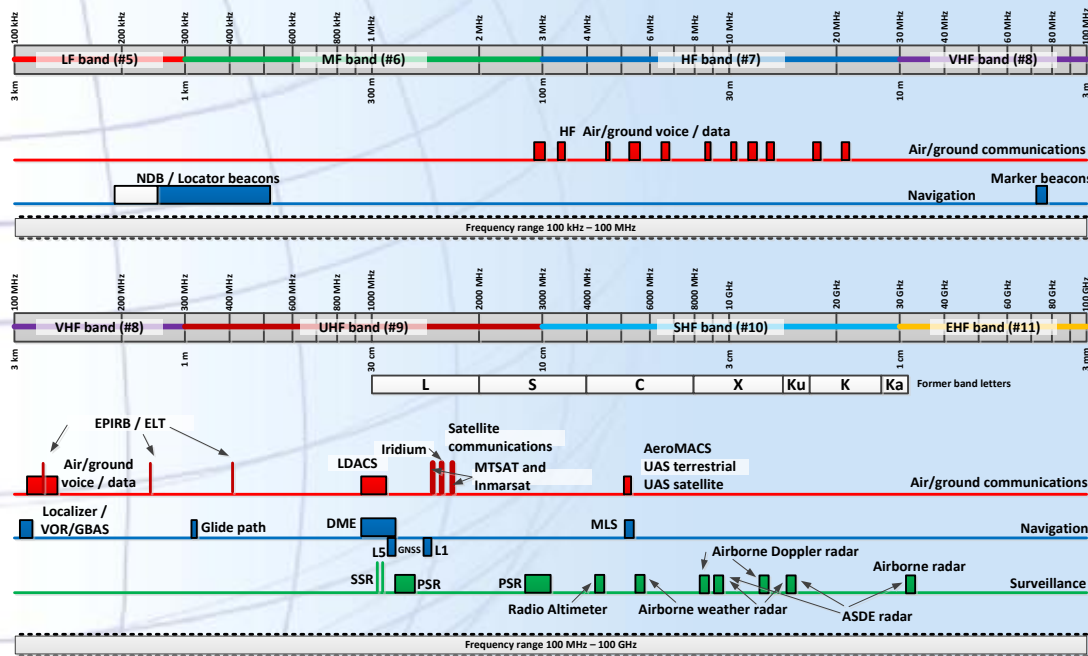


ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation

Vol. I - ICAO Spectrum Strategy

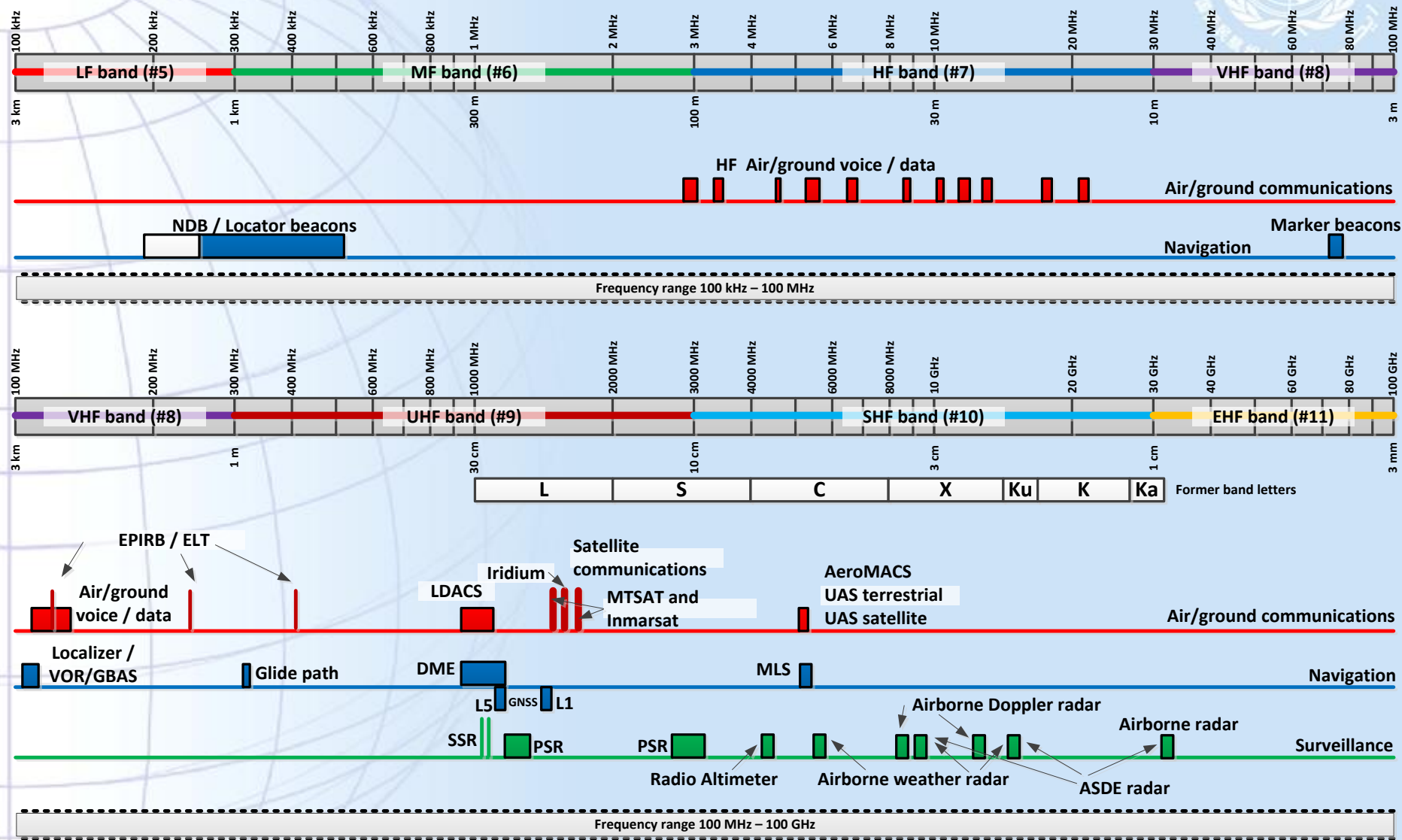
Vol. II - Frequency Planning



Notes:
 Drawing not to scale
 Not all Regional or sub-Regional allocations are shown
 Band identification (e.g. VHF) and band # per Radio Regulations
 The satellite communication bands used by MTSAT and Inmarsat are not allocated the the Aeronautical Mobile Satellite (R) Service

Aeronautical Spectrum Workshop
Preparation for WRC-15
Pattaya, Thailand, 11 – 12 Mach 2014

Loftur Jónasson
 ICAO



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Overview

- **Volume I – ICAO Spectrum Strategy and Policies**
- **Volume II – ICAO Frequency Assignment Planning**

Pre-publication drafts of Doc 9718 and other relevant material can be downloaded, free of charge, from the ACP website (Repository section) at

<http://www.icao.int/safety/acp>

The latest Edition of Doc 9718, now called Doc 9718 Volume I, first edition, became available in printed format this week (March 2014).

The new Volume II became available in printed format last autumn.



Handbook Volume I

Spectrum Strategy and Policies

