S.1341	No. **5.511A**
Rec. ITU-R S.1428-1	TABLE **22-1A,** TABLE **22-1B,** TABLE **22-1C** (and No. **22.5C.6)**
Rec. ITU-R BO.1443-2	TABLE **22-1D** (and No. **22.5C.11)**
Rec. ITU-R M.1583	No. **5.443B** (via Resolution **741 (WRC-03)**), App4 Annex 2 (item A.17.b.3) (via Resolution **741 (WRC-03)**)
Rec. ITU-R S.1586-1	No. **5.551H**
Rec. ITU-R F.1613	No. **5.447E**
Rec. ITU-R RA.1631	No. **5.208B** (via Resolution **739 (Rev. WRC-07)**, No. **5.443B** (via Resolution **741 (WRC-03)**), No. **5.551H,** App4 Annex 2 (item A.17.b.3) (via Resolution **741 (WRC-03)**)
Rec. ITU-R RS.1632	No. **5.447F**
Rec. ITU-R M.1638	Nos. **5.447F, 5.450A**

ITU-R Recommendations incorporated by reference and contained in RR Volume 4	**RR provisions and footnotes with mandatory references to ITU-R Recommendations contained in RR Volume 4**
Rec. ITU-R M.1642-2	Nos. **5.328A** (via Resolution **609 (Rev. WRC-07)**)
Rec. ITU-R M.1643	No. **5.504B** (refers to Annex 1, Part C of Rec. ITU-R M.1643)**,** Nos. **5.504C**, **5.508A** and **5.509A** (refer to Annex 1, Part B of Rec. ITU-R M.1643)
Rec. ITU-R M.1652 (Annex 1)	No. **5.446A** (via Resolution **229 (WRC-03)**)
Rec. ITU-R M.1827	No. **5.444B** (via Resolutions **419 (WRC-07)** and **748 (WRC-07)**)

MOD

RESOLUTION 27 (Rev.WRC-~~07~~12)

Use of incorporation by reference in the Radio Regulations

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that the principles of incorporation by reference were adopted by WRC-95~~,~~ and revised by subsequent conferences ~~WRC-97 and further refined by WRC-2000~~ (see Annexes 1 and 2 to this Resolution);

b) that there are provisions in the Radio Regulations containing references which fail to distinguish adequately whether the status of the referenced text is mandatory or non-mandatory,

noting

that references to Resolutions or Recommendations of a world radiocommunication conference (WRC) require no special procedures, and are acceptable for consideration, since such texts will have been agreed by a WRC,

resolves

1 that for the purposes of the Radio Regulations, the term "incorporation by reference" shall only apply to those references intended to be mandatory;

2 that when considering the introduction of new cases of incorporation by reference, such incorporation shall be kept to a minimum and made by applying the following criteria:

– only texts which are relevant to a specific WRC agenda item may be considered;

– the correct method of reference shall be determined on the basis of the principles set out in Annex 1 to this Resolution;

– the guidance contained in Annex 2 to this Resolution shall be applied in order to ensure that the correct method of reference for the intended purpose is employed;

3 that the procedure described in Annex 3 to this Resolution shall be applied for approving the incorporation by reference of ITU-R Recommendations or parts thereof;

4 that existing references to ITU-R Recommendations shall be reviewed to clarify whether the reference is mandatory or non-mandatory in accordance with Annex 2 to this Resolution;

5 that ITU-R Recommendations, or parts thereof, incorporated by reference at the conclusion of each WRC, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations, shall be collated and published in a volume of the Radio Regulations (see Annex 3 to this Resolution),

instructs the Director of the Radiocommunication Bureau

1 to bring this Resolution to the attention of the Radiocommunication Assembly and the ITU-R Study Groups;

2 to identify the provisions and footnotes of the Radio Regulations containing references to ITU-R Recommendations and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration, as well as for inclusion in the Director's Report to the next WRC;

3 to identify the provisions and footnotes of the Radio Regulations containing references to WRC Resolutions that contain references to ITU-R Recommendations, and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration, as well as for inclusion in the Director's Report to the next WRC,

invites administrations

to submit proposals to future conferences, taking into account the CPM Report, in order to clarify the status of references, where ambiguities remain regarding the mandatory or non-mandatory status of the references in question, with a view to amending those references:

i) that appear to be of a mandatory nature, identifying such references as being incorporated by reference by using clear linking language in accordance with Annex 2;

ii) that are of a non-mandatory character, so as to refer to "the most recent version" of the Recommendations.

ANNEX 1 TO RESOLUTION 27 (Rev.WRC-07)

Principles of incorporation by reference

(No change)

ANNEX 2 TO RESOLUTION 27 (Rev.WRC-07)

Application of incorporation by reference

(No change)

ANNEX 3 TO RESOLUTION 27 (Rev.WRC-~~07~~12)

Procedures applicable by WRC for approving the incorporation by reference of ITU-R Recommendations or parts thereof

The referenced texts shall be made available to delegations in sufficient time for all administrations to consult them in the ITU languages. A single copy of the texts shall be made available to each administration as a conference document.

During the course of each WRC, a list of the texts incorporated by reference, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations, shall be developed and maintained by the committees. ~~This~~ These lists shall be published as a conference document in line with developments during the conference.

Following the end of each WRC, the Bureau and General Secretariat will update the volume of the Radio Regulations which serves as the repository of texts incorporated by reference in line with developments at the conference as recorded in the above-mentioned document.

6/2/3 Lists of RR provisions and footnotes containing references to ITU-R Recommendations or to WRC Resolutions containing references to ITU-R Recommendations

According to Resolution **27** (**Rev.WRC-07**), the Director of the Radiocommunication Bureau is instructed to identify provisions and footnotes of the Radio Regulations containing references to ITU-R Recommendations or to WRC Resolutions that contain references to ITU-R Recommendations and make suggestions on further action to the second session of the CPM for its consideration, as well as for inclusion in the Director's Report to WRC-12.

Based on the above instruction:

– Table 2-2 provides the list of the RR provisions and footnotes containing references to ITU-R Recommendations;

– Table 2-3 provides the list of the RR provisions and footnotes containing references to WRC Resolutions that contain references to ITU-R Recommendations.

At the CPM11-2 it was noted that Recommendation ITU-R M.627-1 is not included in RR Volume 4 in spite of the fact that reference (in No. 51.41) to that Recommendation is consistent with the principle for the incorporation by reference in accordance with Resolution **27 (Rev.WRC-07)** (see the relevant footnote of Table 2-2).

Administrations are invited to submit proposals to the Conference, taking into account the CPM Report, in order to clarify ambiguities in the mandatory or non-mandatory status of references to ITU-R Recommendations in the Radio Regulations, in accordance with the principles and procedures for application of incorporation by reference outlined in Resolution **27 (Rev.WRC-07)**.

TABLE 2-2

List of RR provisions and footnotes containing references to ITU-R Recommendations

RR provisions or footnotes	**Recommendation ITU-R ***	**Included in RR Volume 4**
No. 1.14	**TF.460-6**	**YES**
No. **5.279A**	**RS.1260-1**	**YES**
Nos. 5.287, **5.288**	**M.1174-2**	**YES**
No. **5.391**	**SA.1154**	**YES**
No. **5.447E**	**F.1613**	**YES**
No. **5.447F**	**RS.1632, M.1638**	**YES (both)**
No. **5.450A**	**M.1638**	**YES**
Nos. **5.504B, 5.504C, 5.508A, 5.509A**	**M.1643**	**YES**
No. **5.511A**	**S.1341**	**YES**
No. **5.511C**	**S.1340**	**YES**
No. **5.536A**	SA.1278, SA.1625	NO (both)
No. **5.543A**	RA.769 **	NO
No. **5.551H**	**S.1586-1, RA.1631**	**YES (both)**
Nos. **16.2, 16.6**	SM.1139	NO
No. **19.48**	**M.1172**	**YES**
No. **19.83**	**M.476-5, M.625-3**	**YES (both)**
No. **19.96A**	**M.476-5**	**YES**
Nos. **19.99, 19.102, 19.111**	**M.585-4 ****	**YES**
Nos. **21.2.2, 21.4.1**	SF.765 **	NO
No. **22.5A**	**S.1256**	**YES**
TABLE 22-1A, TABLE 22-1B, TABLE 22-1C (and No. **22.5C.6**)	**S.1428-1**	**YES**
TABLE 22-1D (and No. **22.5C.11)**	**BO.1443-2**	**YES**
TABLE 22-2 (and No. **22.5D.3),** TABLE 22-3 (and No. **22.5F.3)**	**S.672-4**	**YES**
No. **22.36**	S.732	NO
No. **25.6**	M.1544	NO
No. **29.12**	RA.769 **	NO
No. **32.5**	M.493 ** M.541 **	NO **YES**
No. **32.7**	**M.1172**	**YES**
No. **32.13E**	M.541 **	**YES**
Nos. **32.19B, 32.21A**	M.493 ** M.541 **	NO **YES**
No. **32.53C**	M.493 **	NO
Nos. **33.8, 33.20A**	M.493 ** M.541 **	NO **YES**
No. **34.1**	**M.633-3****	**YES**
No. **51.35**	**M.541-9**	**YES**

RR provisions or footnotes	Recommendation ITU-R *	Included in RR Volume 4
	M.476-5	**YES**
No. **51.41**	**M.625-3** **M.627-1 *** **	**YES** NO
No. **51.71**	**M.1171** M.1170	**YES** NO
No. **51.77**	**M.489-2**	**YES**
No. **51.112**	**M.541-9** M.493 **	**YES** NO
Nos. **52.149, 52.153**	**M.541-9**	**YES**
No. **52.181**	**M.1173**	**YES**
Nos. **52.192, 52.195, 52.213, 52.224**	**M.1171**	**YES**
No. **52.229**	**M.1173**	**YES**
No. **52.231**	**M.489-2**	**YES**
Nos. **52.234, 52.240**	**M.1171**	**YES**
No. **54.2**	M.493 ** **M.541-9**	NO **YES**
No. **55.1**	M.1170	NO
No. **56.2**	**M.492-6**	**YES**
No. **57.1**	**M.1171**	**YES**
Appendix **1** (§ 1 and § 2)	**SM.1138-1 ****	**YES**
Appendix **3**:		
§ 4	SM.329 **	NO
§ 10	M.1177 **	NO
§ 10*bis*	SM.329 **, M.1177 **	NO (both)
§ 12 (note 14 to Table II)	M.1177 **	NO
Annex 1 (§ 1 and § 3)	SM.1541 **	NO
Appendix **4**:		
Annex 1, Footnotes to Table 1 and 2 (§ 1)	SF.675 **	NO
Annex 1, Table 2, items 3.5.c.a, 3.5.d, 3.5.e, 3.5.f	F.1500	NO
Annex 2, Information related to the data listed in the following tables	S.1503 **, SM.1413 **	NO (both)
Annex 2, Footnotes to Tables A, B, C, D (§ 2)	SF.675 **	NO
Annex 2, items B.4.a.3.a.1, B.4.a.3.a.2	SM.1413 **	NO
Annex 2, item C.11.b	**M.1187-1**	**YES**
Appendix **5**, Annex 1:		
§ 1.2.1	IS.1143 (now M.1143 **)	NO
§ 1.2.3.1	SF.357 **	NO
§ 1.2.3.2	IS.1143 (now M.1143 **)	NO
Appendix **7**, § 1.4, Annexes 4, 5, 6	SM.1448	NO
Appendix **10**, footnote 3	**M.1172**	**YES**
Appendix **15**:		
Table 15-2	**M.690-1**	**YES**
Legend: AIS	M.1371 **	NO

RR provisions or footnotes	Recommendation ITU-R *	Included in RR Volume 4
Appendix **17**, Part B (§ 2 and § 6)	**M.1173**	**YES**
Appendix **18**:		
Note B	**M.1084-4**	**YES**
General notes, e)	M.1084 **, **M.489-2**	**YES (both)**
General notes, l)	M.1371 **	NO
Appendix **30**:		
Article 11, Col. 6	BO.1445	NO
Article 11, Col. 9, Annex 3, § 2.4.1	BO.1213 **	NO
Annex 5, § 2.1	P.837-1 **, P.618-5 **	NO (both)
Annex 5, § 3.1.1	F.405-1 (was suppressed by RA-03)	NO
Annex 5, § 3.2.4	BO.1212	NO
Annex 5, § 3.4	**BO.1293-2**	**YES**
	BO.1297	NO
Annex 5, § 3.7.2	BO.1213 **	NO
Annex 5, § 3.13.3	BO.1445	NO
Annex 6, Part A, § 1.1	BO.1213 **, S.580-5 **	NO (both)
Annex 6, Part B, § 1.5	S.483-3	NO
Annex 6, Part B, § 1.6	BT.500-7 **	NO
Annex 6, Part B, § 2.1	S.465-5 **	NO
Appendix **30A**:		
Article 9A, Col. 6	BO.1296	NO
Article 9A, Col. 9	BO.1295	NO
Annex 3, § 2.1	P.837-1 **	NO
	P.618-5 **	NO
Annex 3, § 2.2	**P.838-3**	**YES**
	P.841 **	NO
Annex 3, § 2.4	P.618-5 **	NO
Annex 3, § 3.3	BO.1297	NO
	BO.1293-2	**YES**
Annex 3, § 3.5.3	BO.1295	NO
Annex 3, § 3.7.3	BO.1296	NO
Annex 3, § 3.9	BO.1212	NO
Appendix **30B**:		
Annex 1, § 1.2	P.676-7 **, P.618-9 **	NO (both)
Annex 1, § 1.3	P.837-5	NO

* Numbers in bold indicate that these versions of the Recommendations are incorporated by reference and included in RR Volume 4.

** This is not the most recent version of this Recommendation.

*** This ITU-R Recommendation is not included in RR Volume 4 in spite of the fact that it is referred to together with other ITU-R Recommendations which are included in RR Volume 4.

TABLE 2-3

List of RR provisions and footnotes containing references to WRC Resolutions that contain references to ITU-R Recommendations

RR provisions or footnotes	WRC Resolution	Recommendation ITU-R*	Included in RR Volume 4
No. **5.547**	**75 (WRC-2000)**	SA.1157 **, SA.1396	NO (both)
No. **22.5K**	**76 (WRC-2000)**	S.1428 **, BO.1443 **	**YES (both)**
Nos. **5.444**, **5.444A**	**114 (Rev.WRC-03)**	S.1342	NO
Nos. **5.552A**, Appendix **4** Annex 1 Table 2 items 1.14.e, 1.14.f, 1.14.g, 1.14.h	**122 (Rev.WRC-07)**	F.1500, SF.1481-1, SF.1843, F.1820	NO (all)
No. **5.462A**	**124 (Rev.WRC-2000)**	F.386 **, F.1502	NO
No. **5.516B**	**143 (Rev.WRC-07)**	S.524-9, S.1594, S.1783	NO
Nos. **5.537A**, **5.543A**, Appendix **4** Annex 1 Table 2 item 1.14.d	**145 (Rev.WRC-07)**	F.1570 **, F.1609 **, SF.1601 **, F.1612	NO (all)
Nos. **5.162A**, **5.291A**	**217 (WRC-97)**	M.1226, M.1085-1 (WAS SUPPRESSED BY RA-07), M.1227 **	NO (all)
No. **5.388A**, Appendix **4** Annex 1 Table 2 items 1.14.b, 1.14.c	**221 (Rev.WRC-07)**	M.1456, M.1457 **	NO (both)
Nos. **5.384A**, **5.388**	**223 (Rev.WRC-07)**	M.819 **, M.1308, M.1457 **, M.1645	NO (all)
No. **5.286AA**	**224 (Rev.WRC-07)**	M.819 **, M.1645	NO (both)
Nos. **5.446A**, **5.447**	**229 (WRC-03)**	RS.1166 **, S.1426, M.1450 **, M.1454, M.1653 **RS.1632, M.1652**	NO (all) **YES (both)**
Nos. **52.101**, **52.189**	**354 (WRC-07)**	**M.1171, M.1172**	**YES (both)**
No. **5.197A**	**413 (Rev.WRC-07)**	SM.1009 **, BS.1114 **	NO (both)
Nos. **5.444B**, **5.446C**	**418 (WRC-07)**	M.1828, M.1829	NO
No. **5.444B**	**419 (WRC-07)**	**M.1827**	**YES**
No. **5.134**, Appendix **11**, Part B, § 1.1	**517 (Rev.WRC-07)**	BS.1514 **	NO
No. **5.530**	**525 (Rev.WRC-07)**	BT.1201 **, BO.1659, BT.1769, BO.1776, BO.1785	NO (all)
Appendix **11**, Part C, § 1.1, § 2.5	**543 (WRC-03)**	BS.1514 **, BS.1615	NO (both)
No. **5.328A**	**609 (Rev.WRC-07)**	**M.1642-2**	**YES**
Nos. **5.389A**, **5.389C**	**716 (Rev.WRC-2000)**	F.1098 **	NO
No. **5.208B**	**739 (Rev.WRC-07)**	RA.1513 ** S.1586 **, **M.1583 **, RA.1631**	NO **YES (all)**
No. **5.443B**, Appendix **4**, Annex 2, items A.17.b.1, A.17.b.3	**741 (WRC-03)**	RA.769 **, RA.1513 ** **M.1583 **, RA.1631**	NO **YES (both)**

RR provisions or footnotes	WRC Resolution	Recommendation ITU-R*	Included in RR Volume 4
No. **5.379D**	**744 (Rev.WRC-07)**	M.1799	NO
No. **5.444B**	**748 (WRC-07)**	**P.525-2, P.526-10 **, M.1827**	**YES (all)**
No. **5.338A**	**750 (WRC-07)**	RS.1029 **, M.1457 **	NO (both)
-	**754 (WRC-07)**	SA.1016	NO
Nos. **5.457A**, **5.457B**, **5.506A**, **5.506B**	**902 (WRC-03)**	SF.1650 **	NO

* Numbers in bold indicate that this version of the Recommendations are incorporated by reference and included in RR Volume 4.

