Radiocommunication Study Groups

Received: 13 July 2012

Subject: Documents 4-5-6-7/2 and 4/11 (1 April 2008), Document 4A/41

Document 4-5-6-7/29-E
16 July 2012
English only

North American Broadcasters Association (NABA)

BROADCASTING SPECTRUM USAGE IN NORTH AMERICA BELOW 5 GHz AND ITS NEEDED PROTECTION FROM INTERFERENCE

1 Introduction

The North American Broadcasters Association (NABA, *www.nabanet.com*) is an association of broadcasters in Canada, Mexico and the United States, and the NABA Technical Committee is its standing technical body. NABA is thus in a position to present the technical viewpoints of the most authoritative association of professional North American Broadcasters in television and sound programme production, post-production, and distribution for terrestrial, satellite, and cable broadcasting.

NABA is a Sector Member of ITU-R and a long-time participant in ITU-R Study Groups, Working Parties, Task Groups, Rapporteur Groups, etc. NABA numbers among its members Chairmen, Vice-Chairmen and members of the above groups. NABA also participates widely in the ITU work on radio, television and multimedia services.

2 Purpose

To assist the Joint Task Group (JTG) in its assignment to determine the availability of additional spectrum for wireless systems, NABA is submitting this Report which summarizes the use of spectrum below 5 GHz for broadcasting in North America and the interference protection needed to provide such services. Some of the material has already been submitted to the JTG; thus, in the interest of efficiency, it will be only included by reference.

3 Terrestrial broadcast television

Terrestrial broadcast television is pervasive throughout North America using VHF and UHF frequencies. Over the past decade it has transitioned technically in most areas from analogue to digital transmission, some of the latter providing high definition visual reception. Hundreds of millions of viewers use the service for entertainment, news, education, etc. Although in urban areas there are equivalent services through cable or by internet, broadcast television is generally the main service provider in the rural areas which constitute the major portion of North America. The rural areas are considered fragile for reception, particularly near their service contour boundaries due to terrain and radio frequency noise considerations. Many of these rural and terrain challenged areas

receive television signals exclusively from low power terrestrial transmitters that complete a universal service chain by repeating the signals of their nearby parent stations.

Details of spectrum use and consideration of interference into receivers of terrestrial broadcast television in North America have been well documented by Study Group 6. Their documentation is incorporated herein by reference. Document 4-5-6-7/2 is the recent reply liaison statement from Working Party 6A to the JTG dealing directly with the subject of this Report.

In addition to the Study Group 6 documentation, the JTG must address adjacent band and third order intermodulation interference into terrestrial broadcast television receivers for any proposed new wireless frequency allocations that are close to those frequency bands utilized by terrestrial broadcast television service. Such interference is manifest by the omni-directional antennas and limited selectivity of television receivers. Adjacent band and third order intermodulation interference are also discussed in the following section 5.

4 Terrestrial broadcast radio

The highest frequency used in North America for terrestrial broadcast radio is 108 MHz. It is believed that the JTG will not be considering frequencies so low for new wireless communications systems.

5 Satellite broadcast radio

BSS (Sound)/Satellite Digital Audio Radio (SDARS)/Satellite Digital Audio Broadcasting (S-DAB) will be called “Satellite Radio” herein. Satellite Radio is prevalent over North America, currently providing service to over 24 million subscribers predominantly in the 48 continuous United States and Canada. The service typically provides 160 audio channels and several data channels using the 2 320-2 345 MHz satellite downlink transmission band. The subscriber receivers are mainly installed on mobile platforms (i.e., automobiles, trucks, boats, etc.). They are characterized by very low gain omni-directional antennas and sensitive receivers (typical system receive temperature of less than 150 deg. Kelvin) with an approximate receiving G/T= -19 dB/K.

In-band interference is addressed in Recommendation ITU-R BO.1773 (Documents 4/11, 4A/41). A particular challenge is the Satellite Radio transmission link budget which must account for foliage attenuation (typically 18 dB for 99.9% service availability). Much of the northern third of the contiguous United States and the southern third of Canada are highly forested. As mentioned earlier, new wireless spectrum allocations near the above Satellite Radio downlink band must also be analyzed for potential interference from intermodulation and adjacent band contributions. Intermodulation products can be calculated from standard equations with the worst out-of-band products caused at 2 fx +/- fy where fx and fy are typically adjacent frequency wireless transmissions. Adjacent band interference contributions from wireless systems are more difficult to calculate since, besides transmission level differences, they depend on the transmitters’ RF transmission profile (power distribution, modulation, frequency occupancy and time occupancy) and the satellite receiver selectivity, sensitivity, etc. Recently, the United States Government made comprehensive measurements of adjacent frequency interference of a developmental wireless system called LightSquared into the Global Positioning System (GPS) at L-Band. The measurements showed significant interference. The methodology might be useful to the JTG in analyzing such interference. Attachment 3 is a specific study of adjacent channel interference from wireless communications systems at S-Band into Satellite Radio.

6 Broadcast transmission distribution

For many decades, broadcast transmissions have been relayed from point of origin to the broadcast transmitter. There are many illustrations such as the extensive Public Radio Satellite System's distribution network and the use of relays from sports venues and news events. Much of this relaying is done using C-band satellites whose down-link band is 3 400-4 200 MHz. The typical earth stations (often called very small aperture terminals – VSATs) have some directivity but employ sensitive receivers; a receiving system of 80 deg. K is typical. It is necessary to protect these stations from in-band interference from new wireless systems. Please note that the VSATs often change antenna pointing direction due to needed use of a different satellite or are frequently relocated to different required locations.

7 Future considerations

Television broadcasting is considering technical changes. Two of these could require additional spectrum. They are the provision of three dimensional video pictures and of both one and two-way services to mobile and fixed receivers. (Reference "ATSC 3.0 Next Generation Television", ATSC Report PT2-046r11, 21 September 2011, http://www.atsc.org/cms/pdf/pt2/PT2-046r11-Final-Report-on-NGBT.pdf). The amount of additional spectrum required and its interference protection needs are currently not quantified.

8 Conclusion

Broadcasting is of great importance in North America from the aspects of safety, economics, education and social values. Consequently, protection from interference must be achieved.
As discussed above, in-band protection criteria have been established. However, it is also necessary when considering new wireless allocations nearby existing broadcast reception allocations to ensure that no significant adjacent channel nor intermodulation products cause significant interference to broadcast reception. The JTG must make thorough analyses to establish that interference is not caused by such new allocations. Although this Report considers North America, other regions of the world are believed to have similar concerns.

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