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Radio Frequency Activities of the Space Frequency Coordination Group, ITU Radiocommunication Sector (ITU-R) and WMO concerning Meteorological Satellites

NOAA-WP-09 presents a summary of radio frequency activities of the Space Frequency Coordination Group (SFCG), various ITU Radiocommunication groups and the WMO during 2008-2009 as well a summary of the frequency issues concerning metsats. This document is to provide information to CGMS Members regarding radio frequency management activities that could possibly affect radio frequencies used by metsats.

Radio Frequency Activities of the Space Frequency Coordination Group (SFCG), International Telecommunication Union (ITU) Radiocommunication Sector (ITU-R) and World Meteorological Organization (WMO) concerning Meteorological Satellites

1. Introduction

There are various international groups, some ad hoc in nature, which meet on a regular basis to discuss management of radio frequencies. Decisions reached by these groups can often affect the future access to the radio spectrum by meteorological satellites (metsats). NOAA is actively engaged in defending as well as promoting the use of the radio frequencies for metsats in order to meet the needs of our satellite missions. Such spectrum use includes not only communication links, both space-to-Earth and Earth-to-space, but also use for passive and active sensing needs.

2. Space Frequency Coordination Group (SFCG)

SFCG-29 met in Moscow, Russia in June, at the invitation of the Russian Federal Space Agency (Roscosmos) and the Russian Institute for Space Devices Engineering (RISDE). This ad hoc international group meets annually to discuss radio frequency matters of interest to the various civil space agencies. SFCG is the pre-eminent radio-frequency collegiate of space agencies and related national and international organizations through which global space systems spectrum resources are judiciously husbanded for the benefit of humanity. The input documents to SFCG are usually attributed to one of several working groups. The two working groups of most importance to metsats are the "ITU Matters and preparation for WRC-12" and the "EES and Metsat". (Note: ITU = International Telecommunication Union, WRC = World Radiocommunication Conference, EES = Earth exploration satellite, SRS = Space Research Service).

NOAA's two inputs to SFCG-29 were 1) a proposed revision to the existing Preliminary Draft New Report ITU-R RS.[ABOVE 275] regarding passive bands of interest from 275 to 3000 GHz and 2) an updated list of present and future radio frequency requirements of NOAA satellite networks.

At SFCG-29 the working group on ITU Matters and preparation for WRC-12 (now scheduled for January 2012) updated the new resolution created last year at SFCG-28 concerning WRC-12 agenda items of importance to the SFCG membership. Those items critical to metsats were discussed in detailed in last year's input to CGMS-36 in paper NOAA-WP-09. The special working group on EES and metsat reviewed many input documents and focused its discussion on active/passive sensors and meteorological issues. The group also reviewed the many SFCG resolutions and recommendations attributed to EES and metsats. Of interest to CGMS are the discussions on protection of passive sensor frequencies and the communications links used by metsats, including the provisional recommendation entitled "Efficient Sharing of the 25.5-27 GHz Band between EESS (s-E) and SRS (s-E)", which considers the band proposed by NPOESS to downlink (i.e. s-E or space-to-Earth), critical raw sensor data to the SafetyNet receptor sites. (EESS = Earth

exploration-satellite service, SRS = space research service). This draft recommendation is moving forward in parallel through ITU WP7B and Study Group 7 – see section 3. International Telecommunication Union.

3. International Telecommunication Union – Radiocommunication (ITU-R) sector Working Parties 7B and 7C (WP7B, WP7C) and Study Group 7 (SG7)

Working Party 7B – Space Radiocommunication Applications

The ITU-R WP7B and WP7C met twice in the last 12 months (16-20 February 2009 and 8-14 September 2009). WP7B is concerned with space radio systems, i.e. the transmissions between the Earth and satellites, both uplinks and downlinks. A major topic of interest to CGMS under consideration in this WP is furthering technical studies toward gaining approval of expanding the existing non-geostationary metsat space-to-Earth allocation at 7750-7850 MHz by 50 MHz from 7850 to 7900 MHz. As a result of inputs by EUMETSAT at each meeting, work progressed on coordination with the fixed service through the draft report on compatibility between metsats and the fixed service in 7850-7900 MHz. Since the sharing in the expanded frequency range will be with the same services in 7750-7850 MHz using similar equipment, the compatibility study is similar to that done prior to WRC-97 when the existing allocation was approved. At its September 2009 meeting WP7B, this report was finalized and sent to Study Group 7 (SG 7). WP7B also updated draft text for the Conference Preparatory Meeting (CPM) on this WRC-12 agenda item. The text indicates that metsat sharing the extended band with the existing fixed and mobile services is feasible.

