AFSW –Aeronautical Frequency Spectrum Workshop
Cairo, Egypt , 16-17 Feb 2015

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ATNS

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INTRODUCTION

AFSW-WRC Preparation

WRC-15 Agenda Item 9.1.5

Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the band 3 400 – 4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of Meteorological information in some countries in Region 1 [Resolution 154 (WRC-12)]

ISSUE

AFSW-WRC Preparation

WRC-07 allocated the frequency band 3 400-3 600 MHz to the mobile, except aeronautical mobile service on a primary basis in some countries, including Region 1, subject to regulatory and technical restrictions (RR No. 5.430A).

The deployment of mobile service systems in the vicinity of airports has led to an increased number of cases of interference into the FSS (VSAT) receivers. Consequently, some additional measures need to be adopted to improve the protection of the FSS links supporting aeronautical and meteorological communications.

VSAT BACKGROUND

AFSW-WRC Preparation

Aviation safety across the African Continent has been compromised by a lack of reliable fixed aeronautical telecommunications infrastructure used for providing Air Traffic Services/Direct Speech ("ATS/DS") and Aeronautical Fixed Telecommunications Network ("AFTN") voice and data services.

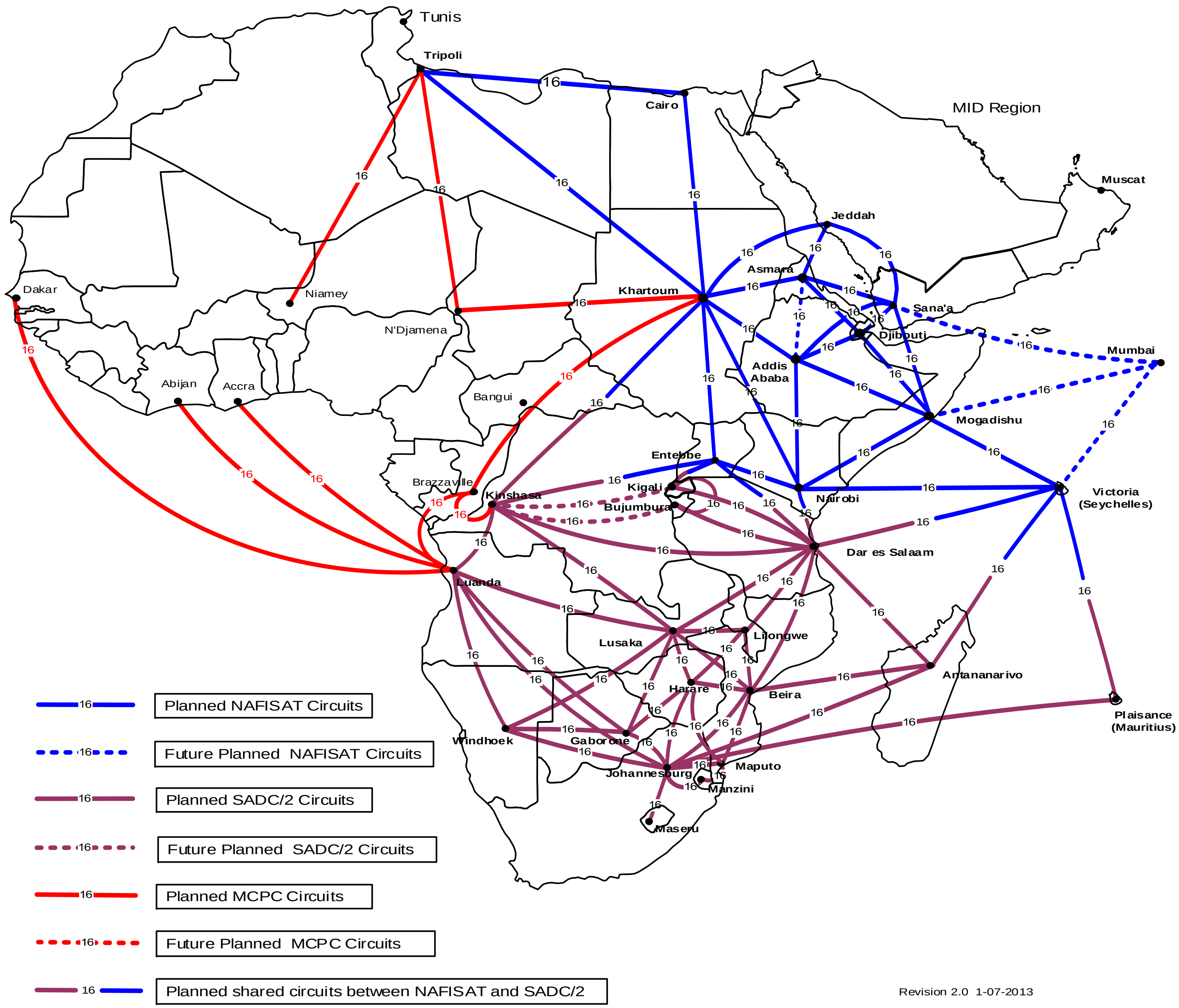
African Service Providers, **Air Traffic and Navigation Services** (ATNS) and the **Agency for the Safety of Aerial Navigation in Africa** (ASECNA) introduced Very Small Aperture Terminal (VSAT) networks to resolve the lack of communications.