** This is not the most recent version of this Recommendation.

AGENDA ITEM 4

4 in accordance with Resolution ***95 (Rev.WRC-07)****, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;*

Resolution 95 (Rev.WRC-07)

General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences

In response to Resolution 95 (Rev.WRC-07), the Bureau performed an initial study in this respect with consultation as appropriate with the Chairmen and Vice-Chairmen of Study Groups. The study results were presented to CPM11-2 for consideration (Document CPM11-2/32). The CPM11-2 received additional contributions from membership. Annex 4-1 contains the result of the consideration during the CPM11-2 taking into account the comments provided in these contributions.

The CPM wishes to emphasize that the indications in the column “Possible follow-up” should not be considered as proposals for the work of the Conference, but merely as suggestions concerning the possible course of action that might be taken in respect of the concerned Resolutions and Recommendations.

For information purposes only, Annex 4-2 provides suggested changes for certain Resolutions and a Recommendation, which were received at the CPM11-2 (Document CPM11-2/15).

The CPM refrained from commenting on a course of action in respect to those Resolutions and Recommendations that are explicitly on the agenda of WRC-12 other than Agenda item 4.

ANNEX 4-1

Review of WARC/WRC Resolutions and Recommendations in response to Resolution 95 (Rev.WRC-07)

PART I - WARC/WRC RESOLUTIONS

Res. No.	Subject	Remark	Possible follow-up
1	Notification of frequency assignments	Still relevant.	NOC
2	Equitable use of GSO and frequency bands for space services	Still relevant.	NOC
4	Period of validity of GSO space systems	Still relevant.	NOC
5	Technical cooperation – Propagation in tropical areas	Still relevant.	NOC
7	National radio-frequency management	Still relevant; supported by BR and studies in SG 1 with respect to spectrum management systems for developing countries; also supported by BR world and regional seminars.	NOC
10	Wireless communications by the International Red Cross and Red Crescent Movement	Still relevant.	NOC
13	Formation of call signs	Still relevant.	NOC
15	Cooperation in space radiocommunications	Still relevant; implemented through liaison with ITU-D Study Groups and BR/BDT seminars.	NOC
18	Identification/non-parties in an armed conflict	Text recently updated (at WRC-07); still relevant.	NOC
		The requested ITU-R studies have made progress (revisions of Recommendations ITU-R M.493 and M.1371).	MOD
20	Technical cooperation – Aeronautical service	Still relevant.	NOC
25	Operation of Global Satellite Systems for personal communications	Still relevant.	NOC
26	Review of footnotes	Text recently updated (at WRC-07); still relevant (permanent agenda item at each WRC (WRC-12 Agenda item 1.1)).	-
27	Use of incorporation by reference in the Radio Regulations (principles)	Text recently updated (at WRC-07); still relevant (permanent agenda item at each WRC (WRC-12 Agenda item 2)).	-
28	Revision of references to ITU-R Recommendations incorporated by reference in the Radio Regulations	Still relevant (permanent agenda item at each WRC (WRC-12 Agenda item 2)); linked with Resolution 27.	-
33	Procedure for BSS prior to the entry into force of agreements and plans for the BSS	Still relevant.	NOC
		Processing of filings under this Resolution completed prior to WRC-07.	SUP

Res. No.	Subject	Remark	Possible follow-up
34	Planning the band 12.5-12.75 GHz in R3	Still relevant.	NOC
		Text may need to be updated in view of WRC-12 decision on Resolution 33.	MOD
42	Interim systems in R2 (BSS and FSS) in AP30/30A bands	Still relevant.	NOC
49	Administrative due diligence	Text recently updated (at WRC-07); still relevant.	NOC
51	Transitional arrangements concerning coordination and notification	This resolution was abrogated by WRC-07 as of 1 January 2010.	SUP
55	Temporary procedures for improving satellite network coordination and notification procedure	Still relevant.	NOC
		Text recently updated (at WRC-07) may be modified if items of *resolves* and of *instructs the BR* are implemented or new items added.	MOD
58	Transitional measures for coordination in the bands 10.7-12.75 GHz, 17.8-18.6 GHz and 19.7-20.2 GHz	Still relevant.	NOC
		The text may need to be updated in view of current developments within BR leading to the completion of the "epfd" simulation software package.	MOD
63	Protection from ISM equipment	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 8.1.1 (Issue A).	-
72	Regional preparations	Text recently updated (at WRC-07); still relevant.	NOC
73	Compatibility BSS-R1/FSS-R3 in 12 GHz	Still relevant.	NOC
74	Continuing updating of technical bases of Appendix **7**	Still relevant; ongoing consideration in SG 1 and SG 3.	NOC
75	Possible update of technical bases of Appendix 7 for determining coordination area of receiving ES in SRS in bands 31.8-32.3 and 37-38 GHz	Still relevant; closely related to Resolution 74.	NOC
		The requested ITU-R studies have been conducted by the developments of Recommendations ITU-R F.1760 and ITU-R F.1765; with the same reason, Res.79 (WRC-2000) was suppressed at WRC-07.	SUP
76	Development of calculation methodologies concerning aggregate epfd produced by non-GSO in the bands 10.7-30 GHz	*Resolves* part still relevant.	NOC
		Invites ITU-R may need to be updated taking account of Recommendation ITU-R S.1588 in force; Annex 1 may also need to be updated to take into account the versions of Recommendations ITU-R S.1428 and ITU-R BO.1443 incorporated by reference.	MOD
80	Due diligence in applying the principles embodied in the Constitution	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 8.1.3.	-
81	Evaluation of administrative due diligence	Implemented.	SUP
85	Protection of GSO systems (FSS and BSS) from non-GSO FSS systems	Still relevant.	NOC
		The text may need to be updated in view of current developments within BR leading to the completion of the "epfd" simulation software package.	MOD
86	Criteria for implementation of Resolution 86 (Rev. PP-02)	Text recently updated (at WRC-07); still relevant (permanent agenda item at each WRC (WRC-12 Agenda item 7)).	-

Res. No.	Subject	Remark	Possible follow-up
95	Review of Resolution/Recommendation	Text recently updated (at WRC-07); still relevant (permanent agenda item at each WRC (WRC-12 Agenda item 4)).	-
97	Provisional application of certain provisions of RR as revised by WRC-07 and abrogation of certain Res./Rec.	Implemented and could be deleted.	SUP
111	Planning of the FSS in 18/20/30 GHz	Still relevant.	NOC
114	FSS (feeder links for MSS) in 5 GHz	Still relevant; allocation to the ARNS and the FSS should be reviewed at a future WRC prior to 2018; Recommendation ITU-R S.1342 in force.	NOC
122	HAPS in 47/48 GHz	Text recently updated (at WRC-07); still relevant.	NOC
124	Sharing FS/EESS in 8 GHz	Still relevant; it requested that ITU-R study required pfd limits for the GSO EESS in the band 8 025-8 400 MHz; the ITU-R studied this and approved Recommendation ITU-R F.1502; WRC-2000 revised this Resolution and considering that Recommendation ITU-R F.1502 contains pfd limits different from those referred to in No. **5.462A**, it resolved to invite a future WRC to review No. **5.462A**; as no further studies on the issue are expected, such a review could be considered under Agenda item 8.1.2 of WRC-12.	NOC SUP (after the review of No. 5.462A)
125	Sharing MSS/RA in 1.6 GHz	Still relevant; future competent WRC to review the ongoing sharing studies between the MSS and RAS.	NOC
		Updating of the versions of the referenced Recommendations may be necessary.	MOD
136	Criteria for sharing between GSO FSS and non-GSO FSS in 37.5-50.2 GHz	Still relevant.	NOC
		Results of studies to be reported to WRC-12; Recommendation ITU-R S.1655 in force.	SUP
140	Equivalent epfd limits in 19.7-20.2 GHz	Still relevant; Recommendation ITU-R S.1715 in force.	NOC
142	Transitional arrangements for use of the band 11.7-12.2 GHz by GSO/FSS networks in Region 2	*Resolves* 1, 2 and 4 implemented; *resolves* 3 still relevant.	NOC MOD
143	Guidelines for implementation of high-density applications in the FSS in identified frequency bands	Text recently updated (at WRC-07); still relevant.	NOC
144	Special requirements for operating earth stations in the FSS in the band 13.75-14 GHz	Text recently updated (at WRC-07); parts still relevant (e.g. *resolves* 2); Recommendation ITU-R S.1712 in force.	NOC MOD
145	Potential use of the bands 27.5-28.35 GHz and 31-31.3 GHz by HAPS in the fixed service	Text recently updated (at WRC-07); still relevant.	NOC
		The requested ITU-R studies have made little progress and may need to be reviewed.	MOD
147	Pfd limits for FSS using highly inclined orbits in the band 17.7-19.7 GHz	Still relevant.	NOC
148	Satellite systems formerly listed in Part B of Appendix **30B** (WARC Orb-88)	Still relevant.	NOC
		The text may need some updates in view of completion of some actions.	MOD

Res. No.	Subject	Remark	Possible follow-up
149	Implementation of decisions of WRC 07 relating to Appendix **30B**	*Resolves* 5 and 8 are still relevant; however, the resolution can be suppressed because most *resolves* and all *instructs* have been implemented.	SUP
205	Protection of MSS in 406-406.1 MHz	Still relevant.	NOC
207	Monitor MMS/AM(R)S	Still relevant.	NOC
212	Implementation of IMT	Text recently updated (at WRC-07); still relevant.	NOC
215	Coordination among non-GSO MSS	Still relevant.	NOC
217	Wind profiler radars	Still relevant.	NOC
		Updating of the versions of the referenced Recommendations may be necessary.	MOD
221	HAPS for IMT in the bands around 2 GHz	Text recently updated (at WRC-07); still relevant.	NOC
222	Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the MSS and studies for long-term availability for AMS(R)S	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.7.	-
223	Additional bands identified for IMT	Text recently updated (at WRC-07); still relevant; ITU-R study has made fair progress but not been completed.	NOC
		The term “IMT-2000” be replaced with “IMT”.	MOD
224	Frequency bands for the terrestrial component of IMT below 1 GHz.	Text recently updated (at WRC-07); still relevant; ITU-R SGs 5 and 6 are carrying out studies taking into account the studies carried out and terminated by JTG 5-6 on Resolution 749.	NOC
225	Use of additional bands for the satellite component of IMT	Text recently updated (at WRC-07); still relevant; ITU-R study has not yet been completed.	NOC
		The results of the studies to be reported to a future WRC; The result of WRC-07 may need to be reflected (the bands 2 500-2 520 MHz and 2 670-2 690 MHz are allocated to the MSS in Region 3 only). This Resolution is also for consideration by Agenda item 8.1.2.	MOD
229	Use of bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz for WAS including RLAN	Still relevant.	NOC
		Updating of the version of the referenced Recommendations may be necessary.	MOD
231	Additional allocations to the mobile-satellite service with particular focus on the bands between 4 GHz and 16 GHz	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.25	-
331	Transition arrangements for the GMDSS	Text recently updated (at WRC-07); still relevant.	NOC
339	Coordination of NAVTEX services	Text recently updated (at WRC-07); still relevant.	NOC
342	Revision of AP18	Still relevant.	NOC
343	Certificates (vessels using GMDSS equipment on a non-compulsory basis)	Still relevant (to ensure inter-communication between SOLAS and non-SOLAS vessels).	NOC
		The outdated descriptions may need to be updated.	MOD

Res. No.	Subject	Remark	Possible follow-up
344	Exhaustion of MMSI	Still relevant.	NOC
		Report each WRC on the use and status of the MMSI resource; Recommendation ITU-R M.585 incorporated by reference in this Resolution has been revised; the use of MMSI is expanding.	MOD
345	Operation of GMDSS equipment on non-compulsory fitted vessels	Still relevant.	NOC
		Recommendation ITU-R M.493 has been revised for inclusion of simplified DSC equipment.	MOD
349	False alerts in GMDSS	Still relevant.	NOC
		Parts of the text may need to be harmonized with Article 32 revised at WRC-07.	MOD
351	Review of channel arrangements in the HF bands allocated to the maritime mobile service (Appendix 17), use of new digital technologies	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.9	-
352	Use of carrier frequencies 12 290 kHz and 16 420 kHz for safety related calling to and from RCC	Still relevant.	NOC
354	Distress and safety radiotelephony procedures for 2 182 kHz	Still relevant.	NOC
355	Content, formats and periodicity of the maritime related service publications	Still relevant; studies completed; all revised publications will be published in 2011 prior to WRC-12.	MOD
			SUP
356	ITU maritime service information registration	Still relevant; ITU-R consultation invited in this Resolution is still under way.	NOC
357	Regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports	For consideration by WRC-12 Agenda item 1.10	-
405	Frequencies for AM(R)	Still relevant.	NOC
413	Use of the band 108-117.975 MHz by the aeronautical mobile (R) service (AM(R)S)	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.4.	-
416	Use of the bands 4 400-4 940 MHz and 5 925-6 700 MHz by an aeronautical mobile telemetry application	Still relevant.	NOC
417	Use of the band 960-1 164 MHz by the AM(R)S	For consideration by WRC-12 Agenda item 1.4.	-
418	Use of the band 5 091-5 250 MHz by AMS for telemetry applications	Still relevant.	NOC
419	Use of the band 5 091-5 150 MHz by AMS for certain aeronautical applications	Still relevant.	NOC
420	Consideration of frequency bands between 5 000-5 030 MHz for AM(R)S surface applications at airports	For consideration by WRC-12 Agenda item 1.4.	-
421	Regulatory provisions for the operation of unmanned aircraft systems	For consideration by WRC-12 Agenda item 1.3.	-
506	GSO only, in BSS bands (12 GHz)	Still relevant.	NOC