Overall ICAO Spectrum Policy (approved by Council)

- ICAO Spectrum Strategy
 - ✓ Long term spectrum use of current and future radio systems
- ICAO Spectrum Policy Statements
 - ✓ Specific actions to assist in meeting the Strategic Objectives
- ICAO Position for future WRC's
 - ✓ Medium and long term availability of spectrum for aviation



Handbook Volume I

Spectrum Strategy and Policies

Background material in the Handbook, (Volume I) (1)

- Role of ICAO
 - ✓ In ITU-R (Study Groups) and in Regional Telecommunication Organizations
 - ✓ At ITU World Radiocommunication Conferences
 - ✓ In frequency coordination and registration (also ITU)
- Role of the ITU and Regional Telecommunication Organizations
 - ✓ Develop technical material (ITU-R Study Groups)
 - ✓ Amend Radio Regulations (at WRCs)



Handbook Volume I

Spectrum Strategy and Policies

Background material in the Handbook, (Volume I) (2)

- Policy Statements on frequency allocations and technical details (Chapter 7), including:
 - ✓ Frequency allocations and footnotes in ITU Radio Regulations
 - ✓ Information on Aviation use
 - ✓ Commentary (specific comments on ITU and ICAO review In frequency coordination and registration (also ITU))
- Spectrum Strategy (Chapter 8)