AFSW-WRC Preparation

The basic networks evolved as improved technology became available and today sports the ATNS SADC/2 network supporting the Southern African Development Community (SADC),

The North East AFI (Africa-Indian Ocean) Region, to address the ATS/DS and AFTN deficiencies within this region. (The NAFISAT network)

ATNS VSAT NETWORK:
NAFISAT and SADC/2 - ATS/DS Connectivity



Revision 2.0 1-07-2013

AFSW-WRC Preparation

In West Africa a network was also initiated by ASECNA.
This network called AEROSATEL was implemented to provide Reliable Aeronautical Fixed and mobile services in the West and Central Africa region in the ACCRA, KANO, N`DJAMENA and NIAMEY FIR's.

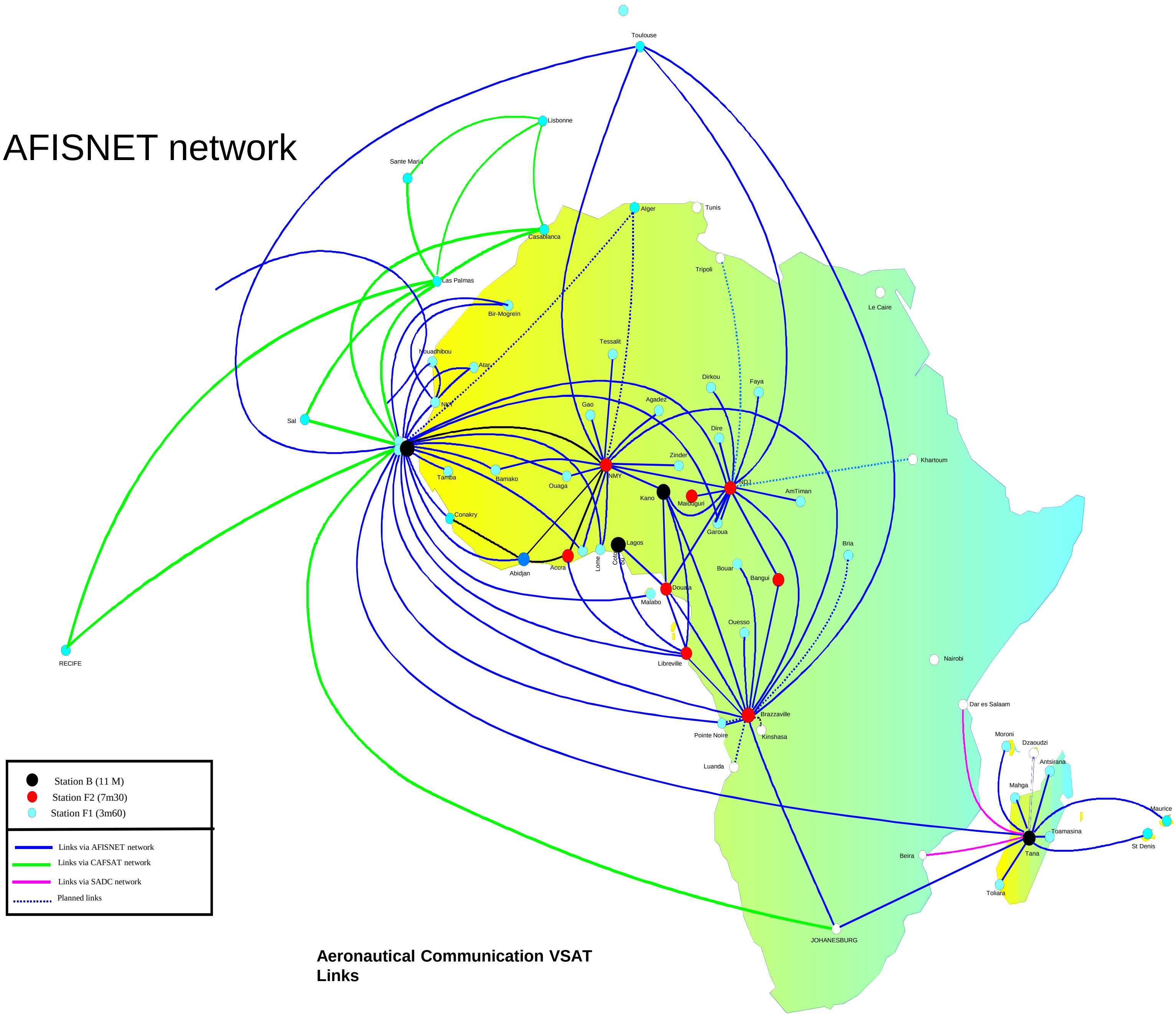
This initial network was expanded and became AFISNET.
This service covers the ASECNA area including Roberts FIR, Madagascar, Reunion and Mayotte, The Comoros, Angola, Algeria, Sao Tome & Principe with links to South Africa and France