Res. No.	Subject	Remark	Possible follow-up
507	Agreements/Plans for BSS	Still relevant; would need to be reviewed if Resolution 33 is SUP.	NOC
517	Introduction of digitally modulated emissions in the HFBC	Text recently updated (at WRC-07); still relevant; SG 6 continues its studies and is updating Recommendations ITU-R BS.1514 and ITU-R BS.1615.	NOC
525	Introduction of HDTV in 22 GHz	Text recently updated (at WRC-07); may need to be reviewed in view of WRC-12 decisions on Agenda item 1.13.	-
526	Additional provisions for HDTV	May need to be reviewed in view of WRC-12 decisions on agenda item 1.13.	-
528	BSS (sound) in 1.5 GHz	Still relevant; for consideration by a future WRC.	NOC
		Resolves 1 is outdated; would need to be reviewed if Resolution 33 is suppressed.	MOD
533	Implementation of certain provisions relating to AP30/30A	Obsolete because all concerned networks had been processed.	SUP
535	Application of Article 12	Still relevant.	NOC
			MOD
536	BSS satellites serving other countries	Still relevant.	NOC
539	Use of the band 2 630-2 655 MHz for non-GSO BSS	Still relevant.	NOC
543	Provisional RF protection ratios for analogue and digital emissions in HFBC	Still relevant; results of ITU-R studies reported to WRC-07; Recommendation ITU-R BS.1615 in force since 2003; see comments on Resolution 517.	NOC
546	Processing of notices under AP30 and AP30A in accordance with the decisions of WRC-03	Obsolete because all concerned networks had been processed.	SUP
547	Updating of the “Remarks” columns in AP30/30A	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 8.1.1.	-
548	Application of the grouping concept in AP30/30A in Regions 1 and 3	Still relevant.	NOC
		May need some updates in view of completion of some actions.	MOD
549	Use of the band 620-790 MHz for existing assignments to BSS	Still relevant.	NOC
550	Information relating to HF broadcasting service	Still relevant; see comments on Resolution 517.	NOC
551	Use of the band 21.4-22 GHz for the broadcasting-satellite service and associated feeder-link bands in Regions 1 and 3	For consideration by WRC-12 Agenda item 1.13.	-
608	Use of 1 215-1 300 MHz band by systems in the RNSS (space-to-Earth)	Still relevant.	NOC
		Recommendation ITU-R M.1787 in force; draft new Recommendation ITU-R M.[1088_NEW] sent to RA-12. The text may need to be updated with respect to reference to relevant ITU-R Questions.	MOD
		Delete after studies are completed.	SUP

Res. No.	Subject	Remark	Possible follow-up
609	Protection of ARNS from the equivalent epfd produced by RNSS networks and systems in the 1 164-1 215 MHz band	Text recently updated (at WRC-07); still relevant; Recommendation ITU-R M.1787 in force.	NOC
610	Coordination of RNSS networks and systems in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz	Still relevant; Recommendation ITU-R M.1787 in force; draft new Recommendations ITU-R M.[CHAR-RX3], M.[1088_NEW], M.[1479_NEW] and M.[1477_NEW] sent to RA-12.	NOC
611	Use of portion of the VHF band by radiolocation service	For consideration by WRC-12 Agenda item 1.14.	-
612	Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations	For consideration by WRC-12 Agenda item 1.15.	-
613	Global primary allocation to the radiodetermination-satellite service in the band 2 483.5-2 500 MHz (space-to-Earth)	For consideration by WRC-12 Agenda item 1.18.	-
614	Use of the band 15.4-15.7 GHz by the radiolocation service	For consideration by WRC-12 Agenda item 1.21.	-
641	Use of the band 7 000-7 100 kHz	Still relevant.	NOC
642	Earth stations in the amateur satellite service	Still relevant.	NOC
644	Disaster communications	Text recently updated (at WRC-07); still relevant (in line with ongoing studies in BR and the Study Groups).	NOC
		Perhaps requires updating to reflect current aspects of the topic; Recommendations ITU-R M.1854, ITU-R S.1001-2 and Reports ITU-R M.2149, ITU-R S.2151 in force.	MOD
646	Public protection and disaster relief	Still relevant (in line with ongoing studies in BR and the Study Groups).	NOC
		Perhaps requires updating to reflect current aspects of the topic; Recommendations ITU-R M.1854, ITU-R S.1001-2 and Reports ITU-R M.2149, ITU-R S.2151 in force. The term "IMT-2000" be replaced with "IMT".	MOD
647	Spectrum management guideline for disaster communication	Still relevant; ongoing activities; report on the progress on this Resolution to subsequent WRCs.	NOC
		Perhaps requires updating to reflect current aspects of the topic; Recommendations ITU-R M.1854, ITU-R S.1001-2 and Reports ITU-R M.2149, ITU-R S.2151 in force.	MOD
671	Recognition of systems in the meteorological aids service in the frequency range below 20 kHz	For consideration by WRC-12 Agenda item 1.16.	-
672	Extension of the allocation to the meteorological-satellite service in the band 7 750-7 850 MHz	For consideration by WRC-12 Agenda item 1.24.	-
673	Earth observation applications	Ongoing studies within SG 7 for CPM11-2 under WRC-12 Agenda item 8.1.1 Issue C.	-

Res. No.	Subject	Remark	Possible follow-up
703	Interference criteria for the shared bands	Text recently updated (at WRC-07); still relevant.	NOC
705	Protection of services in 70-130 kHz	Some elements still relevant; for consideration by a future WRC though it invites the Council to place the agenda of next WRC.	NOC
			MOD
716	Use of bands around 2 GHz	Still relevant.	NOC
		Some updates might be necessary; Recommendation ITU-R F.1335 responds to this Resolution (by providing the phased transitional approach for the bands shared between MSS and FS); a part of the ITU-R study has been completed. The term “IMT-2000” be replaced with “IMT”.	MOD
729	Adaptive systems at MF/HF	Text recently updated (at WRC-07); still relevant.	NOC
		Delete after WRC-12.	SUP
731	Sharing and adjacent-band compatibility between passive and active services above 71 GHz	For consideration by WRC-12 Agenda item 1.8.	-
732	Sharing between active services above 71 GHz	For consideration by WRC-12 Agenda item 1.8.	-
734	Studies for spectrum identification for gateway links for HAPS in the range from 5 850 to 7 075 MHz	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.20.	-
739	Compatibility between RA and active space services	Text recently updated (at WRC-07); still relevant.	NOC
741	Protection of RA in the bands 4 990-5 000 MHz	Still relevant.	NOC
		This Resolution refers in its *resolves* part to a former version of Recommendation ITU-R M.1583.	MOD
743	Protection of single-dish RA stations in the band 42.5-43.5 GHz	Still relevant.	NOC
744	Sharing between MSS (Earth-to-space) and other services in the band 1 668.4-1 675 MHz	Text recently updated (at WRC-07); still relevant.	NOC
748	Compatibility between AM(R)S and FSS (Earth-to- Space) in the band 5 091-5 150 MHz	Still relevant.	NOC
		This Resolution refers in its *resolves* part to a former version of Recommendation ITU-R P.526.	MOD
749	Studies on use of the band 790-862 MHz by mobile applications and other services	For consideration by WRC-12 Agenda item 1.17.	-
750	Compatibility between EESS (passive) and relevant active services	Still relevant (see RR No. **5.338A**).	NOC
751	Use of the band 10.6-10.68 GHz	Still relevant (see RR No. **5.482A**).	NOC
752	Use of the band 36-37 GHz	Still relevant (see RR No. **5.550A**).	NOC
753	Use of the band 22.55-23.15 GHz by the space research service	For consideration by WRC-12 Agenda item 1.11.	-

Res. No.	Subject	Remark	Possible follow-up
754	Modification of aeronautical component of the mobile service allocation in the 37-38 GHz band for protection of other services	For consideration by WRC-12 Agenda item 1.12.	-
804	Principles for establishing agendas for WRC	Still relevant.	NOC
805	Agenda for WRC-11	Obsolete in view of the action taken by the Council (see C-08 Resolution 1291 (MOD)).	SUP
806	Preliminary agenda for WRC-15	For consideration by WRC-12 Agenda item 8.2.	-
900	Review of the RoP for No. **9.35**	Networks under notification.	NOC
		Corresponding Rules of Procedure had been suppressed in 2005.	SUP
901	Determination of the orbital arc separation	Text recently updated (at WRC-07); parts still relevant; ongoing studies in SGs 4 and SC; Recommendation ITU-R S.1780 in force.	NOC MOD
902	Provisions related to earth stations located on board vessels, in FSS networks in 5 925-6 425 MHz and 14-14.5 GHz	Still relevant; Recommendation ITU-R S.1587-2 in force.	NOC
903	Transitional measures for BSS/FSS in the band 2 500-2 690 MHz	Still relevant.	NOC
904	Transitional measures for coordination between MSS (Earth-to-Space) and SRS (passive) in the band 1 668-1 668.4 MHz	Still relevant.	NOC
905	Date of entry into force of a certain provisions of RR relating to non-payment of cost-recovery fees	No longer necessary.	SUP
906	Submission of notice to BR	Implemented.	SUP
950	Consideration of the use of frequencies between 275 and 3 000 GHz	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.6.	-
951	Enhancing the international spectrum regulatory framework	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.2.	-
953	Protection of radiocommunication services from emission by short-range devices	Text recently updated (at WRC-07); for consideration by WRC-12 Agenda item 1.22.	-
954	Harmonization of spectrum use by terrestrial ENG systems	For consideration by WRC-12 Agenda item 1.5.	-
955	Consideration of procedures for free-space optical links	For consideration by WRC-12 Agenda item 1.6.	-
956	Regulatory measures to enable introduction of software-defined radio and cognitive radio systems	For consideration by WRC-12 Agenda item 1.19.	-

PART II - WARC/WRC RECOMMENDATIONS

Rec. No.	Subject	Remark	Possible follow-up
7	Standard forms for licenses	Still relevant.	NOC
8	Automatic identification	Still relevant.	NOC
9	Measures to be taken to prevent the operation of broadcasting stations on board ships/aircraft outside national territories	Still relevant.	NOC
34	Principles for allocation of frequency bands	Still relevant.	NOC
		This Recommendation is under consideration by Agenda item 1.2 of WRC-12.	SUP
36	International monitoring of emissions from space stations	Still relevant; studies carried out within SG 1.	NOC
37	Operational procedures for ESV	Still relevant; Recommendation ITU-R S.1587-2 (updated 10/2007), ITU-R SF.1649-1 (updated 08/2008) and ITU-R SF.1650-1 (updated 02/2005) in force.	NOC
63	Calculation of necessary bandwidth	Still relevant; ongoing studies; Recommendation ITU-R SM.1138-2 (updated 10/2008) and ITU-R SM.328-11 (updated 05/2006) in force.	NOC
71	Type approval	Still relevant.	NOC
75	Study of boundary between out-of-band and spurious domains of primary radars using magnetrons	Still relevant; Recommendation ITU-R SM.1541-3 (updated 01/2011) in force; ongoing studies to review Annex 8 to this ITU-R Recommendation.	NOC
			SUP
100	Bands for troposcatter	Still relevant.	NOC
104	pfd and e.i.r.p. limits	Obsolete.	SUP
206	Integrated MSS	Still relevant; SG 4 is carrying out studies towards the development of relevant draft new Recommendations/Reports.	NOC
		The term “IMT-2000” be replaced with “IMT”.	MOD
207	Future IMT systems	Still relevant.	NOC
316	Use of SES within harbours	Still relevant.	NOC
401	Use of worldwide frequencies in AP27	Still relevant.	NOC
503	HFBC	Still relevant.	NOC
506	Harmonics in BSS	Still relevant.	NOC
520	Elimination of out-of-band HFBC emissions	Still relevant.	NOC
522	Coordination of HFBC schedules	Still relevant.	NOC
608	Guidelines for consultation meetings established by Res. 609	Text recently updated (at WRC-07); still relevant; Recommendations ITU-R M.1642-2 (updated 10/2007) and ITU-R M.1787 (approved 08/2009) in force.	NOC
622	Sharing of bands 2 025-2 110 MHz and 2 200-2 290 MHz	Still relevant; relevant ITU-R Recommendations have been adequately updated along with this Recommendation.	NOC
707	Sharing in 32-33 GHz	Still relevant; Recommendation ITU-R S.1151 in force.	NOC

Rec. No.	Subject	Remark	Possible follow-up
724	Use by civil aviation of allocations to FSS	Still relevant.	NOC

ANNEX 4-2

Draft modifications to WRC Resolutions proposed to the CPM11-2

(For information)

Reasons for modifications: The Radiocommunication Assembly 2007 adopted Resolution **56** which resolves "that the term "IMT" be the root name that encompasses both IMT-2000 and IMT-Advanced collectively." As a consequence, with the idea that the references in the Radio Regulations to "IMT-2000" should be changed to "IMT", unless the specific reference to "IMT-2000" is still applicable, WRC-07 made appropriate changes to most of the Article **5** footnotes, Resolutions and Recommendations associated with IMT-2000. However some footnotes, as well as some *considering* and *recognizing* in some Resolutions and Recommendations still refer to IMT-2000 in a non-consistent manner.

The relevant texts in the following Resolutions and Recommendation need to be updated in the above respect.

MOD

RESOLUTION 223 (Rev.WRC-~~07~~12)

Additional frequency bands identified for IMT

considering

d) that the technical characteristics of IMT-2000 are specified in ITU-R and ITU-T Recommendations, including Recommendation ITU-R M.1457, which contains the detailed specifications of the radio interfaces of IMT-2000;

MOD

RESOLUTION 646 (Rev.WRC-~~03~~12)

Public protection and disaster relief

considering

h) that continuing development of new technologies such as IMT~~-2000 and systems beyond IMT-2000~~ and Intelligent Transportation Systems (ITS) may be able to support or supplement advanced public protection and disaster relief applications;

MOD

RESOLUTION 734 (Rev.WRC-~~07~~12)*

Studies for spectrum identification for gateway links for high-altitude platform stations in the range from 5 850 to 7 075 MHz

considering

c) that provision has been made in the Radio Regulations for the deployment of HAPS in specific bands, including as base stations to serve IMT~~-2000~~ networks (Article **11**);

*This Resolution is for consideration by WRC Agenda item 1.20.

MOD

RECOMMENDATION 206 (Rev.WRC-~~07~~12)

Consideration on the possible use of integrated mobile-satellite service and ground component systems in some frequency bands identified for the satellite component of International Mobile Telecommunications

considering

g) that the bands 1 980-2 010 MHz and 2 170-2 200 MHz are identified for use by the satellite component of IMT~~-2000~~ in accordance with Resolution **212 (Rev.WRC-07)**;

AGENDA ITEM 8.1

8.1 to consider and approve the Report of the Director of the Radiocommunication Bureau:

8.1.1 on the activities of the Radiocommunication Sector since WRC-07;

8.1.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

*8.1.3 on action in response to Resolution **80 (Rev.WRC-07)***

6/8.1.1 Activities of the Radiocommunication Sector since WRC-07

6/8.1.1/1 Issue A: Protection of radiocommunication services against interference from ISM equipment

Resolution **63 (Rev.WRC-07)**: *Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment*

6/8.1.1/1.1 Executive summary

Resolution **63 (Rev.WRC-07)** and WRC-12 Agenda item 8.1.1 Issue A invites the ITU-R to study the radiation from industrial, scientific and medical (ISM) equipment, within and outside the frequency bands designated for ISM applications (RR No. **5.138** and No. **5.150**) to ensure adequate protection of radiocommunication services.

The ITU-R has developed Report ITU-R SM.2180 to address Resolution **63 (Rev.WRC-07)**.

The Report introduces the interference analysis method and the radiation limits of ISM equipment developed by International Special Committee on Radio Interference (CISPR). According to the Report, it is shown that the interference analysis method of CISPR is practicable to compute the probability of interference produced by ISM equipment. However, current and future radiocommunication systems are adopting digital technologies and the current emission limits of CISPR Publication 11 may not take the protection of these digital radiocommunication systems into account.

Thus, the present emission limits of CISPR Publication 11 should be reviewed for the protection of digital radiocommunication services from interferences produced by ISM equipment.

6/8.1.1/1.2 Background

Recommendation ITU-R SM.1056 recommends administrations to use the CISPR Publication 11 as a guide for ISM equipment to protect radiocommunication services outside of ISM frequency bands.

According to RR No. **15.13**, administrations shall take all practicable and necessary steps to ensure that radiation from equipment used for industrial, scientific and medical applications is minimal and that, outside the bands designated for use by this equipment, radiation from such equipment is at a level that does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the RR provisions.

Pursuant to RR No. **15.13**, administrations established their regulatory arrangement referring to the emission limits of CISPR Publication 11.

Meanwhile, Resolution **63 (Rev.WRC-07)** describes concerns about the interferences caused by the radiation from ISM equipment. Therefore, it is necessary to examine whether radiocommunication services can be adequately protected by using the interference analysis method and radiation limits of CISPR or not.

6/8.1.1/1.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Reports: Recommendation ITU-R SM.1056 and Report ITU-R SM.2180.

CISPR recently developed an interference analysis method based on the signal-to-noise ratio (SNR) in which Gaussian probability distribution is used.

This method has been used to establish the radiation limits of ISM equipment to protect radio receivers in the vicinity of ISM equipment. The analytical model presented in CISPR Publication 16-4-4 can be used to derive the emission limits for coexisting between radio receivers and ISM equipment. However, in order to evaluate the performance degradation of radiocommunication services due to the radiation from ISM equipment, the protection criteria described in ITU-R Recommendations and Reports have to be considered. Those recommendations and reports are listed in Report ITU-R SM.2180. A guideline on limits of ISM equipment is given in Recommendation ITU-R SM.1056.

