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PROTECTING OUR RF SPECTRUM – FOLLOW UP ISSUES RELATED TO ITU WRC-07

WBU-ISOG FORUM, ATLANTLA
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Items to be Covered

1. Introduction to ITU WRCs;
2. WRC-07 - Specifics of the Agenda, of Interest to WBU-ISOG
3. WRC-07 Results of Interest to WBU-ISOG
4. Special Look at C-Band, i.e. 3 500 – 4 200 MHz
5. Concluding Remarks

Introduction to ITU WRCs

• A World Radio Conference (WRC) is the only opportunity for member States of the ITU to modify the Radio regulations that govern the use of the radiofrequency spectrum, as well as the International Tables of Frequency Allocations.

• The proposed agenda of any given WRC is adopted by its preceding WRC and will determine part of the study work to be achieved prior to it. Results of a WRC will impact the use of RF spectrum internationally and either directly impact, or at least influence domestic policies and regulations related to the use of RF spectrum.

• While the development of digital technologies allows for a more efficient use of frequency bands, it also creates among all users of radio frequencies, and related equipment manufacturers, an increased demand for access to the spectrum.

Introduction to ITU WRCs

• As early users of spectrum, broadcasters have been assigned, through the development of Radio Regulations of the ITU over the past 80 years, prime locations within the spectrum. These locations are now being highly coveted by a new generation of service providers and the current positioning of broadcasting, within the wide range of spectrum, must now be fiercely protected.
• It is with this perspective in mind that CBC/Radio-Canada & NABA have attended the 2007 World Radio Conference.

WRC-07 - Specifics of the Agenda, of Interest to WBU-ISOG

4 issues were proactively followed during WRC-07 as they presented a high potential for impact on spectrum used by Broadcasters:

- the identification of spectrum for the IMT and IMT-2000 applications (Agenda item 1.4) – potentially affecting UHF-TV and C-Band FSS spectrum
- the review of technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services (Agenda item 1.9);
- the review of sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from space services (Agenda item 1.11);
- the identification of items for inclusion in the agenda of WRC-11 (Agenda item 7.2).

WRC-07 Results of Interest to WBU-ISOG

A) Identification of spectrum for the IMT and IMT-2000 applications (Agenda item 1.4)

The most contentious item of the conference because it made it necessary to provide for compromise in frequency bands allocated to existing services. The following frequency bands were identified for the use of IMT applications:

- 450-470 MHz;
- Portions of 698-862 MHz (currently UHF Broadcasting band – Channels 52 to 78), specifically 698-806 MHz (Channels 52-69) in Region 2 and some countries of Region 3, and 790-862 MHz (channels 67-78) -in Regions 1 & 3;
- 2 300- 2 400 MHz
- 3 400 – 3 500 MHz but not in Region 2 (except in a number of countries, not including Canada and USA)

WRC-07 Results of Interest to WBU-ISOG

UHF Broadcasting Band: 698-806 MHz (channels 52-69)

- The major impact on broadcasting comes from the identification in Region 2 of the 698-806 MHz band for use by the IMT applications. Though this use needs to be regulated domestically and is not mandatory for any country, the importance of the lobbying from the IMT industry will need to be counter-balanced by representations from broadcasters to decision-making bodies in order to protect the existing broadcasting services in this band and allow for the deployment of new technologies that may be used in these bands by broadcasters, Also, there are still unknown needs that may result from the deployment of DTV that would require more spectrum than expected to be retained for off-air terrestrial broadcasting.
- The footnotes and resolution under which this identification is permitted all underline the need to protect broadcasting services

WRC-07 Results of Interest to WBU-ISOG

- The 2 300 to 2 400 MHz band was identified for IMT for Region 1 through footnote 5.384. However, footnote 5.3932 which provides for the co-primary allocation of band 2310-2360 MHz in Canada and the USA for BSS remains and does not include an identification for the use of IMT. As a result, protection of the DARS systems is maintained.

- However WRC-07 Resolution 225 to study the sharing and coordination issues in the above bands related to use of the mobile-satellite service allocations for the satellite component of IMT and the use of this spectrum by the other allocated services, including the radiodetermination-satellite service.