AFSW-WRC Preparation

Additional Multi-Channel per Carrier (“MCPC”) point-to-point links are provided in the SADC and NAFISAT VSAT network for interconnection to the ASECNA **AFISNET** (“Africa Indian Ocean Satellite Network”) VSAT network operated in West Africa.

The central Atlantic FIR’s network (CAFSAT) links the SAM, EUR and AFI regions and provides interconnectivity between the AFI networks and the South American digital network (REDDIG)

AFISNET network



Aeronautical Communication VSAT Links

AFSW-WRC Preparation

These VSAT networks support all aeronautical communications services including the extension of aeronautical mobile, navigation and surveillance. VSAT networks are also used for data links for the meteorological services in Africa

Today, VSAT networks constitute a real infrastructure, spanning the entire African continent and beyond.

The availability of the entire 3400 to 4200 MHz FSS band is crucial for the AFI Region to ensure the continued growth of traffic while maintaining the required level of safety in this region.

CHALLENGES

AFSW-WRC Preparation

Agenda Item 1.4 at the World Radio Conference of 2007 (WRC-07), addressed the issue whether the band 3400 MHz to 4200 MHz ("C-band") should be identified for the International Mobile Telecommunications (IMT) on a global basis with the longstanding primary allocation to the fixed satellite service (FSS)

WRC-07 rejected the global identification for IMT in the C-band because of the recognised need to protect FSS communications from harmful interference evidenced in studies by the ITU

AFSW-WRC Preparation

WRC-07, subject to certain restrictions, adopted new footnotes to Radio Regulations to allow the band 3400MHz to 3600MHz for use by the IMT, but only by countries listed in the foot notes (opt-in countries).

The restrictions established additional protection for the C-band earth stations by the opt-in countries in each of the three ITU regions.

81 Countries in Region 1 opt-in and the band 3400- 3600MHz was allocated and became effective in November 2010 on a co-primary basis for the mobile (including IMT) with PFD limit restrictions and coordination requirements

AFSW-WRC Preparation

In the 14 opt-in countries in Region 2, the 3400 MHz – 3500 MHz band was allocated by footnote to mobile services (which includes IMT) on a co-primary basis subject to coordination with affected administrations.

The 3500 MHz – 3600 MHz band has also been identified for IMT in opt-in countries in Region 3.

*Since the effective date, interference interruptions have occurred throughout Africa, and in Australia, Bolivia, Peru, the Caribbean, China, Fiji, Hong Kong, Indonesia and Russia.

**Source - Squire, Sanders & Dempsey L.L.P.*

AFSW-WRC Preparation

The relevant ITU-R studies showed a potential for interference from fixed wireless access and IMT stations into FSS receiving earth stations at distances from tens of kilometres up to hundreds of kilometres, depending on the parameters and deployment of stations of these services.

Report ITU-R M.2109 contains sharing studies between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands.

Report ITU-R S.2199 contains studies on compatibility of broadband wireless access systems and fixed-satellite service networks in the 3 400-4 200 MHz band.