The United States proposed a global review of all ITU-R recommendations dealing with EESS and meteorological satellite service space-to-Earth and Earth-to-space links. The way interference assessments are done has changed quite a bit since the 1990s when the last major revision of the ITU-R Recommendations on EESS and METSAT systems was carried out. Considering the increasing use of dynamic simulation for performing interference assessments, it is becoming evident that the methodology for determining interference and sharing criteria, as described in Recommendations ITU-R SA.1022 and SA.1023, is outdated, and is not strictly correct. This proposed revision would re-visit the methodology, with the aim toward simplifying and improving the accuracy of these recommendations as well as the recommendations that are based on the methodology. Specifically, the revision would incorporate a combination of the current concepts of performance criteria (C/N) and interference criteria into a single concept of a required minimum $C/(N+I)$ value, where C = carrier power, I = interference power and N = noise power. The goal of this work would be a merger of Recommendations ITU-R SA.1021 and SA.1022 and a merger of Recommendations ITU-R SA.1025, SA.1159, and SA.1162, as well as the shift of most of the material from Recommendations ITU-R SA.1026, SA.1160, SA.1163, and SA.1627 into a single report providing typical EESS and metsat parameters that can be used for interference assessment. Finally, this would lead to the suppression of Recommendations ITU-R SA.1023, SA.1026, SA.1027, SA.1160, SA.1161, SA.1163, SA.1164 and SA.1627.

Under WRC-12 agenda item 1.25, WP 4C (Efficient orbit/spectrum utilization for the mobile-satellite service (MSS)) is currently performing sharing studies between possible future MSS allocations in various bands and corresponding incumbent

services, including metsats in the 7750 – 7900 MHz (non-geostationary meteorological satellite space-to-Earth links). WP7B considered various input documents from WP-4C (3 liaison statements) and ESA and, in particular, the current working document towards a draft new Report on “*Feasibility of MSS operations in certain frequency bands*” developed in WP4C. A liaison statement back to WP 4C referred to ITU-R SA recommendations containing characteristics and protection criteria for metsat systems, as well as, provided initial comments related to the current sharing studies. In particular, this liaison statement stressed that current sharing studies related to the potential interference from Mobile Earth Stations (MES) to metsat receiving Earth stations have not been considered. Preliminary analysis in WP 7B indicates that keep-out distances for MES to prevent interference to metsat Earth stations could be around 100 km. Transmissions from maritime MES or land-based MES near large bodies of water will require significantly larger distances. The distances would be even greater for aeronautical MES.

Lastly, WP7B deemed the preliminary draft new recommendation entitled “Guidelines for Efficient Use of the 25.5-27 GHz Band by the Earth Exploration-satellite Service (space-to-Earth) and Space Research Service (space-to-Earth)” to be mature and approved its being sent forward to SG 7 for consideration.

Working Party 7C – Remote Sensing Systems

WP7C covers applications in the EES concerning active and passive sensors as well as metajds, i.e. radiosondes and meteorological radars. The major thrust in WP7C during the last meeting of interest to CGMS is to address the WRC-12 agenda item 1.6, viz., to review the last footnote (5.565) in the ITU table of frequency allocations in order to update the spectrum use by the passive services between 275 GHz and 3000 GHz. The draft report on passive sensing use in this region of spectrum reached consensus at the September 2009 meeting and was sent to SG 7 for approval. Additionally, several documents (reports and recommendations) related to passive sensors reached maturity and were presented to SG 7 for consideration and approval.

Study Group 7 – Science Services

As the overseeing body for its working parties, SG7 is responsible for reviewing the outputs of the working parties. If an output is approved by SG7, it is sent forward to the members of the ITU for adoption and approbation by correspondence. At the SG 7 September 2009 meeting the following documents were approved for sending to administrations:

- 1) Report ITU-R [METSAT 7.9 GHz] - Compatibility between the meteorological satellite and the fixed service in the band 7 850-7 900 MHz (from WP7B)
- 2) Recommendation ITU-R RS.[AGGREGATE] - Characterization and assessment of aggregate interference to EESS (passive) sensor operations from man-made emission power sources (Question ITU-R 243/7) (from WP7C)

- 3) Recommendation ITU-R RS.[DISASTER] - Use of remote sensing systems in the event of natural disasters and similar emergencies for warning and relief operations (from WP7C)
- 4) Recommendation ITU-R RS.[PASSIVE_CHARS] - Typical technical and operational characteristics of Earth exploration-satellite service (passive) systems using allocations between 1.4 and 275 GHz (from WP7C)
- 5) Report ITU-R RS.[IDEN_DEGRAD] - Identification of degradation due to interference and characterization of possible interference mitigation techniques for passive sensors operating in the Earth exploration-satellite service (passive) (from WP7C)
- 6) Recommendation ITU-R SA.[26 GHz] - Guidelines for efficient use of the band 25.5-27.0 GHz by the Earth exploration-satellite service (space-to-Earth) and space research service (space-to-Earth) (from WP7B)

4. World Meteorological Organization (WMO) Commission for Basic Systems (CBS) Steering Group on Radio Frequency Coordination (SG-RFC)

The WMO's SG-RFC met 14-15 September 2009 to discuss topics related to metatids and metsats. The major topic of interest to metsat operators was the WMO position on several of the WRC-12 agenda items concerning metsats and metatids. Details of the position on the various agenda items are provided in a separate input from the WMO. The joint (WMO/ITU) publication (2009) of the handbook entitled "Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction" was also discussed. The handbook updates the original edition published in 2002 and provides comprehensive information on meteorological satellites, radars and radiosondes. The handbook is available without charge at: <http://www.itu.int/publications/publications.aspx?lang=en&media=electronic&parent=R-HDB-45-2008> SG-RFC also considered topics on frequency bands used for metsat transmissions and those concerning spaceborne remote sensing as well as contributions to the ITU-R involving metsat and EESS allocations.