WRC-07 Results of Interest to WBU-ISOG

C-Band 3 400 – 3 500 MHz: satellite collection and distribution for broadcasting networks

- The identification of this band for use by IMT applications in Regions 1 and 3 will not directly impact the protection of the existing services in Region 2. While there was an upgrade of the existing mobile allocation in this band for Region 2 to primary, (via opt-in footnote 5.ZZZ3), such identification was not done by Canada nor the USA, but it was done by Mexico. There was no specific identification for the use of this band by IMT applications. Protection from space services cannot be claimed.
- The status of the remaining of the C-Band, i.e. 3 500 – 4 200 MHz and 4 400 – 4 990 MHz remains unchanged.

WRC-07 Results of Interest to WBU-ISOG

B) Review of technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services (Agenda item 1.9)

- The need for coordination with terrestrial service installations, or transmitting earth stations in this frequency band has been added to footnote 5.4164, hence providing better protection to terrestrial installations in this band.

C) Review of sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from space *services* (Agenda item 1.11)

- The allocation for Broadcast Satellite Service (BSS) was suppressed in this band, except for 2 geo-stationary grandfathered Russian systems. As a result, the terrestrial systems in this band, current and future in Region 2, will be given a better protection.

WRC-07 Results of Interest to WBU-ISOG

D) identification of items for inclusion in the agenda of WRC-11 (Agenda item 7.2)

- Over 25 agenda items were adopted for the consideration of WRC-11. While some of them related directly to broadcasting issues, others may have an impact on broadcast spectrum as they call for consideration of spectrum requirements for specific services. The latter category needs to be monitored to protect the existing spectrum used by broadcast
- Items directly related to « broadcasting spectrum »
  - to consider worldwide/regional harmonization of spectrum for Electronic News Gathering (Agenda item 1.5): such harmonization will make covering of news stories around the world more efficient by “facilitating the rapid and less restricted deployment and operation of ENG systems from one country to another”.

WRC-07 Results of Interest to WBU-ISOG

D) identification of items for inclusion in the agenda of WRC-11 (Agenda item 7.2) (Cont'd):

- to consider results of sharing studies between the mobile service and other (note from authors: "others" includes broadcasting) services in the band 790-862 MHz in Regions 1 & 3 to ensure protection of existing services (Agenda item 1.17): though these studies will be conducted for Regions 1 & 3 only, their results will be useful to assess the impact of the future implementation of IMT in the 698-806 MHz band on broadcasting services in Region 2 also and therefore provide arguments to influence domestic regulation in favour of the protection of broadcasting.

- to examine the effect of emission from short-range devices on radio communication services (Agenda item 1.22): this will provide data and arguments to help regulate the use of these devices in order to protect broadcasting services.

WRC-07 Results of Interest to WBU-ISOG

Extracts from World Radiocommunication Conference: Provisional Acts, Geneva 22 October – November 16 2007

FOOTNOTES :

- **MOD** (R9/425/7)
- **5.317A** Those parts of the band 698-960 MHz in Region 2 and the band 790-960 MHz in Regions 1 and 3 which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement International Mobile Telecommunications (IMT) See Resolution **224 (Rev.WRC-07)** and Resolution **[COM4/13] (WRC-07)**. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. [our emphasis] (WRC-07)
- **ADD** (R9/425/9)
- **5.UUU** *Different category of service:* In Brazil, the allocation of the band 698-806 MHz to the mobile service is on a secondary basis (see No. **5.32**).

WRC-07 Results of Interest to WBU-ISOG

Extracts from World Radiocommunication Conference: Provisional Acts, Geneva 22 October – November 16 2007

ADD (R9/425/5)

- **5.YYY** The band, or position of the band, in Bangladesh, China, Korea (Rep. of), India, Japan, New Zealand, Papua New Guinea, Philippines and Singapore is identified for use by these administrations wishing to implement IMT. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-07)

- **MOD** COM5/264/58 (B6/268/65) (R8/424/4)
- **5.393** *Additional allocation:* in Canada, the United States, India and Mexico, the band 2 310-2 360 MHz is also allocated to the broadcasting-satellite service (sound) and complementary terrestrial sound broadcasting service on a primary basis. Such use is limited to digital audio broadcasting and is subject to the provisions of Resolution **528 (Rev.WRC-03)**, with the exception of *resolves* 3 in regard to the limitation on broadcasting-satellite systems in the upper 25 MHz. (WRC-07)