AFSW-WRC Preparation

Both studies show a potential for interference from IMT and broadband wireless access stations into FSS Earth stations at distances of up to several hundred km. Such large separation distances would impose substantial constraints on both mobile and satellite deployments. The studies also show that interference can occur when IMT systems are operated in the adjacent frequency band.

AFSW-WRC Preparation

The main culprit of interference to aeronautical VSAT networks is **Wi-MAX** (**Worldwide Interoperability for Microwave Access**)

Tests indicated that interference was not caused by co-channel Assignments, but by the harmonic content in the side lobes of the radiated signal.

RECORDED INTERFERENCE

THE UNITED REPUBLIC OF TANZANIA

TANZANIA COMMUNICATIONS REGULATORY AUTHORITY

Telegram : TUMEWASILI, Dar Es Salaam
Telephone : 255 22 2118947-52
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Email: dg@tcra.go.tz
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P. O. Box 474
DAR ES SALAAM
TANZANIA

Ref. No: TCRA/R.12/INT./189

08/11/2006

Corporate Legal Counsel
GS Telecom (PTY) LTD
GS Telecom House, 68 Oak Avenue
Highveld Techno Park, Centurion

FAX: +27 012 665 1079

<u>RE: Complaint on C-Band Frequency Allocation to WiMax and Broadband Wireless Access Service Provider:</u>

We acknowlege receipt of your letter dated 30 October 2006 regarding the above subject matter.

We regret to learn that your client ABC has been experiencing interference on their VSAT services.

Following ~~to~~ your complaint our engineers along with your Telecommunications engineer visited ABC offices where the VSAT is installed. It was confirmed that there was indeed interference caused by Vodacom Wimax operations. However, this interference was not caused by double allocation but rather by WiMax harmonics which spread over C-Band affecting weak VSAT receive signals. Please note that vodacom were assigned frequency band (3434-3449.5) MHz uplink and (3534-3549.5) MHz downlink Where as ABC VSAT operates on 3705.50 MHz for receive and 5930.850 MHz for transmit.

We understand that Vodacom have switched off their WiMax equipment as a temporary solution to this problem however TCRA is currently working very hard in finding the best possible way to resolve this problem permanently.

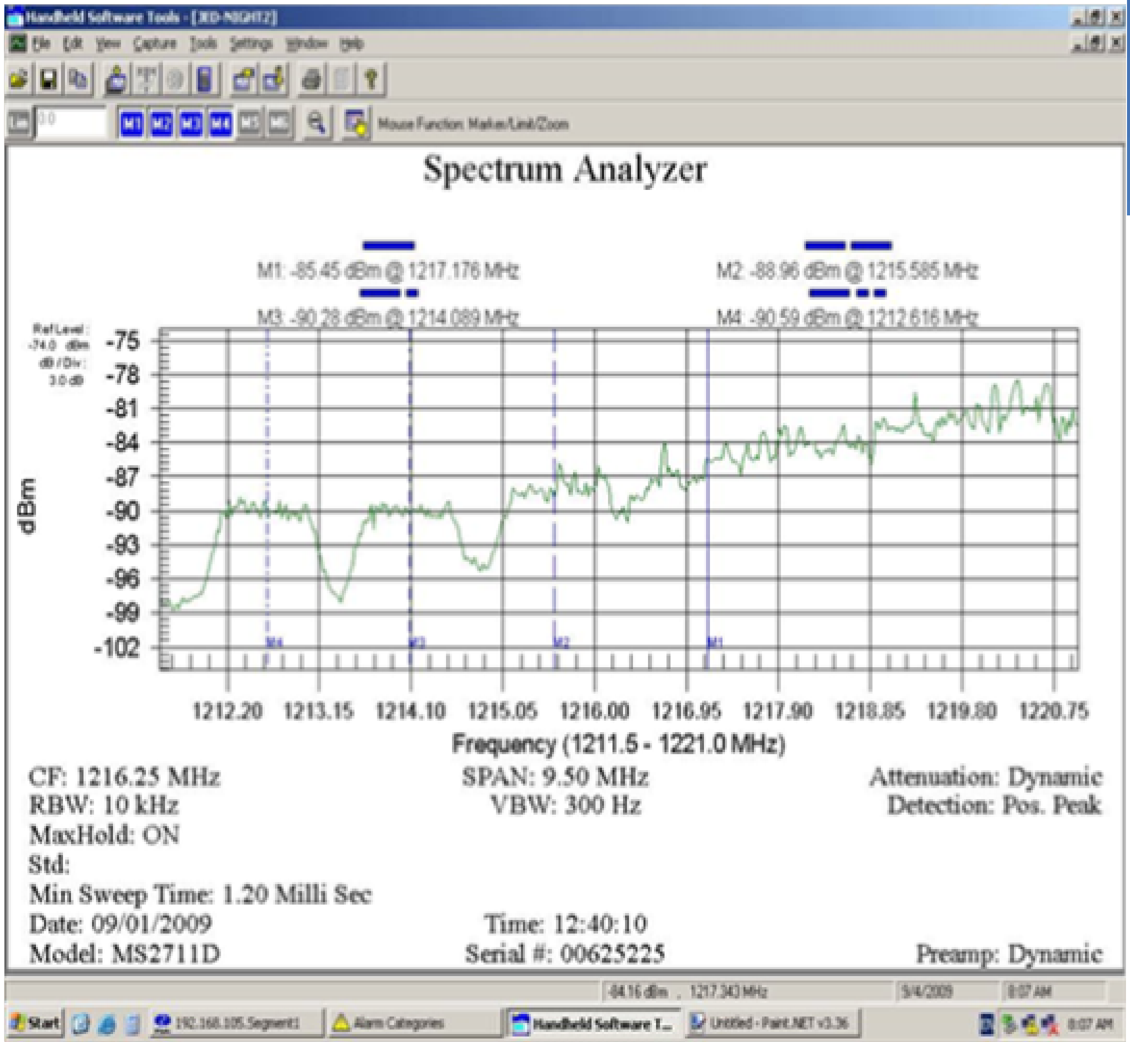
Thank you for your patience and continued cooperation