Handbook Volume II

Frequency assignment planning

Published for the first time in 2013

Provides globally harmonized frequency assignment planning criteria and guidance material to support the application of SARPs in Annex 10, Vol. V

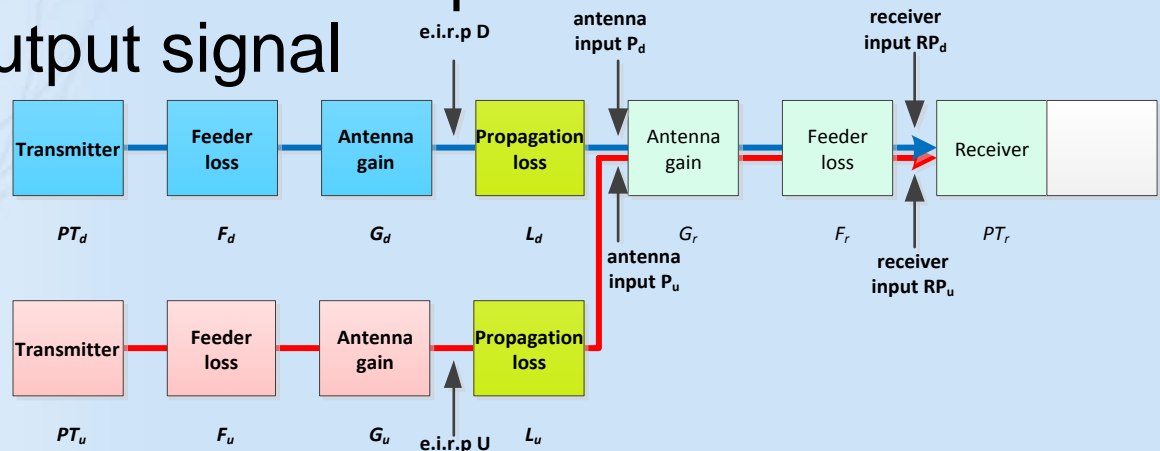
- Developed in conjunction with the revisions to Annex 10, Vol. V
- Developed by ACP Working Group F
- **Implementation through Regional Air Navigation Agreement by PIRG**
- To support the development of Global COM lists and the Global Air Navigation Plan

Handbook Volume II

Frequency assignment planning

Chapter 1 (1) General methodology

- General methodology for compatibility analysis
 - ✓ General model for compatibility assessment
 - ✓ Based on:
 - Protection of desired signal at receiver input
 - Not to exceed maximum permissible distortion of receiver output signal





Handbook Volume II

Frequency assignment planning

Chapter 1 (2) General methodology

- Propagation model
 - ✓ Based on free space propagation
(Re. Recommendation ITU-R P.525)
- Propagation model does not accommodate certain phenomena which are difficult to predict such as
 - ✓ Changes in the refractive index of the atmosphere
 - ✓ Ducting
- ITU has developed propagation curves for aeronautical communication and navigation systems (Recommendation ITU-R P.528)

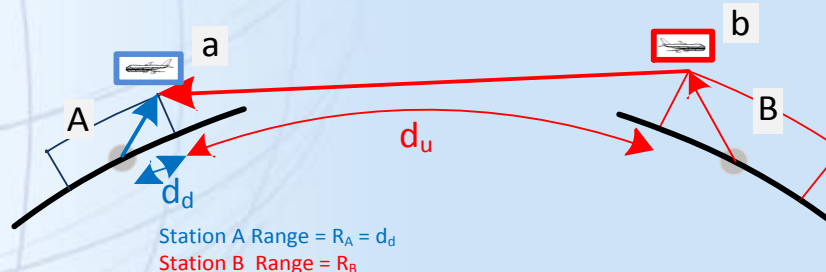
Handbook Volume II

Frequency assignment planning

Chapter 2 (1)

Frequency assignment planning criteria for VHF air-ground communication systems

- Interference model (co-frequency separation)
 - ✓ Confirms to the general methodology in Chapter 1
 - ✓ Model for establishing separation distances to prevent air-to-air interference:



- ✓ Minimum separation between stations A and B:
Range A + Radio horizon A + Radio Horizon B + Range B

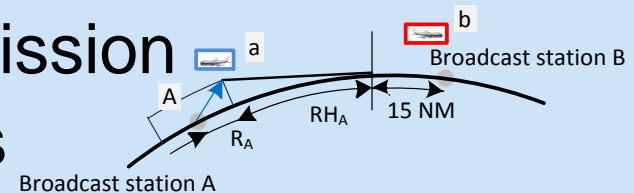
Handbook Volume II

Frequency assignment planning

Chapter 2 (2)

Frequency assignment planning criteria for VHF air-ground communication systems

- Interference model (co-frequency)
 - ✓ Aeronautical broadcast stations (ATIS, VOLMET)
 - Do not involve aircraft transmission
 - Separation distances are less
- Interference model (adjacent frequency separation)
 - ✓ Same model as for co-frequency separation
 - ✓ Takes into account the attenuation of the undesired signal by the (aircraft) receiver
 - ✓ 1st adjacent channel separation (25 kHz): 10 NM





Handbook Volume II

Frequency assignment planning

Chapter 2 (3)

Frequency assignment planning criteria for VHF air-ground communication systems

- Frequency separation and channelling
 - ✓ 25 kHz and 8.33 kHz channel spacing.
 - ✓ Special consideration for mixed environment where both are applied

- Designated Operational Coverage (DOC)
 - ✓ Table of uniform values for DOC
 - ✓ Complies with common values used in most Regions
 - ✓ Area services ACC-FIS – are in many cases not specified



Handbook Volume II

Frequency assignment planning

Chapter 2 (4)

Frequency assignment planning criteria for VHF air-ground communication systems

- Calculation of separation distances.
 - ✓ Methodology for establishing separation distances
 - ✓ Air/ground communications
 - ✓ Aeronautical broadcast communications
 - ✓ Aerodrome surface communications

For each of these types the Handbook clarifies the principles and method used when the separation distances were established. A summary of the results (25 kHz channel spacing) is on the next slide



Handbook Volume II

Frequency assignment planning

Chapter 2 (5)

Frequency assignment planning criteria for VHF air-ground communication systems

		VICTIM											
	Service	TWR 25/400 0	AFIS 25/400 0	AS Surface	APP-U 150/450	APP- I 75/250	APP-L 50/120	ACC-U Area/45 0	ACC-L Area/25 0	FIS-U Area/45 0	FIS- L Area/250	VOLMET 260/450	ATIS 200/450
INTERFER	TWR	156	156		338	273	212	338	273	338	273	338	338
	AFIS	156	156		338	273	212	338	273	338	273	338	338
	AS (Note 2)			25									
	APP-U	338	338		520	455	394	520	455	520	455	520	520
	APP-I	273	273		455	390	329	325	390	455	390	455	455
	APP-L	212	212		394	329	268	394	329	394	329	394	394
	ACC-U (Note 1)	338	338		520	455	394	520	455	520	455	520	520
	ACC-L (Note 1)	273	273		455	390	329	455	390	455	390	455	455
	FIS-U (Note 1)	338	338		520	455	394	520	455	520	455	520	520
	FIS-L (Note 1)	273	273		455	390	329	455	390	455	390	455	455
	VOLMET	338	338		520	455	394	520	455	520	455	15	15
	ATIS	338	338		520	455	394	520	455	520	455	15	15



Handbook Volume II

Frequency assignment planning

Chapter 2 (6)

Frequency assignment planning criteria for VHF air-ground communication systems

- Frequency planning criteria for VDL were considered by the ACP between 2002 – 2008
- Same methodology as for developing planning criteria for VHF voice systems
- Criteria for VDL (Mode 2 and Mode 4):

		Interference source		
		DSB-AM	VDL 2	VDL 4
Victim	DSB-AM		1	2
	VDL 2	1	1	1
	VDL 4	2	1	1

The Handbook contains specific considerations to be taken into account when using VDL on the surface of an airport.



Handbook Volume II

Frequency assignment planning

Future work

- Future work will concentrate on developing harmonized and updated planning criteria for aeronautical radionavigation systems
- The Handbook and other relevant material can be downloaded from the ACP website (Repository section) at

<http://www.icao.int/safety/acp>