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

Radiocommunication Study Groups

ITU International Telecommunication Union

Source: Documents 4A/TEMP/24

Annex 3 to Document 4A/60-E
2 May 2008
English only

Annex 3 to Working Party 4A Chairman's Report

PRELIMINARY DRAFT NEW REPORT

Compatibility of broadband wireless access (BWA) networks and fixed-satellite service (FSS) networks in the 3 400-4 200 MHz band[1]

Executive summary

The 3 400-4 200 MHz band is currently heavily used by the fixed-satellite service (FSS) for space-to-Earth transmissions. Some administrations are introducing broadband wireless access (BWA) systems in all or portions of this frequency band. As BWA is being introduced, harmful interference and loss of service for FSS receivers has been reported. Thus introduction of broadband wireless access (BWA) networks in portions of the 3 400-3 800 MHz band will have a detrimental impact on FSS reception in the entire 3 400-4 200 MHz band due to interference received both in-band and out-of-band. This Report examines the possibility of compatibility between BWA and FSS networks in the range 3 400-4 200 MHz. The reported cases cover interference both for BWA in overlapping frequency bands and in non-overlapping bands

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

Based on the studies indicated in this Report, the following conclusion can be reached regarding the compatibility of BWA and FSS in the 3 400-4 200 MHz band:

a) - BWA networks may operate within the fixed and/or mobile services as defined by the Radio Regulations and relevant ITU-R Recommendations, depending on the type of technology and licensing regime adopted in individual administrations. BWA user terminals deployed at unknown locations (without individual licensing of fixed user terminals, ubiquitously deployed, nomadic or mobile) and the associated base stations would operate in the mobile service while BWA user terminals would be deployed at fixed, specified locations, and their associated base stations would operate in the fixed service.

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Special Look at C-Band, i.e. 3 500 – 4 200 MHz

•Appendix 7 of the Radio Regulations defines coordination contours around FSS receive earth stations inside which coordination is required for terrestrial services. Such contours typically extend 400-1 000 km out from the earth station and never less than 100 km. Implementation of BWA networks in a country will require international coordination with any country that has filed FSS earth stations whose coordination contour covers part of the service area of the BWA network.

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

•Sharing studies and field trials referenced in this Report have been performed in relation to the co-existence of BWA networks being deployed in portions of the 3 400-3 800 MHz band and FSS networks in the bands 3 400-4 200 MHz. Three different types of interference were identified in these studies and tests:

•– in-band interference-BWA interfering with FSS in overlapping frequency bands;

•– out-of-band emissions (i.e. unwanted emissions of BWA (e.g. spurious emissions e.g. spectrum roll-off) interfering with FSS in other parts of the 3 400-4 200 MHz band;

•– FSS receiver saturation-BWA power levels affecting the operating point of the FSS receiver LNA or LNB such that it is driven into saturation or non-linear operation;

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

•The studies test indicate that to provide protection to FSS receive earth stations, some separation distance between the stations of the BWA network and the FSS receive earth stations is required. The magnitude of this separation distance depends on the parameters of the networks, the protection criteria of concerned satellite networks and the deployment of the two services and if the two services operate in the same or in adjacent frequency bands. With the assumptions used in the studies, it was shown that when no particular shielding or blocking with the respect to the interfering signal can be guaranteed, the required separation distances would be about:

- co-frequency: in excess of 100 km;
- out-of-band emissions: a few km;
- FSS receiver saturation: a few to several km;

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

- When the BWA stations and/or FSS earth stations are deployed in a ubiquitous manner and/or without individual licensing or registration, the locations of the stations are not known and hence, no minimum separation distance can be guaranteed. Compatibility of BWA networks operating within any part of the 3 400-4 200 MHz range and FSS networks operating in this same range is not feasible within the same geographical area.
- The retrofit of FSS earth stations with bandpass filters at the LNB could improve the situation with regard to reducing the earth station susceptibility to interference, however such measures would be costly and could reduce performance of the earth station, and in any case may be impractical due to the vast number of earth stations already deployed in the 3 400-4 200 MHz band.
- Deployment of BWA in any portion of the 3 400-4 200 MHz band would likely pose limitations future deployment of FSS earth stations in the entire 3 400-4 200 MHz band.
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BroadcastEngineering.