6/8.1.1/1.3.1 Interference analysis method

As in Report ITU-R SM.2180, the analytical method developed by CISPR is available to compute the probability of interferences produced by ISM equipment and establish the emission limits of ISM equipment to protect radio receivers.

6/8.1.1/1.3.2 Emission limits

The limits of ISM equipment are given in the latest CISPR Publication 11. These limits have been adapted by many administrations to establish their regulatory arrangements in accordance with RR No. **15.13**. For some frequency bands, administrations may require more stringent limits than those of CISPR Publication 11 in order to protect the radiocommunication services operating in their countries.

6/8.1.1/1.4 Analysis of the results of studies

The ITU-R has developed Report ITU-R SM.2180 to address Resolution **63 (Rev.WRC-07)**. The report introduces the interference analysis method and the radiation limits of ISM equipment developed by CISPR. Since the emission limits of CISPR Publication 11 are derived on the basis of the signal-to-noise ratios (SNR) of radiocommunication services, these limits have been playing an important role for administrations to successfully protect radiocommunication services from the radiation generated by ISM equipment.

Yet, according to the latest papers concerning electromagnetic interference, the present CISPR emission limits have been developed to protect analogue radiocommunication services rather than digital radiocommunication services. The CISPR model used for analogue radiocommunication services may not be appropriate for digital radiocommunication services. Therefore, it is necessary to review whether the present limits of CISPR Publication 11 provide adequate protection to digital radiocommunication systems.

6/8.1.1/1.5 Conclusion

With regard to the impact of ISM equipment on the radiocommunication services, ITU-R should provide CISPR with the required protection criteria of the digital radiocommunication systems as part of liaison activities between ITU-R Study Group 1 and CISPR. Then CISPR could develop the emission limits of ISM equipment required to protect the digital radiocommunication systems within and outside the frequency bands designated for ISM applications (RR Nos. **5.138** and **5.150**) in the Radio Regulations.

To examine the impact of ISM equipment on digital radiocommunication systems in terms of CISPR method, it is believed that Resolution **63 (Rev.WRC-07)** should be revised to improve collaboration with CISPR.

An example of the revised text for Resolution **63 (Rev.WRC-07)** is provided below, however the results of collaboration with CISPR to define limits in CISPR Publication 11 on radiation from ISM equipment within the frequency bands designated in the RR should have a time-limit.

MOD

RESOLUTION 63 (Rev.WRC-~~07~~12)

Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

a) that ISM applications are defined under ~~RR~~ No. **1.15** as "operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of *telecommunications*";

b) that ISM equipment may be situated in locations where outward radiation cannot always be avoided;

c) that there is an increasing amount of ISM equipment working on various frequencies throughout the spectrum;

d) that in some cases a considerable part of the energy may be radiated by ISM equipment outside its working frequency;

e) that Recommendation ITU-R SM.1056 recommends to administrations the use of International Special Committee on Radio Interference (CISPR) Publication 11 as a guide for ISM equipment to protect radiocommunication services, but that CISPR 11 does not yet fully specify radiation limits for all frequency bands;

f) that some radio ~~services~~systems, especially those using low field strengths, may suffer interference caused by radiation from ISM equipment, a risk which is unacceptable particularly in the case of systems belonging to radionavigation or other safety services;

g) that, in order to limit the risks of interference to specified parts of the spectrum:

– the preceding Radio Conferences of Atlantic City, 1947, and Geneva, 1959, designated some frequency bands within which the radiocommunication services must accept harmful interference produced by ISM equipment;

– WARC-79 accepted an increase in the number of bands to be designated for ISM equipment, but only on the condition that limits of radiation from such equipment be specified within the bands newly designated for worldwide use and outside all the bands designated for ISM equipment~~,~~;

h) that current evolution of digital technologies used in radiocommunication systems may require continuous review of CISPR Publication 11,

recognizing

that there are various technologies and standards for digital radiocommunication systems,

noting

that certain digital radiocommunication systems use low transmission power and the receivers of these systems may be more sensitive to the interference from ISM equipment,

resolves

that, to ensure that radiocommunication services are adequately protected, studies are required on the limits to be imposed on the radiation from ISM equipment within the frequency bands designated in the Radio Regulations for this use and outside of those bands,

invites ITU-R

1 to provide the necessary interference criteria of relevant digital radiocommunication systems to enable CISPR to review the limit of radiation from ISM equipment;

2 to continue, in collaboration with CISPR, its studies relating to radiation from ISM equipment within the frequency bands designated in the Radio Regulations for this use and outside of those bands in order to ensure adequate protection of radiocommunication services, with priority being given to the completion of studies which would permit CISPR to define limits in Publication CISPR 11 on radiation from ISM equipment inside all the bands designated in the Radio Regulations for the use of such equipment,

instructs the Director of the Radiocommunication Bureau

~~1~~ to bring this Resolution to the attention of CISPR.~~;~~

~~2 to provide the results of these studies to WRC-11 for its consideration.~~

6/8.1.1/2 Issue B: Updating of the "Remarks" columns in the Tables of Article 9A of Appendix 30A and Article 11 of Appendix 30 to the Radio Regulations

Resolution **547 (Rev. WRC-07)**: *Updating of the "Remarks" columns in the Tables of Article 9A of Appendix 30A and Article 11 of Appendix 30 of the Radio Regulations*

This issue is under consideration by the Bureau.

6/8.1.1/3 Issue C: Earth observation applications

Resolution **673 (WRC-07)**: *Radiocommunications use for Earth observation applications*

6/8.1.1/3.1 Executive summary

Resolution **673 (WRC-07)** called for studies by ITU-R "on possible means to improve the recognition of the essential role and global importance of Earth observation radiocommunications applications and the knowledge and understanding of administrations regarding the utilization and benefits of these applications".

In response to this Resolution, ITU-R developed several deliverables stressing the essential role of Earth observations for climate, environment and disaster prediction and mitigation.

Some administrations consider that a relevant response to Agenda item 8.1.1 Issue C would be to modify this Resolution at WRC-12, together with the inclusion of a new provision in the RR urging administration to duly recognize the importance of Earth observation.

6/8.1.1/3.2 Background

Resolution **673 (WRC-07)** notes that Earth observation applications operate under the EESS (active and passive), MetSat, MetAids and RLS. The Resolution further notes that the importance of Earth observation radiocommunication applications has been stressed by a number of international bodies such as the Group on Earth Observation, the World Meteorological Organization (WMO) and the Intergovernmental Panel on Climate Change. It is also noted that, although meteorological- and Earth observation-satellites are currently only operated by a limited number of countries, the data and/or related analyses resulting from their operation are distributed and used globally, particularly by national weather services in developed and developing countries and by organizations studying climate change throughout the world. Resolution **673 (WRC-07)** invites the ITU-R to carry out studies on possible means to improve the recognition of the essential role and global importance of Earth observation radiocommunication applications and the knowledge and understanding of administrations regarding the utilization and benefits of these applications.

6/8.1.1/3.3 Summary of technical and operational studies and relevant ITU-R Recommendations

Existing relevant Recommendation: ITU-R RS.1859

New relevant ITU-R Recommendations and Reports: Recommendation ITU-R RS.1883 and Report ITU-R RS.2178.

Also notable are the Joint ITU/WMO Handbook on the “Use of radio spectrum for meteorology: weather, water and climate monitoring and prediction” (2008), Handbook on the EESS (currently under development within ITU-R) and the ITU-D Q.22/2 Report “Utilization of ICT for disaster management, resources, and active and passive space-based sensing systems as they apply to disaster and emergency relief situations”.

6/8.1.1/3.4 Analysis of the results of studies

Part A of Report ITU-R RS.2178 includes an extensive overview of the use of spectrum by Earth observation radiocommunication applications. The Report describes the considerable societal weight and economic benefits of spectrum use for Earth observation activities and, where possible, references previous studies and reports that have evaluated these impacts and benefits for the global community. The Report shows the economic benefits in relation to the investments for these observation systems. However, the Report also recognizes the inherent difficulty in attempting to quantify these benefits to society as a whole because loss of human life and damage to the environment and property are not readily translated into economic values. The Report also notes that most of the societal benefits of Earth observation applications occur over many years and therefore these benefits are long-term in nature.

Recommendation ITU-R RS.1859 as well as the ITU-D Q.22/2 Report consider the use of active and passive space-based sensing systems and the important role that they play in disaster management activities, especially in disaster prediction and relief efforts as well as the evaluation of the aftermath of these disasters.

The Recommendation ITU-R RS.1883 considers the role of Earth observation systems such as space-based active and passive sensors in the long-term study and understanding of global climate change. Such measurements are vital in understanding the causes and effects of changes in climate throughout the world.

The long-term effective and increasing cooperation between WMO and ITU also needs to be highlighted through, in particular, the ITU-R participation in the work of the WMO Steering Group on Radio Frequency Coordination (SG-RFC), the release of the new version of their joint Handbook on the "Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction" (Edition 2008) and the organization of the first joint ITU-WMO Seminar (16-18 September 2009).

The organization of this Seminar build upon the shared recognition of the crucial importance of radio-frequency spectrum and radio-based remote sensing systems and applications for meteorological and environmental observations for climate monitoring, disaster risk reduction, adaptation and mitigation of negative effects of climate change. The Seminar shared information on WMO's Integrated Global Observing System and ITU's role in using information and communication technologies (ICT) to help combat and monitor climate change. Discussions focused on the effective use of radio spectrum, space orbits and radio-based meteorological tools and systems for monitoring the environment and thus predicting and detecting natural disasters, and mitigating their effects. The quality of meteorological measurements was also on the agenda, as well as the activities of national and international organizations in this field. The Seminar concluded that:

– taking into account the increasing importance of weather, climate and water monitoring systems in predicting of climate change WMO and ITU should continue and even further strengthen their cooperation;
– ITU should actively participate in the development and implementation of a new WMO Global Framework for Climate Services as decided by the World Climate Conference 3;
– representatives of meteorological and telecommunication communities should intensify their efforts in developing awareness of their communities and the general public about the use of telecommunications/ICTs and essential role of radio-frequency spectrum for activities related to climate, weather and water information, warnings and prediction services.

It was also proposed to organize similar ITU/WMO Seminars regularly, in particular before WRCs.

Finally, one can stress the ITU implication in climate change that led, among others, to ITU-R participation in several ITU Symposia on ICT and Climate Change, in the WMO World Climate Conference-3 (September 2009) and in the United Nations Conference on Climate Change that took place in December 2009 in Copenhagen, Denmark.

6/8.1.1/3.5 Conclusion

In response to Resolution **673 (WRC-07)**, ITU-R developed several ITU-R Recommendations, Report and Handbooks (listed in Section 6/8.1.1/3.3) as well as specific actions stressing the essential role of Earth observations for climate, environment and disaster prediction and mitigation.

A relevant response to Agenda item 8.1.1 Issue C could be to modify Resolution **673 (WRC-07)** at WRC-12, together with the inclusion of a new provision in the RR urging administrations to duly recognize the importance of Earth observation.

Some administrations have expressed concerns with this response as given below, i.e. the inclusion of a new provision in Article **4** and with some of the proposed modifications to Resolution **673 (WRC-07)**.

An example provision for possible addition to Article **4** is as follows:

4.YZ Member States recognize the importance of the Earth observation related radio services; in this respect it is necessary to take into account Resolution **673 (Rev.WRC-12)**.

One example for the possible revision of Resolution **673 (WRC-07)** is as follows:

RESOLUTION 673 (Rev.WRC-~~07~~12)

~~Radiocommunications use for~~Spectrum use by Earth observation applications

The World Radiocommunication Conference (Geneva, 20~~07~~12),

considering

~~*a)* that *in situ* and remote Earth observation capabilities depend on the availability of radio frequencies under a number of radio services, allowing for a wide range of passive and active applications on satellite- or ground-based platforms;~~

[Explanatory note: this *considering* appears now in *noting a)*]

a~~b~~) that the collection and exchange of Earth observation data are essential for maintaining and improving the accuracy of weather forecasts, ~~that~~which contributes to the protection of life, preservation of property and sustainable development throughout the world;

b~~c~~) that Earth observation data are also essential for monitoring and predicting climate changes, for disaster prediction, monitoring and mitigation, for increasing the understanding, modelling and verification of all aspects of climate change, and for related policy-making;

c) that more than 90 per cent of natural disasters are climate- or weather-related;
[Explanatory note: this *considering* appeared in the original version of Res. 673 as *noting further d)*]

d) that Earth observations are also used to obtain pertinent data regarding natural resources, this being particularly crucial for the benefit of developing countries;

e) that furthermore, Earth observations are also used to obtain global and detailed images of the Earth's surface that are used for a large variety of commercial applications (e.g. urban developments, utilities deployments, agriculture, security);

f~~e~~) that Earth observations are performed for the benefit of the whole international community and all mankind, are shared among all countries and are generally available at no cost;~~,~~

g) that for certain Earth observation measurements current data are compared with historical data. For these long-term measurements and trends long-term consistency of measurements is essential;

h) Recommendation ITU-R RS.1859 "Use of remote sensing systems for data collection to be used in the event of natural disasters and similar emergencies";

i) Recommendation ITU-R RS.1883 "Use of remote sensing systems in the study of climate change and the effects thereof";

j) ITU-D Report "Utilization of ICT for disaster management, resources and active and passive space-based sensing systems as they apply to disaster and emergency relief situations";
[Explanatory note: this *considering* replaces the *recognizing c)* of the original version of Res. 673]

k) Report ITU-R RS.2178 "The essential role and global importance of radio-spectrum use for Earth observations and for related applications";

l) joint WMO-ITU Handbook on "Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction";

m) ITU-R handbook on “Earth Exploration Satellite Service”,

~~*recognizing*~~

~~*a)* that § 20 c) of the Plan of Action of the World Summit on Information Society (Geneva, 2003), on e-environment, calls for the establishment of monitoring systems, using information and communication technologies (ICT), to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, least developed countries and small economies;~~
[Explanatory note: this *recognizing* is only repositioned; it appears later on this draft revision]

~~*b)* Resolution 34 (Rev. Doha, 2006) of the World Telecommunication Development Conference, on the role of telecommunications/ICT in early warning and mitigation of disasters and humanitarian assistance;~~
[Explanatory note: this *recognizing* is only repositioned; it appears later in this draft revision]

~~*c)* ITU-D Question 22/2 “Utilization of ICT for disaster management, resources and active and passive space-based sensing systems as they apply to disaster and emergency relief situations”,~~
[Explanatory note: this *recognizing* is replaced by the new *considering h)*]

~~*noting*~~

~~*a)* that Earth observation applications are conducted under the Earth exploration-satellite (active and passive), meteorological satellite, meteorological aids and radiolocation services;~~
[Explanatory note: this *noting* is repositioned and now part of a new *noting a)* appearing after the section *considering further*]

~~*b)* that some essential passive frequency bands are covered by No. **5.340**,~~
[Explanatory note: this *noting* is repositioned to be *noting d)* appearing after the section *considering further*]

~~considering~~noting further

a) that the importance of Earth observation radiocommunication~~s~~ applications has been stressed by a number of international bodies such as ~~the Group on Earth Observation (GEO),~~ the World Meteorological Organization (WMO), ~~and~~ the Intergovernmental Panel on Climate Change (IPCC) and the Group on Earth Observation (GEO) and that collaboration of ITU-R with these bodies ~~could be importantis~~ essential;

b) that, in particular, GEO is leading a worldwide effort to build a Global Earth Observation System of Systems (GEOSS) to provide comprehensive and coordinated Earth observations from thousands of instruments worldwide, transforming the collected data into vital information for society and mankind;

c) that GEOSS provides a broad range of societal benefits, including disaster management and aspects related to human health, energy, climate, water, weather, ecosystems, agriculture and biodiversity~~;~~,