Your Sincerly,

James Kilaba
FOR: DIRECTOR GENERAL.

cc: GS Telecom Tanzania Office Box 75080, DSM, Tanzania. FAX: 2153565

Plot of Interference recorded on the VSAT carriers (NAFISAT network)



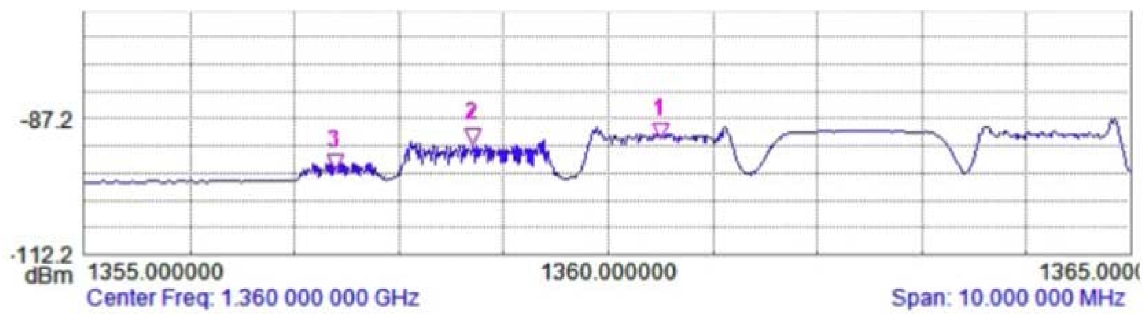
Interference recorded at Ouagadougou (Burkina Faso) On VSAT network.

Spectrum Analysis of the intermediate frequency (IF) 141.9125 MHz

Spectrum analysis **without IMT signal**
08 March 2013

Interference recorded at Lima Earth Station (Peru) 31 August to 07 September 2012