Tests confirm WiMAX interference threat to C-band signals, says SUIRG study

Mar 6, 2008 8:56 AM

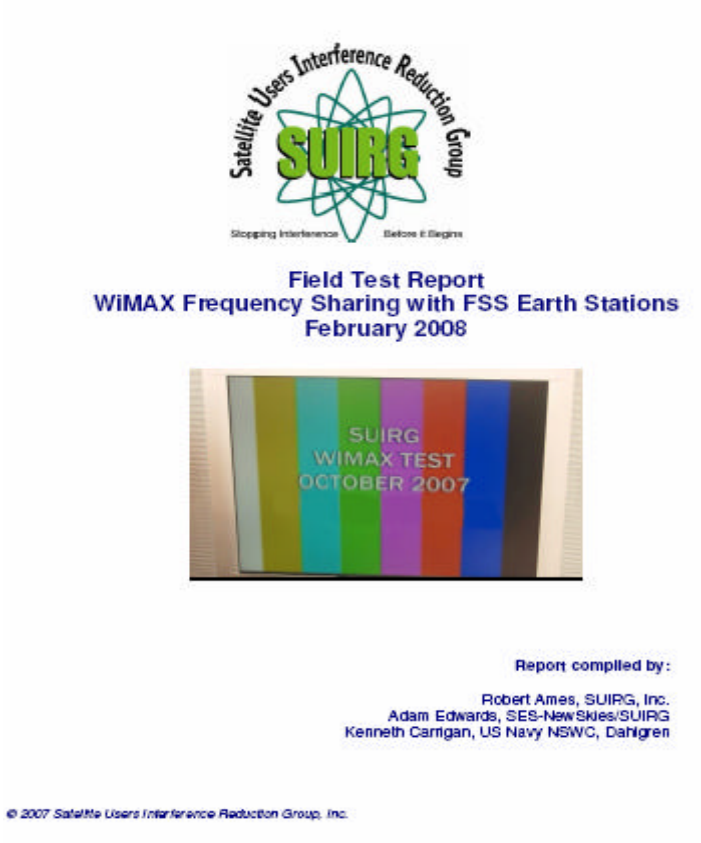
WiMax communications pose a significant interference threat to satellite signals transmitted in the C-band frequency, according to a new study from the Satellite Users Interference Reduction Group (SUIRG).

SUIRG testing conducted in the last quarter of 2007 conclusively found the incompatibility of C-band spectrum sharing between fixed frequency service (FSS) satellite transmissions and WiMAX services, the group said.

The primary objective of the test was to measure interference levels generated by fixed WiMAX transmissions into an FSS satellite receiving station. The method employed taking measurements of carrier/noise (C/N), interference/noise (I/N), bit error rate (BER) and spectrum plots of a satellite downlink video channel. Testing was performed in two phases.

Phase 1: The FSS antenna remained in a fixed location while a WiMAX base unit was moved to several locations operating at various angles and distances from the FSS antenna to simulate subscriber waveforms. This test modeled WiMAX subscribers in a nomadic deployment affecting FSS. Tests conducted within the immediate area (up to 0.62mi away) showed that the digital signal was rendered unacceptable for use.

Special Look at C-Band, i.e. 3 500 – 4 200 MHz

- 

Concluding Remarks

- In the past, frequency bands were assigned to specific radiocommunications services, broadcasting being one of them. This rule remains, which makes it difficult for new applications to find their niche within the spectrum. Newcomers have therefore developed techniques to circumvent this difficult by requesting "identification" of bands for use by new services. This trend will continue and broadcast spectrum will continue to be under attack.

- We therefore need to continue monitoring the work of the ITU on a regular basis and contribute to the study work to ensure that impacts to broadcasting signals are duly considered in the decision-making process.

Concluding Remarks

- Another technique that has been developed by seekers of spectrum is the use of a three-fold argument that: a) change of international rules is necessary to pave the way for the needs of future radiocommunication services, b) any change in international rule needs to be implemented domestically at the discretion of each State, and c) therefore any change in international rule is not a threat to existing services.
- The conclusion in c) is misleading and used to minimize objections from incumbent services within the spectrum. It is true that any change in international rule can only be integrated domestically at the discretion of each State. However, the existence of the international rule gives weight in favour of the change domestically. The need to influence decision-making bodies domestically, prior to proposal of changes to international rules, as well as following these changes, is more important than ever if the use of spectrum by broadcasters is to be protected.

Questions ?

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