~~*d)* that more than 90 per cent of natural disasters are climate- or weather-related;~~
[Explanatory note: repositioned, now appearing as *considering c)*]

noting

a) that *in situ* and remote Earth observation applications are conducted under the Earth exploration-satellite (active and passive), meteorological-satellite, meteorological aids, radiolocation services, and some applications within the radio astronomy service and therefore depend on the availability of spectrum, allowing for a wide range of passive and active applications on satellite- or ground-based platforms;
[Explanatory note: the first part of this *noting* appeared in the original version of Res 673 as *considering a)*]

b) that many observations are required at a global level and, therefore, spectrum-related issues must be considered globally;

c) that, due to the specificity and uniqueness of passive bands, there are no alternative frequency bands to gather the required information, and that, therefore, passive bands are unsuitable for migration;

d) that some essential frequency bands allocated to passive services are covered by No. **5.340**;
[Explanatory note: similar *noting* appeared in the original version of Res. 673 as *noting b)*]

e) that some essential passive Earth observation operations currently suffer radio interference resulting in erroneous data or even complete loss of data~~;~~,

noting further

a~~f~~) that, although meteorological and Earth observation satellites are currently only operated by a limited number of countries, the data and/or related analyses resulting from their operation are distributed and used globally, in particular by national weather services in developed and developing countries and by climate-change-related organizations;~~,~~

b) that, on a more general basis, all Earth observation data and/or related analyses are shared among the global community and to its overall benefit irrespective of any political or economic interest,

recognizing

a) that § 20 c) of the Plan of Action of the World Summit on Information Society (Geneva, 2003), on e-environment, calls for the establishment of monitoring systems, using information and communication technologies (ICT), to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, least developed countries and small economies;
[Explanatory note: this *recognizing* appeared earlier in the original version of Res. 673]

b) Resolution 136 (Rev. Guadalajara, 2010) of the ITU Plenipotentiary Conference "The use of telecommunications/information and communication technologies for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief";

c) Resolution 182 (Guadalajara, 2010) of the ITU Plenipotentiary Conference "The role of telecommunications/information and communication technologies on climate change and the protection of the environment",

taking into account

a) that the total amount of estimated damage by hydro-meteorological disasters during the period 1998-2007 was about USD 800 billion;

b) that WMO has estimated that the overall economic benefits of modern meteorological services typically outweigh the national cost of maintaining such services by a ratio of as much as 10 to 1;

c) that most of the associated investments are coming from public funds;

d) that the benefits of the use of spectrum by Earth observation applications has a considerable societal and economic value, both for society as a whole and for the individual citizens;

e) that most of this societal value of Earth observation is incommensurable in financial terms, as they relate to preventing large losses of lives or threats to socio-political stability and security,

resolves ~~*to invite ITU-R*~~

~~to carry out studies on possible means to improve the recognition of the essential role and global importance of Earth observation radiocommunications applications and the knowledge and understanding of administrations regarding the utilization and benefits of these applications,~~

1 to recognize that the use of spectrum by Earth observation applications has a considerable economic and societal value, as most of the data retrieved are directly dedicated to the benefit of every citizen since they relate in particular to meteorology, climatology, environment, economy, civil security and safety of life and property;

2 to urge Member States to take into account and support Earth observation radio-frequency requirements and in particular protection and long-term availability of related frequency bands, in the light of "*noting further*" above;

3 to urge Member States to consider the extensive use of some frequency bands by Earth observation applications prior to any decision potentially affecting these applications, noting in particular that certain bands used by Earth observation applications have specific physical characteristics (spectral lines, propagation) that do not allow a migration to a different frequency.

6/8.1.2 Difficulties or inconsistencies encountered in the application of the Radio Regulations

Two contributions were received (Documents 34 and 61).

The preliminary draft Report of the Director of the Radiocommunication Bureau (Document 34) provided a number of items summarizing the experiences of the BR in administering the Radio Regulations. The contribution in Document 61 provided two proposals for correcting inconsistencies in the Radio Regulations. The CPM took note of these proposals and brings these issues to the attention of the Director of the Radiocommunication Bureau for possible inclusion into his Report under WRC-12 Agenda item 8.1.2.

6/8.1.3 Action in response to Resolution 80 (Rev.WRC-07)

WRC-12 Agenda item 8.1.3 references Resolution **80 (Rev.WRC-07)**. *Resolves* 1 of this Resolution instructs the Radiocommunication Sector to, *inter alia*, conduct studies on procedures for measurement and analysis of the basic principles contained in Article 44 of the ITU Constitution.

6/8.1.3/1 Work already performed by ITU-R in response to Resolution 80 (Rev.WRC-07)

The function of ITU-R has been to conduct its work with a view to fulfilling the referenced principles in Article 44 of the ITU Constitution. In this respect, it has conducted many analyses to 1) provide for guaranteed access to the geostationary-satellite orbit, and 2) adopt Reports and Recommendations which promote efficient use of the geostationary-satellite orbit. These actions have included the following:

6/8.1.3/1.1 Guarantee of access

The Radio Regulations in their Appendices **30**, **30A**, and **30B** provide for a guarantee of access to the geostationary-satellite orbit. RR Appendices **30/30A** provide for the guaranteed access to frequencies from geostationary orbit positions for the transmission of BSS to all Member States of the ITU. Similarly, RR Appendix **30B** provides a guarantee of access to all Member States of the ITU to FSS spectrum allocation for use from orbital positions on the geostationary-satellite orbit. Within this Plan, there is 1 600 MHz of spectrum (2 × 800 MHz) for each Member State of ITU.

These Plans have been analysed and updated since their inception. At WRC-07 the technical characteristics of the RR Appendix **30B** Plan were modified to improve efficiency of the Plan. If the guarantee of access has not been fulfilled by these Plans, then perhaps the Plans should be modified to better achieve such an objective.

6/8.1.3/1.2 Efficient use of the GSO

During the last 30 years the ITU-R has carried out numerous analyses to improve the efficient use of the GSO spectrum resource. As a testimony to the success of these efforts, there are today over 200 communication satellites operating in orbit. This contribution to the efficient use of the GSO spectrum resource has been accomplished through a variety of techniques and through adoption of numerous ITU-R Reports and Recommendations. These include:

a) station keeping tolerance of ±0.1 degrees e.g. see Recommendation ITU-R S.484 “Station keeping in longitude of geostationary orbit satellites”;

b) earth station off-axis antenna gain patterns e.g. see Recommendations ITU-R S.465 “Reference radiation pattern of earth station antennas in the fixed-satellite service for use in coordination and interference analysis” and ITU-R S.1855 “Alternative reference radiation pattern for earth station antennas used with satellites in the geostationary-satellite orbit for use in coordination and/or interference assessment in the frequency range from 2 to 31 GHz”;

c) implementation of a coordination arc in RR Appendix **5**. Study being conducted to analyse impact of a reduction in coordination arc to simplify coordination;

d) performance standards e.g. see Recommendation ITU-R S.1420 “Performance for broadband integrated services digital network asynchronous transfer mode via satellite”;

e) adaptive power control standards e.g. see Recommendation ITU-R S.1255 “Use of adaptive power control to mitigate interference between GSO FSS and MSS networks”;

f) sharing methodologies e.g. see Recommendation ITU-R S.1593 “Methodology for frequency sharing between certain types of homogeneous highly-elliptical orbit non-geostationary fixed-satellite service systems in the 4/6 GHz and 11/14 GHz frequency bands”;

g) polarization standards e.g. see Recommendation ITU-R S.736 “Estimation of polarization discrimination in calculations of interference between geostationary satellites in the fixed-satellite service”;

h) updates on service requirements for newer digital modulation techniques
e.g. see Recommendation ITU-R S.1782 “Possibilities for global broadband Internet access by the fixed-satellite service”.

The above and other ongoing activities reflect the technical actions related to improving equitable access to the geostationary-satellite orbit/spectrum.

The ITU-R in dealing with WRC-12 Agenda item 1.13 studied various approaches to address this agenda item. Among these approaches (with the view to enhance the access to the orbit/spectrum resources) some of them, i.e. Methods B and E, could be equally used to address the objectives of Resolution **80 (Rev.WRC-07)**, depending on the decisions of the Conference.

Should the Conference decide to use any of these approaches to the 21.4-22 GHz band, there would be a need to study the implication of the application of these approaches to other frequency bands.

AGENDA ITEM 8.2

8.2 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution ***806 (WRC-07)****,*

6/8.2/1 Preliminary agenda items for the 2015 World Radiocommunication Conference (WRC-15)

Resolution **806 (WRC-07):** *Preliminary agenda for WRC-15* (items listed below are from section 2)

2.1 to consider spectrum requirements and possible additional spectrum allocations in the radiodetermination service to support the operation of unmanned aerial systems (UAS) in non-segregated airspace;

2.2 to review the use of the band 5 091-5 150 MHz by the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-GSO mobile-satellite service) in accordance with Resolution ***114 (Rev.WRC-03)****;*

Resolution **114 (Rev.WRC-03)**: *Studies on compatibility between new systems of the aeronautical radionavigation service and the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in the frequency band 5 091-5 150 MHz*

6/8.2/2 Additional suggested items

Some suggestions for agenda items currently under consideration for inclusion on the agenda for WRC-15 were submitted to the CPM and noted here for information purposes (Documents CPM11-2/11, 48, 50, 77, 78 and 102).

Regional organizations and administrations are still in the process of preparing for WRC-12. It is expected that this process will take into account Resolution **804 (WRC-07)**. Information on views and proposals for agenda items for WRC-15 may be available on websites of regional organizations:

African Telecommunications Union (ATU)
http://www.atu-uat.org/

Arab Spectrum Management Group (ASMG)
http://www.asmg.ae/

Asia-Pacific Telecommunity (APT)
http://www.aptsec.org/APG-WP6

Inter-American Telecommunication Commission (CITEL)
http://portal.oas.org/Portal/Topic/CITEL/Estructura/CCPII/WRC12/tabid/1876/Default.aspx

European Conference of Postal and Telecommunications Administrations (CEPT)
http://apps.ero.dk/cpg

Regional Commonwealth in the Field of Communications (RCC)
http://www.en.rcc.org.ru/

6/8.2/3 Time-frame for WRC-15

WRC-15 may be faced with a number of pressing matters. For example, one such matter could be the spectrum requirements for mobile broadband applications, including IMT. Early discussions on this topic will contribute towards achieving the Millennium Development Goals set by the UN and to which the ITU is committed.

To enable a timely international discussion and resolution of regulatory and operational radiocommunication matters, the next WRC (WRC-15), should be held in 2015 as early as practicable, taking into account that the time-frame between the CPM and conference should be the minimum stipulated in Resolution 2.

6/8.2/4 Grouping the agenda items for WRC-15

To ease the WRC-15 preparations by administrations, WRC-12 could consider grouping the agenda items by service (e.g. maritime and aeronautical, radiolocation and amateur, fixed/mobile and broadcasting, science, satellite, future work and other issues).

ANNEX TO THE CPM REPORT

Reference List of ITU-R Resolutions, Recommendations and Reports, as well as other ITU and non-ITU publications, used in the CPM Report

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1 List of existing ITU-R Resolutions

Resolution ITU-R	Latest Publication	Resolution Title	Agenda Item	CPM Chapter
9-3	Res. ITU-R 9-3	Liaison and collaboration with other relevant organizations, in particular ISO and IEC	1.22	3
54	Res. ITU-R 54	Studies to achieve harmonization for short-range radiocommunication devices (SRDs)	1.22	3

2 List of preliminary draft new (PDN) ITU-R Resolution(s)

Number of the draft new or revised Resolution	Available Document / Status	Draft Resolution Title	Agenda Item	CPM Chapter
[CRS]	PDN Res. ITU-R [CRS] (Doc. 1B/267 Annex 6)	Studies on the implementation and use of cognitive radio systems (CRS)	1.19	6

3 List of existing ITU-R Recommendations

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
BS.	216	Rec. ITU-R BS.216-2	Protection ratio for sound broadcasting in the Tropical Zone	1.19	6
RA.	314	Rec. ITU-R RA.314-10	Preferred frequency bands for radio astronomical measurements	1.22	3
RA.	314-10	Rec. ITU-R RA.314-10	Preferred frequency bands for radio astronomical measurements	1.6	4
SM.	329	Rec. ITU-R SM.329-11	Unwanted emissions in the spurious domain	1.22	3
SF.	357	Rec. ITU-R SF.357-4	Maximum allowable values of interference in a telephone channel of an analogue angle-modulated radio-relay system sharing the same frequency bands as systems in the fixed-satellite service	1.18	5

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SA.	363	Rec. ITU-R SA.363-5	Space operation systems	1.19	6
P.	368	Rec. ITU-R P.368-9	Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz	1.15 1.16 1.23	2 4 2
P.	372	Rec. ITU-R P.372-10	Radio noise	1.15	2
BS.	412	Rec. ITU-R BS.412-9	Planning standards for terrestrial FM sound broadcasting at VHF	1.4 1.19	1 6
BT.	417	Rec. ITU-R BT.417-5	Minimum field strengths for which protection may be sought in planning an analogue terrestrial television service	1.17	3
BT.	419	Rec. ITU-R BT.419-3	Directivity and polarization discrimination of antennas in the reception of television broadcasting	1.17	3
BS.	450	Rec. ITU-R BS.450-3	Transmission standards for FM sound broadcasting at VHF	1.4	1
P.	452	Rec. ITU-R P.452-14	Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz	1.17	3
S.	465	Rec. ITU-R S.465-6	Reference radiation pattern of earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz	8.1.3	6
S.	484	Rec. ITU-R S.484-3	Station-keeping in longitude of geostationary satellites in the fixed-satellite service	8.1.3	6
M.	489-2	Rec. ITU-R M.489-2	Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz	1.10	1
M.	493	Rec. ITU-R M.493-13	Digital selective-calling system for use in the maritime mobile service	1.10	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SA.	514	Rec. ITU-R SA.514-3	Interference criteria for command and data transmission systems operating in the Earth exploration-satellite and meteorological-satellite services	1.19	6
RS.	515-4	Rec. ITU-R RS.515-4	Frequency bands and bandwidths used for satellite passive sensing	1.6	4
RA.	517	Rec. ITU-R RA.517-4	Protection of the radio astronomy service from transmitters operating in adjacent bands	1.22	3
S.	523	Rec. ITU-R S.523-4	Maximum permissible levels of interference in a geostationary-satellite network in the fixed-satellite service using 8-bit PCM encoded telephony, caused by other networks of this service	1.19	6
S.	524	Rec. ITU-R S.524-9	Maximum permissible levels of off-axis e.i.r.p. density from earth stations in geostationary-satellite orbit networks operating in the fixed-satellite service transmitting in the 6 GHz, 13 GHz, 14 GHz and 30 GHz frequency bands	1.13	5
P.	526-10	Rec. ITU-R P.526-11	Propagation by diffraction	2	6
P.	528	Rec. ITU-R P.528-2	Propagation curves for aeronautical mobile and radionavigation services using the VHF, UHF and SHF bands	1.21	2
P.	533	Rec. ITU-R P.533-10	Method for the prediction of the performance of HF circuits	1.15	2
M.	540	Rec. ITU-R M.540-2	Operational and technical characteristics for an automated direct-printing telegraph system for promulgation of navigational and meteorological warnings and urgent information to ships	1.10 1.23	1 2
BS.	560	Rec. ITU-R BS.560-4	Radio-frequency protection ratios in LF, MF and HF broadcasting	1.19 1.23	6 2