REDDIG Network

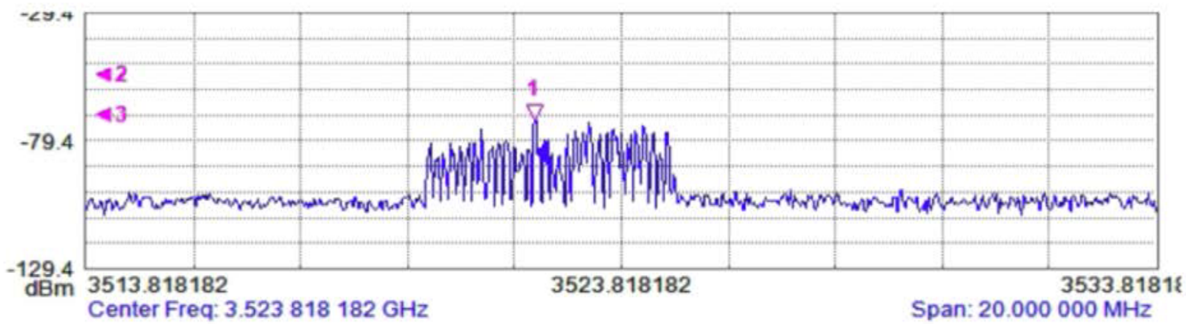


Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	☐	☐	1.360 5 GHz	-90.88 dBm	--	--
2	☐	☐	1.358 7 GHz	-91.84 dBm	--	--
3	☐	☐	1.357 4 GHz	-96.70 dBm	--	--
4	☐	☐	--	--	--	--
5	☐	☐	--	--	--	--

Measurement Parameters

		Start Frequency	1.355 000 000 GHz
Trace Mode	Normal	Stop Frequency	1.365 000 000 GHz
Preamp	OFF	Frequency Span	10.000 000 MHz
Min Sweep Time	0.668 S	Reference Level	-62.184 dBm
Reference Level Offset	0 dB	Scale	5.0 dB/div
Input Attenuation	0.0 dB	Serial Number	931151
RBW	100.0 kHz	Base Ver.	V2.01
VBW	30.0 Hz	App Ver.	V3.17
Detection	Peak	Date	9/14/2012 3:51:23 PM
Center Frequency	1.360 000 000 GHz	Device Name	ana105a

Spectrum Analysis of Frequency Band 3.513 – 3.533 GHz with WIMAX signal – 06 September 2012



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	☐	☐	3.522 2 GHz	-71.14 dBm	--	--
2	☐	☐	2.685 3 GHz	-100.37 dBm	--	--
3	☐	☐	2.427 9 GHz	-102.01 dBm	--	--
4	☐	☐	--	--	--	--
5	☐	☐	--	--	--	--
6	☐	☐	--	--	--	--

Measurement Parameters

		Start Frequency	3.513 818 182 GHz
Trace Mode	Normal	Stop Frequency	3.533 818 182 GHz
Preamp	OFF	Frequency Span	20.000 000 MHz
Min Sweep Time	0.668 S	Reference Level	-29.412 dBm
Reference Level Offset	0 dB	Scale	10.0 dB/div
Input Attenuation	0.0 dB	Serial Number	931151
RBW	10.0 kHz	Base Ver.	V2.01
VBW	3.0 kHz	App Ver.	V3.17
Detection	Peak	Date	9/6/2012 4:05:05 PM
Center Frequency	3.523 818 182 GHz	Device Name	ana105a

Different methods used to resolve interference

- Changing the channels
- Using Filters
- Relocating antennae
- Shielding antennae

CONCLUSION

Regulatory measures are needed to ensure an appropriate level of protection for the FSS C-band spectrum which is used to augment terrestrial communication networks through the use of VSAT technology. VSAT technology is used to facilitate safety of life, CNS services within the aeronautical community.

Long-term VSAT spectrum availability and protection from interference should be guaranteed across the entire African continent and other parts of the world. The meeting is invited to support the following recommendation:

ICAO has noted that there is currently no regional positions in support of IMT above 3 800 MHz, and that co-ordination of VSAT with IMT appeared to be mainly a domestic issue. It has was also pointed out that the proposed changes to Resolution 154 as contained in the draft CPM text could serve to strengthen that domestic co-ordination.

RECOMMENDATION

Resolution 154 (WRC-12) could be modified, calling for relevant administrations in Region 1 to use special care in the co-ordination, assignment, and management of frequencies taking into consideration the potential impact on the FSS earth stations used for satellite communications related to safe operation of aircraft and reliable distribution of meteorological information in the frequency band

3 400-4 200 MHz.

In parallel to the modification of Resolution 154 (WRC-12), consideration may be given to modifying RR No. 5.430A to include a reference to the modified Resolution.

that ICAO Member States should not support additional International Mobile Telecommunications spectrum allocation in the fixed satellite services C-band spectrum at the expense of the current or future aeronautical very small aperture terminal networks; and

ICAO and ICAO Member States to pursue this matter in ITU-R and during the World Radio Conference (WRC-15, Agenda item 9.1.5), to prevent any international mobile telecommunications spectrum allocation that compromises the availability of the aeronautical very small aperture terminal networks.

THE END

Thank You