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	585-4	Rec. ITU-R M.585-5	Assignment and use of maritime mobile service identities	2	6
SA.	609	Rec. ITU-R SA.609-2	Protection criteria for radiocommunication links for manned and unmanned near-Earth research satellites	1.5 1.19	3 6
SA.	609-2	Rec. ITU-R SA.609-2	Protection criteria for radiocommunication links for manned and unmanned near-Earth research satellites	1.22	3
RA.	611	Rec. ITU-R RA.611-4	Protection of the radio astronomy service from spurious emissions	1.22	3
P.	618	Rec. ITU-R P.618-10	Propagation data and prediction methods required for the design of Earth-space telecommunication systems	1.13	5
M.	627	Rec. ITU-R M.627-1	Technical characteristics for HF maritime radio equipment using narrow-band phase-shift keying (NBPSK) telegraphy	1.23	2
M.	633-3	Rec. ITU-R M.633-4	Transmission characteristics of a satellite emergency position-indicating radio beacon (satellite EPIRB) system operating through a satellite system in the 406 MHz band	2	6
BO.	652	Rec. ITU-R BO.652-1	Reference patterns for Earth-station and satellite antennas for the broadcasting satellite service in the 12 GHz band and for the associated feeder links in the 14 GHz and 17 GHz bands	1.13	5
BT.	655	Rec. ITU-R BT.655-7	Radio-frequency protection ratios for AM vestigial sideband terrestrial television systems interfered with by unwanted analogue vision signals and their associated sound signals	1.19	6
S.	671	Rec. ITU-R S.671-3	Necessary protection ratios for narrow-band single channel-per-carrier transmissions interfered with by analogue television carriers	1.19	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
S.	672	Rec. ITU-R S.672-4	Satellite antenna radiation pattern for use as a design objective in the fixed-satellite service employing geostationary satellites	1.18	5
SF.	675	Rec. ITU-R SF.675-3	Calculation of the maximum power density (averaged over 4 kHz) of an angle modulated carrier	7	5
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M.	688	Rec. ITU-R M.688	Technical characteristics for a high frequency direct-printing telegraph system for promulgation of high seas and NAVTEX-type maritime safety information	1.23	2
F.	699	Rec. ITU-R F.699-7	Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to about 70 GHz	1.17	3
BS.	704	Rec. ITU-R BS.704	Characteristics of FM sound broadcasting reference receivers for planning purposes	1.4	1
S.	735	Rec. ITU-R S.735-1	Maximum permissible levels of interference in a geostationary-satellite network for an HRDP when forming part of the ISDN in the fixed-satellite service caused by other networks of this service below 15 GHz	1.19	6
S.	736	Rec. ITU-R S.736-3	Estimation of polarization discrimination in calculations of interference between geostationary-satellite networks in the fixed-satellite service	8.1.3	6

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F.	758	Rec. ITU-R F.758-4	Considerations in the development of criteria for sharing between the terrestrial fixed service and other services	1.14 1.17 1.24	2 3 4
F.	760	Rec. ITU-R F.760-1	Protection of terrestrial line-of-sight radio-relay systems against interference from the broadcasting-satellite service in the bands near 20 GHz	1.13	5
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BO.	791	Rec. ITU-R BO.791	Choice of polarization for the broadcasting-satellite service	1.13	5
BO.	792	Rec. ITU-R BO.792	Interference protection ratios for the broadcasting-satellite service (television) in the 12 GHz band	1.13	5
M.	819	Rec. ITU-R M.819-2	International Mobile Telecommunications-2000 (IMT-2000) for developing countries	1.17	3
P.	837	Rec. ITU-R P.837-5	Characteristics of precipitation for propagation modelling	1.13	5
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ITU-R Series Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
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SA. 1016	Rec. ITU-R SA.1016	Sharing considerations relating to deep-space research	1.12	4
SA. 1018	Rec. ITU-R SA.1018	Hypothetical reference system for systems comprising data relay satellites in the geostationary orbit and user spacecraft in low Earth-orbits	1.5	3
SA. 1019	Rec. ITU-R SA.1019	Preferred frequency bands and transmission directions for data relay satellite systems	1.5	3
SA. 1026	Rec. ITU-R SA.1026-4	Aggregate interference criteria for space-to-Earth data transmission systems operating in the Earth exploration-satellite and meteorological-satellite services using satellites in low-Earth orbit	1.19 1.24	6 4
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RS. 1029	Rec. ITU-R RS.1029-2	Interference criteria for satellite passive remote sensing	1.19	6
RS. 1029-2	Rec. ITU-R RS.1029-2	Interference criteria for satellite passive remote sensing	1.6 1.22	4 3
RA. 1031	Rec. ITU-R RA.1031-2	Protection of the radio astronomy service in frequency bands shared with other services	1.8 1.22	3 3
M. 1036	Rec. ITU-R M.1036-3	Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications-2000 (IMT 2000) in the bands 806-960 MHz, 1 710-2 025 MHz, 2 110-2 200 MHz and 2 500-2 690 MHz	1.17	3
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ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
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M.	1073	Rec. ITU-R M.1073-2	Digital cellular land mobile telecommunication systems	1.19	6
M.	1084	Rec. ITU-R M.1084-4	Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service	1.10	1
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SM.	1132-2	Rec. ITU-R SM.1132-2	General principles and methods for sharing between radiocommunication services or between radio stations	1.2	6
SM.	1133	Rec. ITU-R SM.1133	Spectrum utilization of broadly defined services	1.2	6
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SA.	1154	Rec. ITU-R SA.1154	Provisions to protect the space research (SR), space operations (SO) and Earth exploration-satellite services (EESS) and to facilitate sharing with the mobile service in the 2 025-2 110 MHz and 2 200-2 290 MHz bands	1.5	3
SA.	1155	Rec. ITU-R SA.1155	Protection criteria related to the operation of data relay satellite systems	1.5 1.11 1.19	3 4 6
SA.	1157	Rec. ITU-R SA.1157-1	Protection criteria for deep-space research	1.19 1.25	6 5
SA.	1160	Rec. ITU-R SA.1160-2	Interference criteria for data dissemination and direct data readout systems in the Earth exploration-satellite and meteorological-satellite services using satellites in the geostationary orbit	1.19	6
SA.	1163	Rec. ITU-R SA.1163-2	Interference criteria for service links in data collection systems in the Earth exploration-satellite and meteorological-satellite services	1.19	6
RS.	1166	Rec. ITU-R RS.1166-4	Performance and interference criteria for active spaceborne sensors	1.19 1.25	6 5
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M.	1184	Rec. ITU-R M.1184-2	Technical characteristics of mobile satellite systems in the frequency bands below 3 GHz for use in developing criteria for sharing between the mobile-satellite service (MSS) and other services	1.18	5

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BO.	1212	Rec. ITU-R BO.1212	Calculation of total interference between geostationary-satellite networks in the broadcasting-satellite service	1.13	5
BO.	1213	Rec. ITU-R BO.1213-1	Reference receiving Earth station antenna pattern for the broadcasting-satellite service in the 11.7-12.75 GHz band	1.13	5
M.	1231	Rec. ITU-R M.1231	Interference criteria for space-to-Earth links operating in the mobile-satellite service with non-geostationary satellites in the 137-138 MHz band	1.19	6
M.	1232	Rec. ITU-R M.1232	Sharing criteria for space-to-Earth links operating in the mobile-satellite service with non-geostationary satellites in the 137-138 MHz band	1.19	6
M.	1234	Rec. ITU-R M.1234-1	Permissible level of interference in a digital channel of a geostationary satellite network in the aeronautical mobile-satellite (R) service (AMS(R)S) in the bands 1 545 to 1 555 MHz and 1 646.5 to 1 656.5 MHz and its associated feeder links caused by other networks of this service and the fixed-satellite service	1.19	6
RA.	1237	Rec. ITU-R RA.1237-2	Protection of the radio astronomy service from unwanted emissions resulting from applications of wideband digital modulation	1.22	3
P.	1238	Rec. ITU-R P.1238-6	Propagation data and prediction methods for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 900 MHz to 100 GHz	1.22	3

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
F.	1245	Rec. ITU-R F.1245-1	Mathematical model of average radiation patterns for line-of-sight point-to-point radio-relay system antennas for use in certain coordination studies and interference assessment in the frequency range from 1 GHz to about 70 GHz	1.24	4
S.	1255	Rec. ITU-R S.1255	Use of adaptive uplink power control to mitigate codirectional interference between geostationary satellite orbit/fixed-satellite service (GSO/FSS) networks and feeder links of non-geostationary satellite orbit/mobile satellite service (non-GSO/MSS) networks and between GSO/FSS networks and non-GSO/FSS networks	8.1.3	6
RS.	1263	Rec. ITU-R RS.1263-1	Interference criteria for meteorological aids operated in the 400.15-406 MHz and 1 668.4-1 700 MHz bands	1.19	6
SM.	1265-1	Rec. ITU-R SM.1265-1	National alternative allocation methods	1.2	6
SA.	1275	Rec. ITU-R SA.1275-2	Orbital locations of data relay satellites to be protected from the emissions of fixed service systems operating in the band 2 200-2 290 MHz	1.5	3
BO.	1293	Rec. ITU-R BO.1293-2	Protection masks and associated calculation methods for interference into broadcast-satellite systems involving digital emissions	1.13	5
BO.	1295	Rec. ITU-R BO.1295	Reference transmit Earth station antenna off-axis e.i.r.p. patterns for planning purposes to be used in the revision of the Appendix 30A (Orb-88) Plans of the Radio Regulations at 14 GHz and 17 GHz in Regions 1 and 3	1.13	5
BO.	1297	Rec. ITU-R BO.1297	Protection ratios to be used for planning purposes in the revision of the Appendices 30 (Orb-85) and 30A (Orb-88) Plans of the Radio Regulations in Regions 1 and 3	1.19	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
BT.	1306	Rec. ITU-R BT.1306-4	Error-correction, data framing, modulation and emission methods for digital terrestrial television broadcasting	1.17	3
M.	1313	Rec. ITU-R M.1313-1 Note - Suppressed on 19/10/07 (RA-07)	Technical characteristics of maritime radionavigation radars	1.19	6
M.	1318	Rec. ITU-R M.1318-1	Evaluation model for continuous interference from radio sources other than in the radionavigation-satellite service to the radionavigation-satellite service systems and networks operating in the 1 164-1 215 MHz, 1 215-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz bands	1.4	1
S.	1323	Rec. ITU-R S.1323-2	Maximum permissible levels of interference in a satellite network (GSO/FSS; non-GSO/FSS; non-GSO/MSS feeder links) in the fixed-satellite service caused by other codirectional FSS networks below 30 GHz	1.19	6
S.	1328	Rec. ITU-R S.1328-4	Satellite system characteristics to be considered in frequency sharing analyses within the fixed-satellite service	1.20 1.21	3 2
S.	1340	Rec. ITU-R S.1340	Sharing between feeder links for the mobile-satellite service and the aeronautical radionavigation service in the Earth-to-space direction in the band 15.4-15.7 GHz	1.21	2
S.	1341	Rec. ITU-R S.1341	Sharing between feeder links for the mobile-satellite service and the aeronautical radionavigation service in the space-to-Earth direction in the band 15.4-15.7 GHz and the protection of the radio astronomy service in the band 15.35-15.4 GHz	1.21	2

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
RS.	1346	Rec. ITU-R RS.1346	Sharing between the meteorological aids service and medical implant communication systems (MICS) operating in the mobile service in the frequency band 401-406 MHz	1.22	3
BT.	1368	Rec. ITU-R BT.1368-8	Planning criteria for digital terrestrial television services in the VHF/UHF bands	1.17 1.19	3 6
M.	1371	Rec. ITU-R M.1371-4	Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band	1.10	1
M.	1388	Rec. ITU-R M.1388	Threshold levels to determine the need to coordinate between space stations in the broadcasting-satellite service (sound) and particular systems in the land mobile service in the band 1 452-1 492 MHz	1.19	6
SA.	1396	Rec. ITU-R SA.1396	Protection criteria for the space research service in the 37-38 and 40-40.5 GHz bands	1.12 1.19	4 6
BO.	1408	Rec. ITU-R BO.1408-1	Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting-satellite channel	1.13	5
P.	1411	Rec. ITU-R P.1411-5	Propagation data and prediction methods for the planning of short-range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz	1.22	3
SA.	1414	Rec. ITU-R SA.1414	Characteristics of data relay satellite systems	1.5	3
S.	1420	Rec. ITU-R S.1420	Performance for broadband integrated services digital network asynchronous transfer mode via satellite	8.1.3	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
S.	1432	Rec. ITU-R S.1432-1	Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz	1.19 1.22	6 3
BO.	1444	Rec. ITU-R BO.1444	Protection of the BSS in the 12 GHz band and associated feeder links in the 17 GHz band from interference caused by non-GSO FSS systems	1.19	6
SM.	1448	Rec. ITU-R SM.1448	Determination of the coordination area around an earth station in the frequency bands between 100 MHz and 105 GHz	1.11	4
M.	1450	Rec. ITU-R M.1450-4	Characteristics of broadband radio local area networks	1.4	1
M.	1453	Rec. ITU-R M.1453-2	Intelligent transport systems - Dedicated short range communications at 5.8 GHz	1.20	3
M.	1460	Rec. ITU-R M.1460-1	Technical and operational characteristics and protection criteria of radiodetermination radars in the 2 900-3 100 MHz band	1.19	6
M.	1461	Rec. ITU-R M.1461-1	Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services	1.17 1.19	3 6
M.	1462	Rec. ITU-R M.1462	Characteristics of and protection criteria for radars operating in the radiolocation service in the frequency range 420-450 MHz	1.19	6
M.	1463	Rec. ITU-R M.1463-1	Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 1 215-1 400 MHz	1.19	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1464	Rec. ITU-R M.1464-1	Characteristics of radiolocation radars, and characteristics and protection criteria for sharing studies for aeronautical radionavigation and meteorological radars in the radiodetermination service operating in the frequency band 2 700-2 900 MHz	1.19	6
M.	1465	Rec. ITU-R M.1465-1	Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 3 100-3 700 MHz	1.19	6
M.	1466	Rec. ITU-R M.1466	Characteristics of and protection criteria for radars operating in the radionavigation service in the frequency band 31.8-33.4 GHz	1.19	6
M.	1478	Rec. ITU-R M.1478-1	Protection criteria for Cospas-Sarsat search and rescue instruments in the band 406-406.1 MHz	1.19	6
F.	1495	Rec. ITU-R F.1495-1	Interference criteria to protect the fixed service from time varying aggregate interference from other radiocommunication services sharing the 17.7-19.3 GHz band on a co-primary basis	1.19	6
BO.	1516	Rec. ITU-R BO.1516	Digital multiprogramme television systems for use by satellites operating in the 11/12 GHz frequency range	1.13	5
S.	1524	Rec. ITU-R S.1524	Coordination identification between geostationary-satellite orbit fixed-satellite service networks	7	5
SM.	1541	Rec. ITU-R SM.1541-3	Unwanted emissions in the out-of-band domain	1.11	4
P.	1546	Rec. ITU-R P.1546-4	Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz	1.15 1.17	2 3
M.	1582	Rec. ITU-R M.1582	Method for determining coordination distances, in the 5 GHz band, between the international standard microwave landing system stations operating in the aeronautical radionavigation service and stations of the radionavigation-satellite service (Earth-to-space)	1.4	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1583	Rec. ITU-R M.1583-1	Interference calculations between non-geostationary mobile-satellite service or radionavigation-satellite service systems and radio astronomy telescope sites	2	6
S.	1590	Rec. ITU-R S.1590	Technical and operational characteristics of satellites operating in the range 20-375 THz	1.6	4
S.	1591	Rec. ITU-R S.1591	Sharing of inter-satellite link bands around 23, 32.5 and 64.5 GHz between non-geostationary/geostationary inter-satellite links and geostationary/geostationary inter-satellite links	1.11	4
S.	1593	Rec. ITU-R S.1593	Methodology for frequency sharing between certain types of homogeneous highly-elliptical orbit non-geostationary fixed-satellite service systems in the 4/6 GHz and 11/14 GHz frequency bands	8.1.3	6
P.	1621	Rec. ITU-R P.1621-1	Propagation data required for the design of Earth-space systems operating between 20 THz and 375 THz	1.6	4
P.	1622	Rec. ITU-R P.1622	Prediction methods required for the design of Earth-space systems operating between 20 THz and 375 THz	1.6	4
P.	1623	Rec. ITU-R P.1623-1	Prediction method of fade dynamics on Earth-space paths	1.13	5
RA.	1630	Rec. ITU-R RA.1630	Technical and operational characteristics of ground-based astronomy systems for use in sharing studies with active services between 10 THz and 1000 THz	1.6	4
SM.	1633	Rec. ITU-R SM.1633	Compatibility analysis between a passive service and an active service allocated in adjacent and nearby bands	1.13	5
M.	1634	Rec. ITU-R M.1634	Interference protection of terrestrial mobile service systems using Monte Carlo simulation with application to frequency sharing	1.17	3

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1635	Rec. ITU-R M.1635	General methodology for assessing the potential for interference between IMT-2000 or systems beyond IMT-2000 and other services	1.17	3
M.	1638	Rec. ITU-R M.1638	Characteristics of and protection criteria for sharing studies for radiolocation, aeronautical radionavigation and meteorological radars operating in the frequency bands between 5 250 and 5 850 MHz	1.19	6
M.	1644	Rec. ITU-R M.1644	Technical and operational characteristics, and criteria for protecting the mission of radars in the radiolocation and radionavigation service operating in the frequency band 13.75-14 GHz	1.19	6
M.	1652	Rec. ITU-R M.1652	Dynamic frequency selection (DFS) in wireless access systems including radio local area networks for the purpose of protecting the radiodetermination service in the 5 GHz band	1.19	6
BO.	1659	Rec. ITU-R BO.1659	Mitigation techniques for rain attenuation for broadcasting-satellite service systems in frequency bands between 17.3 GHz and 42.5 GHz	1.13	5
BS.	1660	Rec. ITU-R BS.1660-3	Technical basis for planning of terrestrial digital soun broadcasting in the VHF band	1.19	6
F.	1668	Rec. ITU-R F.1668-1	Error performance objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections	1.24	4
F.	1670	Rec. ITU-R F.1670-1	Protection of fixed wireless systems from terrestrial digital video and sound broadcasting systems in shared VHF and UHF bands	1.17	3

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
S.	1673	Rec. ITU-R S.1673-1	Methodologies for the calculation of the worst-case interference levels from a non-geostationary HEO-type fixed-satellite service system into geostationary fixed-satellite service satellite networks operating in the 10 to 30 GHz frequency bands	7	5
M.	1677	Rec. ITU-R M.1677-1	International Morse code	1.10	1
SM.	1682	Rec. ITU-R SM.1682	Methods for measurements on digital broadcasting signals	1.17	3
BT.	1701	Rec. ITU-R BT.1701-1	Characteristics of radiated signals of conventional analogue television systems	1.17	3
F.	1703	Rec. ITU-R F.1703	Availability objectives for real digital fixed wireless links used in 27 500 km hypothetical reference paths and connections	1.24	4
M.	1730	Rec. ITU-R M.1730-1	Characteristics of and protection criteria for the radiolocation service in the frequency band 15.4-17.3 GHz	1.21	2
BT.	1735	Rec. ITU-R BT.1735	Methods for objective quality coverage assessment of digital terrestrial television broadcasting signals of System B specified in Recommendation ITU-R BT.1306	1.17	3
M.	1739	Rec. ITU-R M.1739	Protection criteria for wireless access systems, including radio local area networks, operating in the mobile service in accordance with Resolution **229 (WRC-03)** in the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz	1.22 1.25	3 5
SA.	1742	Rec. ITU-R SA.1742	Technical and operational characteristics of interplanetary and deep-space systems operating in the space-to-Earth direction around 283 THz	1.6	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SA.	1743	Rec. ITU-R SA.1743	Maximum allowable degradation to radiocommunication links of the space research and space operation services arising from interference from emissions and radiations from other radio sources	1.5	3
RS.	1744	Rec. ITU-R RS.1744	Technical and operational characteristics of ground-based meteorological aids systems operating in the frequency range 272-750 THz	1.6	4
SM.	1754	Rec. ITU-R SM.1754	Measurement techniques of ultra-wideband transmissions	1.22	3
SM.	1755	Rec. ITU-R SM.1755	Characteristics of ultra-wideband technology	1.22	3
SM.	1756	Rec. ITU-R SM.1756	Framework for the introduction of devices using ultra-wideband technology	1.22	3
SM.	1757	Rec. ITU-R SM.1757	Impact of devices using ultra-wideband technology on systems operating within radiocommunication services	1.22	3
M.	1767	Rec. ITU-R M.1767	Protection of land mobile systems from terrestrial digital video and audio broadcasting systems in the VHF and UHF shared bands allocated on a primary basis	1.17 1.22	3 3
M.	1768	Rec. ITU-R M.1768	Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000	1.17	3
BO.	1773	Rec. ITU-R BO.1773	Criterion to assess the impact of interference to the broadcasting-satellite service from emissions of devices without a corresponding frequency allocation in the Radio Regulations, that produce fundamental emissions in the frequency bands allocated to the broadcasting-satellite service	1.19	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
BO.	1776	Rec. ITU-R BO.1776	Reference power flux-density for the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3	1.13	5
F.	1777	Rec. ITU-R F.1777	System characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies	1.5 1.25	3 5
S.	1782	Rec. ITU-R S.1782	Possibilities for global broadband internet access by fixed-satellite service systems	8.1.3	6
BO.	1785	Rec. ITU-R BO.1785	Intra-service sharing criteria for GSO BSS systems in the band 21.4-22.0 GHz in Regions 1 and 3	1.13	5
BT. BS.	1786	Rec. ITU-R BT.1786 Rec. ITU-R BS.1786	Criterion to assess the impact of interference to the terrestrial broadcasting service (BS)	1.19 1.22	6 3
M.	1787	Rec. ITU-R M.1787	Description of systems and networks in the radionavigation-satellite service (space-to-Earth and space-to-space) and technical characteristics of transmitting space stations operating in the bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz	1.4	1
SM.	1792	Rec. ITU-R SM.1792	Measuring sideband emissions of T-DAB and DVB-T transmitters for monitoring purposes	1.17	3
M.	1796	Rec. ITU-R M.1796	Characteristics of and protection criteria for terrestrial radars operating in the radiodetermination service in the frequency band 8 500-10 500 MHz	1.25	5
M.	1797	Rec. ITU-R M.1797	Vocabulary of terms for the land mobile service	1.10	1
M.	1798	Rec. ITU-R M.1798-1	Characteristics of HF radio equipment for the exchange of digital data and electronic mail in the maritime mobile service	1.9	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1802	Rec. ITU-R M.1802-1	Characteristics and protection criteria for radars operating in the radiolocation service in the frequency band 30-300 MHz	1.14	2
RS.	1804	Rec. ITU-R RS.1804	Technical and operational characteristics of Earth exploration-satellite service (EESS) systems operating above 3 000 GHz	1.6	4
SA.	1805	Rec. ITU-R SA.1805	Technical and operational characteristics of space-to-space telecommunication systems operating around 354 THz and 366 THz	1.6	4
M.	1808	Rec. ITU-R M.1808	Technical and operational characteristics of conventional and trunked land mobile systems operating in the mobile service allocations below 869 MHz to be used in sharing studies	1.5 1.14	3 2
P.	1812	Rec. ITU-R P.1812-1	A path-specific propagation prediction method for point-to-area terrestrial services in the VHF and UHF bands	1.17	3
P.	1814	Rec. ITU-R P.1814	Prediction methods required for the design of terrestrial free-space optical links	1.6	4
P.	1817	Rec. ITU-R P.1817	Propagation data required for the design of terrestrial free-space optical links	1.6	4
M.	1823	Rec. ITU-R M.1823	Technical and operational characteristics of digital cellular land mobile systems for use in sharing studies	1.17 1.22	3
M.	1824	Rec. ITU-R M.1824	System characteristics of television outside broadcast, electronic news gathering and electronic field production in the mobile service for use in sharing studies	1.5 1.25	3 5
M.	1825	Rec. ITU-R M.1825	Guidance on technical parameters and methodologies for sharing studies related to systems in the land mobile service	1.17	3

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1828	Rec. ITU-R M.1828	Technical and operational requirements for aircraft stations of aeronautical mobile service limited to transmissions of telemetry for flight testing in the bands around 5 GHz	1.25	5
M.	1830	Rec. ITU-R M.1830	Technical characteristics and protection criteria of aeronautical radionavigation service systems in the 645-862 MHz frequency band	1.17	3
M.	1842	Rec. ITU-R M.1842-1	Characteristics of VHF radio systems and equipment for the exchange of data and electronic mail in the maritime mobile service RR Appendix 18 channels	1.10	1
M.	1849	Rec. ITU-R M.1849	Technical and operational aspects of ground-based meteorological radars	1.19	6
S.	1855	Rec. ITU-R S.1855	Alternative reference radiation pattern for earth station antennas used with satellites in the geostationary-satellite orbit for use in coordination and/or interference assessment in the frequency range from 2 to 31 GHz	7 8.1.3	5 6
RS.	1859	Rec. ITU-R RS.1859	Use of remote sensing systems for data collection to be used in the event of natural disasters and similar emergencies	8.1.1c	6
RA.	1860	Rec. ITU-R RA.1860	Preferred frequency bands for radio astronomical measurements in the range 1-3 THz	1.6	4
RS.	1861	Rec. ITU-R RS.1861	Typical technical and operational characteristics of Earth exploration-satellite service (passive) systems using allocations between 1.4 and 275 GHz	1.20	3
BT.	1871	Rec. ITU-R BT.1871	User requirements for wireless microphones	1.5	3
BT.	1872	Rec. ITU-R BT.1872	User requirements for digital electronic news gathering	1.5	3

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1874	Rec. ITU-R M.1874	Technical and operational characteristics of oceanographic radars operating in sub-bands within the frequency range 3-50 MHz	1.15	2
RS.	1881	Rec. ITU-R RS.1881 (Doc. 7/BL/6)	Protection criteria for arrival time difference (ATD) receivers operating in the met aids service in the frequency band 9-11.3 kHz	1.16	4
SA.	1882	Rec. ITU-R SA.1882 (Doc. 7/BL/7)	Technical and operational characteristics of space research service (Earth-to-space) systems for use in the 22.55-23.15 GHz band	1.11	4
RS.	1883	Rec. ITU-R RS.1883 (Doc. 7/BL/8)	Use of remote sensing systems in the study of climate change and the effects thereof	8.1.1c	6

4 List of draft new (DN) or draft revised (DR) ITU-R Recommendations (may include preliminary draft new (PDN) or draft revised (PDR) ITU-R Recommendations and working documents toward preliminary draft new (WDPDN) or draft revised (WDPDR) ITU-R Recommendations)

ITU-R Series	Recommendation Draft Number	Available Document / Status	Draft Recommendation Title	Agenda Item	CPM Chapter
F.	[HAPS GATEWAY]	PDN Rec. ITU-R F.[HAPS GATEWAY] (Doc. 5C/461 Annex 7)	Evaluation of interference from high altitude platform gateway links to fixed wireless systems* in the range 5 850-7 025 MHz	1.20	3
F.	[HAPS CHAR]	DN Rec. ITU-R F.[HAPS CHAR] (Doc. 5/204(Rev.1+Corr.1))	Technical and operational characteristics of gateway links in the fixed service using high altitude platform stations in the band 5 850-7 075 MHz to be used in sharing studies	1.20	3

ITU-R Series	Recommendation Draft Number	Available Document / Status	Draft Recommendation Title	Agenda Item	CPM Chapter
M.	[CHAR-RX3]	DN Rec. ITU-R M.[CHAR-RX3] (Doc. 4/100)	Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the band 1 164-1 215 MHz	1.4	1
M.	[AM(R)S_1GHz_SHARING]	PDN Rec. ITU-R M.[AM(R)S_1GHz_SHARING] (Doc. 5B/617 Annex 6)	AM(R)S sharing studies in the 960-1 164 MHz band	1.4	1
M.	[S-E RX+TX]	PDN Rec. ITU-R M.[S-E RX+TX] (Doc. 4C/522 Annex 5)	Characteristics and protection criteria of receiving earth stations and characteristics of transmitting space stations of the radionavigation-satellite service (space-to-Earth) operating in the band 5 010-5 030 MHz	1.4	1
M.	[E-S TX+RX]	PDN Rec. ITU-R M.[E-S TX+RX] (Doc. 4C/522 Annex 4)	Characteristics and protection criteria of receiving space stations and characteristics of transmitting earth stations in the radionavigation satellite service (Earth-to-space) operating in the band 5 010-5 030 MHz	1.4	1
SM.	[SRD]	PDN Rec. ITU-R SM.[SRD] (Doc. 1B/267 Annex 1)	Frequency bands regionally or globally identified for short-range devices (SRDs)	1.22	3

5 List of existing ITU-R Reports

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
SM.	2028	Rep. ITU-R SM.2028-1	Monte Carlo simulation methodology for the use in sharing and compatibility studies between different radio services or systems	1.17	3
M.	2039	Rep. ITU-R M.2039-2	Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses	1.17 1.22	3
SM.	2057	Rep. ITU-R SM.2057	Studies related to the impact of devices using ultra wideband technology on radiocommunication services	1.22	3
RS.	2068	Rep. ITU-R RS.2068	Current and future use of the band near 13.5 GHz by spaceborne active sensors	1.25	5
BT.	2069	Rep. ITU-R BT.2069-4	Tuning ranges and operational characteristics of terrestrial electronic news gathering (ENG), television outside broadcast (TVOB) and electronic field production (EFP) systems	1.5	3
BO.	2071	Rep. ITU-R BO.2071	System parameters of BSS between 17.3 GHz and 42.5 GHz and associated feeder links	1.13	5
M.	2073	Rep. ITU-R M.2073	Feasibility and practicality of prioritization and real- time pre-emptive access between different networks of mobile-satellite service in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz	1.7	5
M.	2077	Rep. ITU-R M.2077	Traffic forecasts and estimated spectrum requirements for the satellite component of IMT 2000 and systems beyond IMT-2000 for the period 2010 to 2020	1.25	5
M.	2084	Rep. ITU-R M.2084	Satellite detection of automatic identification system messages	1.10	1
BS.	2104	Rep. ITU-R BS.2104	FM Modulator interference to broadcast services	1.22	3
F.	2106	Rep. ITU-R F.2106-1	Fixed service applications using free-space optical links	1.6	4

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
F.	2107	Rep. ITU-R F.2107-1	Characteristics and applications of fixed wireless systems operating in the 57 GHz to 130 GHz bands	1.8	3
M.	2115	Rep. ITU-R M.2115-1	Testing procedures for implementation of dynamic frequency selection	1.19	6
M.	2116	Rep. ITU-R M.2116-1	Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies	1.5 1.18	3 5
M.	2117	Rep. ITU-R M.2117	Software defined radio in the land mobile, amateur and amateur satellite services	1.19	6
M.	2120	Rep. ITU-R M.2120	Initial estimate of new aviation AM(R)S spectrum requirements	1.4	1
M.	2122	Rep. ITU-R M.2122	EMC assessment of shore-based electronic navigation (eNAV) infrastructure and new draft Standards for data exchange in the VHF maritime mobile band (156-174 MHz)	1.10	1
M.	2147	Rep. ITU-R M.2147	Assessment of potential interference between FM broadcasting stations operating in the band around 87-108 MHz and aeronautical VDL Mode 4 systems in the band 112-117.975 MHz operating in the AM(R)S	1.4	1
SM.	2152	Rep. ITU-R SM.2152	Definitions of Software Defined Radio (SDR) and Cognitive Radio System (CRS)	1.19	6
SM.	2153	Rep. ITU-R SM.2153	Technical and operating parameters and spectrum use for short-range radiocommunication devices	1.22	3
RA.	2163	Rep. ITU-R RA.2163	Astronomical use of frequency band 50-350 THz and coexistence with other applications	1.6	4
SA.	2164	Rep. ITU-R SA.2164	Compatibility between the meteorological satellite an the fixed services in the band 7 850-7 900 MHz	1.24	4

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
M.	2168	Rep. ITU-R M.2168-1	Initial considerations on compatibility between a proposed new aeronautical mobile (R) service (AM(R)S) system and both radionavigation-satellite service (RNSS) operating in the 5 000-5 010 MHz band and radio astronomy in the adjacent band 4 990-5 000 MHz	1.4	1
M.	2169	Rep. ITU-R M.2169	Improved satellite detection of AIS	1.10	1
M.	2170	Rep. ITU-R M.2170	Compatibility analysis and results for radiolocation systems planned to operate in the 15.4 to 17.3 GHz band and aircraft landing system operating in the 15.4-15.7 GHz band as well as the radio astronomy service operating in the adjacent band 15.35-15.40 GHz, FSS systems and aeronautical radionavigation systems	1.21	2
M.	2171	Rep. ITU-R M.2171	Characteristics of unmanned aircraft systems (UAS) and spectrum requirements to support their safe operation in non- segregated airspace	1.3	1
M.	2172	Rep. ITU-R M.2172	Radiolocation service sharing feasibility in the 154-156 MHz bands	1.14	2
RS.	2178	Report ITU-R RS.2178	The essential role and global importance of radio spectrum use for Earth observations and for related applications	8.1.1c	6
SM.	2180	Rep. ITU-R SM.2180 (Doc. 1/109)	Impact of ISM equipment on radiocommunication services	8.1.1-A	6
RS.	2184	Report ITU-R RS.2184	Arrival time difference lightning detection systems in the meteorological aids service in operation below 20 kHz	1.16	4
RS.	2185	Report ITU-R RS.2185	Study on compatibility between arrival time difference (ATD) stations of the meteorological aids service and the radionavigation service in the frequency band 9 to 14 kHz	1.16	4

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
RS.	2186	Report ITU-R RS.2186	Radio services and radio-frequency environment within the band below 20 kHz	1.16	4
RA.	2189	Report ITU-R RA.2189 (Doc. 7/95)	Sharing between the radio astronomy service and active services in the frequency range 275-3 000 GHz	1.6	4
SA.	2190	Report ITU-R SA.2190	Study on compatibility between the mobile service (aeronautical) and the space research service (space-to-Earth) in the frequency band 37-38 GHz	1.12	4
SA.	2191	Report ITU-R SA.2191	Spectrum requirements for future SRS missions operating under a potential new SRS allocation in the band 22.55-23.15 GHz	1.11	4
SA.	2192	Report ITU-R SA.2192	Compatibility between the space research service (Earth-to-space) and the non-GSO-to-non-GSO systems on the inter-satellite service in the band 22.55-23.55 GHz	1.11	4
SA.	2193	Report ITU-R SA.2193	Compatibility between the space research service (Earth-to-space) and the systems in the inter-satellite service (except for HIBLEO-2) in the band 22.55-23.15 GHz	1.11	4
M.	2197	Report ITU-R M.2197	Technical characteristics and operational objectives for Wireless avionics intra-communications (WAIC)	1.12	4
RS.	2194	Report ITU-R RS.2194	Passive bands of scientific interest to EESS/SRS from 275 to 3 000 GHz	1.6	4
M.	2200	Report ITU-R M.2200	Characteristics of amateur radio stations in the range 415-526.5 kHz for sharing studies	1.23	2
M.	2201	Report ITU-R M.2201	Utilization of the 495-500 kHz band by the maritime mobile service for the digital broadcasting of safety and security related information from shore-to-ships	1.10 1.23	1 2
M.	2203	Report ITU-R M.2203	Compatibility of amateur service stations with existin services in the range 415-526.5 kHz	1.23	2

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
M.	2204	Report ITU-R M.2204	Characteristics and spectrum considerations for sense and avoid systems use on unmanned aircraft systems (UAS)	1.3	1
M.	2205	Report ITU-R M.2205	Results of studies of the AM(R)S allocation in the band 960-1 164 MHz and of the AMS(R)S allocation in the band 5 030-5 091 MHz to support control and non-payload communications (CNPC) links for unmanned aircraft systems (UAS)	1.3	1
M.	2206	Report ITU-R M.2206	Sharing between the aeronautical mobile service and the fixed service in the band 37-38 GHz	1.12	4

6 List of draft new (DN) or draft revised (DR) ITU-R Reports (may include preliminary draft new (PDN) or draft revised (PDR) ITU-R Reports and working documents toward preliminary draft new (WDPDN) or draft revised (WDPDR) ITU-R Reports)

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
M.	[LMS.CRS]	WDPDN Rep. ITU-R M.[LMS.CRS] (Doc. 5A/601 Annex 12)	Cognitive radio systems in the land mobile service	1.19	6
F.	[ENGSHARE]	WDPDN Rep. ITU-R F.[ENGSHARE] (Doc. 5C/461 Annex 3)	Sharing and compatibility studies between ENG systems in frequency bands allocated to the fixed and mobile services	1.5	3
F.	[ENGTUNING RANGES]	WDPDN Rep. ITU-R F.[ENGTUNING RANGES] (Doc. 5C/461 Annex 4)	Consideration of issues with potential tuning ranges for ENG and the potential regional/worldwide harmonization	1.5	3

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
F.	[FS/PASSIVE 71-81GHz]	WDPDN Rep. ITU-R F.[FS/PASSIVE 71-81GHz] (Doc. 5C/461 Annex 6)	Coexistence between fixed service operating in 71-76/81-86 GHz [and 92-95 GHz] bands with the passive services	1.8	3
M.	[AM(R)S-5GHz]	PDN Report ITU-R M.[5GHz-SURF] (Doc. 5B/617 Annex 9)	Spectrum requirements for surface applications at airports in the 5 GHz range	1.4	1
M.	[AMS(R)S SPECTRUM ESTIMATE]	WDPDN Rep. ITU-R M. [AMS(R)S SPECTRUM ESTIMATE] (Doc. 4C/522 Annex 16)	AMS(R)S communication requirements forecasts and estimated future spectrum requirements	1.7	5
M.	[AS EXP OP 415-526.5 kHz]	PDN Report ITU-R M.[AS EXP OP 415-526.5 kHz] (Doc. 5A/601 Annex 4)	Description of amateur and experimental operation between 415 and 526.5 kHz	1.23	2
M.	[MSS-REQS]	PDN Rep. ITU-R M.[MSS-REQS] (Doc. 4C/522 Annex 13)	Traffic forecasts and estimated spectrum requirements for future development of the MSS in the range 4-16 GHz	1.25	5
M.	[MSS-SHARING]	WDPDN Rep. ITU-R M.[MSS-SHARING] (Doc. 4C/522 Annex 15)	Feasibility of MSS operations in certain frequency bands	1.25	5
M.	[RLS 3-50 MHz SHARING]	PDN Report ITU-R M.[RLS 3-50 MHz SHARING] (Doc. 5B/317 Annex 5)	The feasibility of sharing sub-bands between oceanographic radars and fixed and mobile services within the 3-50 MHz band	1.15	2
M.	[UAS-BANDS-NEW-ALLOC]	PDN Report ITU-R M.[UAS-BANDS-NEW-ALLOC] (Doc. 5B/617 Annex 7)	Frequency band study to support Control and non Payload Communications (CNPC) links for unmanned aircraft systems (UAS)	1.3	1

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
M.	[UAS-PERF-AND-REQ]	WDPDN Report ITU-R M.[UAS-PERF-AND-REQ] (Doc. 5B/617 Annex 8)	Example of characteristics and potential performance requirements for unmanned aircraft Control and non-Payload Communications (CNPC) links	1.3	1
SM.	[RFID]	PDN Rep. ITU-R SM.[RFID] (Doc. 1B/267 Annex 2)	Technical characteristics, standards, and frequency bands of operation for RFID and potential harmonization opportunities	1.22	3
SM.	[WRC-12-AI-1.2]	WDPDN Rep. ITU-R SM. [WRC-12-AI-1.2] (Doc. 1B/267 Annex 9)	On enhancing the international regulatory framework in relation to WRC-12 Agenda item 1.2	1.2	6
SM.	[WRC-12-AI-1.22]	PDN Rep. ITU-R SM. [WRC-12-AI-1.22] (Doc. 1A/311 Annex 5)	Emissions from Short-range Devices	1.22	3
M.	[SNAP]	WDPDN Rep. ITU-R M.[SNAP] (Doc. 5B/617, Annex 11)	Current usage of ITU-R RR Appendix 18	1.10	1
F.	[FS-SDR]	WDPDN Rep. ITU-R F.[FS-SDR] (Doc. 5C/461 Annex 13)	Impact of Software Defined Radio (SDR) and Cognitive Radio Systems (CRS) on the Fixed Service	1.5	3
F.	[ENGDEPLOYMENT]	WDPDN Rep. ITU-R F.[ENGDEPLOYMENT] (Doc. 5C/461 Annex 2)	System deployment and operational practices for electronic news gathering applications in the fixed and mobile services	1.5	3
F.	[HAPS MODELLING]	WDPDN Rep. ITU-R F.[HAPS MODELLING] (Doc. 5C/461 Annex 8)	Interference analysis modelling for sharing between HAPS gateway links and existing services in the range 5 850-7 075 MHz	1.20	3

7 Other ITU publications

Reference	Publication	Title	Agenda Item	CPM Chapter
Rec. ITU-D D.13.1	Revision to Recommendation ITU-D 13	Effective utilization of the amateur services in disaster mitigation and relief operations	1.23	2
ITU-D Q.22/2 Report	ITU-D Q.22/2 Report	ITU-D Q.22/2 Report “Utilization of ICT for disaster management, resources, and active and passive space-based sensing systems as they apply to disaster and emergency relief situations”	8.1.1c	6
ITU/WMO Handbook		Use of radio spectrum for meteorology: weather, water and climate monitoring and prediction	8.1.1c	6
ITU-R Handbook	DN ITU-R Handbook	The Earth exploration-satellite service	8.1.1c	6
ITU-R Handbook	ITU-R Handbook	Land Mobile Handbook (including Wireless Access) - Volume 4: Intelligent Transport Systems	1.18	5

8 Non-ITU publications*

Reference	Publication	Title	Agenda Item	CPM Chapter
Annex 10 to the Convention on International Civil Aviation	ICAO Convention	Annex 10 to the Convention on International Civil Aviation Aeronautical Telecommunications (Volumes I, II, III, IV and V)	1.3 1.4	1
A 19/Res.801	IMO Resolution A.801(19)	Provision of radio services for the global maritime distress and safety system (GMDSS)	1.23	2
Res. MSC 74(69)	IMO Resolution MSC 74(69)	Adoption of new and amended performance standards (SOLAS reg. V/12)	1.10	1
IEC 61097-6	International Standard IEC 61097-6	Global maritime distress and safety system (GMDSS)	1.23	2
Eurocontrol long-term forecast (2008-2030)	Eurocontrol long-term forecast (2008-2030)	Eurocontrol Long-Term Forecast: Flight Movements (2008-2030)	1.7	5

* *Note by the Secretariat:* Non-ITU publications are available in the Radiocommunication Bureau Study Group Department upon request.

List of abbreviations used in the CPM Report

Abbreviations	Radio services	RR definition
AMS	aeronautical mobile service	No. **1.32**
AM(R)S	aeronautical mobile (route) service	No. **1.33**
AMS(OR)S	aeronautical mobile-satellite (off-route) service	No. **1.34**
AMSS	aeronautical mobile-satellite service	No. **1.35**
AMS(R)S	aeronautical mobile-satellite (route) service	No. **1.36**
ARNS	aeronautical radionavigation service	No. **1.46**
ARNSS	aeronautical radionavigation-satellite service	No. **1.47**
ARS	amateur service	No. **1.56**
ARSS	amateur-satellite service	No. **1.57**
BS	broadcasting service	No. **1.38**
BSS	broadcasting-satellite service	No. **1.39**
EESS	Earth exploration-satellite service	No. **1.51**
FS	fixed service	No. **1.20**
FSS	fixed-satellite service	No. **1.21**
ISS	inter-satellite service	No. **1.22**
LMS	land mobile service	No. **1.26**
LMSS	land mobile-satellite service	No. **1.27**
MetAids	meteorological aids service	No. **1.50**
MetSat	meteorological-satellite service	No. **1.52**
MMS	maritime mobile service	No. **1.28**
MMSS	maritime mobile-satellite service	No. **1.29**
MRNS	maritime radionavigation service	No. **1.44**
MRNSS	maritime radionavigation-satellite service	No. **1.45**
MS	mobile service	No. **1.24**
MSS	mobile-satellite service	No. **1.25**
RAS	radio astronomy service	No. **1.58**
RDS	radiodetermination service	No. **1.40**
RDSS	radiodetermination-satellite service	No. **1.41**
RLS	radiolocation service	No. **1.48**
RLSS	radiolocation-satellite service	No. **1.49**
RNS	radionavigation service	No. **1.42**
RNSS	radionavigation-satellite service	No. **1.43**
SOS	space operation service	No. **1.23**
SRS	space research service	No. **1.55**

Other abbreviations:

Abbreviations	Description (reference to RR)
ACP	Aeronautical Communication Panel
AES	aircraft earth station
AIS	automatic identification system
AIS-SART	automatic identification system-search and rescue transponder
ALMA	Atacama large millimetre/submillimetre array
ALS	aircraft landing system
AM	amplitude modulation
AMT	aeronautical mobile telemetry
App.	Appendix of the RR
Art.	Article of the RR
ATC	air traffic control
ATD	arrival time difference
ATM	air traffic management
BAS	broadcasting auxiliary service
BBDR	broadband disaster relief
BLoS	beyond line-of-sight
BPSK	binary phase-shift keying
BR	Radiocommunication Bureau
BWA	broadband wireless access
CCD	charge-coupled device
CDMA	code division multiple access
CIRAF	Conferencia Internacional de Radiodifusión por altas frequencias (International High Frequency Broadcasting Conference)
CISPR	Comité Internationale Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
COCR	communications operating concept and requirements for the future radio system
CPC	cognitive pilot channel
CPM	conference preparatory meeting
CRS	cognitive radio system
CS	control station
CV	ITU Convention
DFS	dynamic frequency selection
DSC	digital selective calling
DSRC	dedicated short-range communications
DSSS	direct sequence spread spectrum
DTH	direct-to-home
DTT	digital terrestrial television
DVB-T	terrestrial digital video broadcasting
e.i.r.p.	effective isotropically radiated power
e.r.p.	effective radiated power

List of abbreviations

Abbreviations	Description (reference to RR)
EFP	electronic field production
EMI	electromagnetic interference
ENG	electronic news gathering
epfd	equivalent power flux-density
ETSI	European Telecommunications Standard Institute
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FDD	frequency-division duplex
FDP	fractional degradation in performance
FM	frequency modulation
FWS	fixed wireless system
GMDSS	global maritime distress and safety system
GMSK	Gaussian minimum-shift keying
GNSS	global navigation satellite system
GSM	Global System for Mobile communications
GSO	geostationary-satellite orbit (see RR No. **1.190)**
HAPS	high altitude platform station (see RR No. **1.66A)**
HDTV	high-definition television
HF	high frequency
HSDPA	high-speed downlink packet access
Htx	transmitter height
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICT	information and communication technologies
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IMT	International Mobile Telecommunications
ISM	industrial, scientific and medical (see RR No. **1.15)**
ISO	International Organization for Standardization
ITS	intelligent transportation systems
JTG 5-6	Joint Task Group 5-6
LEOP	launch and early operations phase
LIDAR	light detection and ranging
LoS	line-of-sight
MES	mobile earth station
MF	medium frequency
MIFR	Master International Frequency Register (or Master Register)
MLM	multilateral meeting
MLS	microwave landing system
MoU	Memorandum of Understanding
MPR	multipurpose radar

List of abbreviations

Abbreviations	Description (reference to RR)
MSI	maritime safety information
MSK	minimum-shift keying
NASA	*National Aeronautics and Space Administration*
NAVTEX	navigational text messages
NBDP	narrow-band direct printing
NDB	non-directional beacons
NWP	numerical weather prediction
OB	outside broadcasting
OFDM	orthogonal frequency division multiplexing
OoB	out-of-band
ORM	operator review meetings
pfd / PFD	power flux-density
PIAC	peak instantaneous aircraft count
PP	ITU Plenipotentiary Conference
P-P	point-to-point
PPDR	public protection and disaster relief
QPSK	quadrature phase-shift keying
RCC	Regional Commonwealth in the field of Communications
Rec.	recommendation
Rep.	report
Res.	resolution
RFID	radio frequency identification
RLAN	radio local area network
RR	Radio Regulations
RRB	Radio Regulations Board
RSMS	radar sensing and measurement system
RTCA	Radio Technical Commission for Aeronautics
Rx	receive / receiver
SAB	services ancillary to broadcasting
SAP	services ancillary to production / programme-making
SAR	search and rescue
SARPs	standards and recommended practices
SBR	surface-based radar
SCCD	single cell coordination distance
SDR	software defined radio
SG-RFC	Steering Group on Radio Frequency Coordination
SINR	signal to interference and noise ratio
SLA	service level agreement
SMATV	satellite master antenna television
SNG	satellite news gathering
SNR	signal-to-noise ratio
SOLAS	International Convention for the Safety of Life at Sea

List of abbreviations

Abbreviations	Description (reference to RR)
SRD	short-range device
TDD	time-division duplex
TIG	time-invariant gain
TT&C	tracking, telemetry and command
TV	television
TVG	time-variant gain
TVOB	television outside broadcast
UA	unmanned aircraft
UAC	urban *area coverage*
UACS	unmanned aircraft control station
UAS	unmanned aircraft system
UAT	universal access transceiver
UHF	ultra high frequency
UMTS	Universal Mobile Telecommunications System
UWB	ultra wide band
VHF	very high frequency
VLBI	very long baseline interferometry
VSAT	very small aperture terminal
VTS	vessel traffic services
WAIC	wireless avionic intra-aircraft communications
WMO	World Meteorological Organization
WRC	World Radiocommunication Conference
WTDC	World Telecommunication Development Conference
X-QAM	quadrature amplitude modulation (X states)

ACP WG-F/24

21 - 25 March 2011

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