

**NOAA Technical Input to and Summary of Space Frequency
Coordination Group, WMO Steering Group on Radio Frequency
Coordination and ITU-R on Issues Regarding Metsats**

This paper presents a summary of technical inputs provided by NOAA to the Space Frequency Coordination Group and various ITU-Radiocommunication groups during 2004-2005 as well a summary of the frequency issues concerning metsats. Also included is a summary of the WMO Steering Group on Radio Frequency Coordination.

This document is to provide information to CGMS Members regarding radio frequency management activities that could possibly affect frequencies used by metsats.

NOAA Technical Input to and Summary of Space Frequency Coordination Group, WMO Steering Group Radio Frequency Coordination and ITU-R on Issues Regarding Metsats

Introduction

There are various international groups, some ad hoc in nature, that meet on a regular basis to discuss management of radio frequencies. Decisions reached by these groups can often affect the future access to the spectrum by 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 sensing needs.

Space Frequency Coordination Group (SFCG)

The 24th meeting of SFCG was held in Perros-Guirec, France from 14-22 September 2004. 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 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-07" and the "EES and Metsat". (Note: EES = Earth exploration satellite).

NOAA inputs to SFCG-24 concerned the possible interference from ultrawide band (UWB), proposed characteristics of a geostationary metsat using the 18 GHz space-to-Earth allocation and a proposed draft of updates to International Telecommunication Union-Radiocommunication (ITU-R) sector recommendations on sharing in the 1665-1700 MHz band between meteorological services and the mobile-satellite service.

At SFCG-24 the working group on ITU Matters and preparation for WRC-07 updated the resolution dealing with WRC-07 agenda items of importance to the SFCG membership. Those items critical to metsats are discussed in detailed in CGMS-XXXIII USA-WP-08. The working group on EES and metsat reviewed many input documents and focused its discussion on active and passive sensors, meteorological issues (metoids and metsats), and ultra wideband devices. The group also reviewed the many 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.

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

The ITU-R WP7B and WP7C met twice in the last 12 months (27 September – 1 October 2004 and 7-11 March 2005). WP7B is concerned with space radio systems, i.e. the transmissions between the Earth and satellites, both uplinks and downlinks. The single topic of interest to CGMS under consideration in this WP is furthering technical studies toward gaining approval of expanding the existing geostationary metsat space-to-Earth allocation at 18.1-18.3 GHz by 0.1 GHz, i.e. by 50%. As a result of inputs from EUMETSAT and continued coordination with the fixed-satellite service, much progress was made at the 2 meetings. It is expected that draft Conference Preparatory Meeting (CPM) text will be approved that supports the expansion of this metsat allocation at the upcoming meeting in November 2005 for consideration at the CPM in 2006.

WP7C covers applications in the EES concerning active and passive sensors as well as metajets, i.e. radiosondes. The major thrust in WP7C during the last two meetings of interest to CGMS is the concern for protection of passive sensors from UWB devices and from unwanted emissions for active radio services operating in bands adjacent or near exclusively passive allocations and to address the WRC-07 agenda item concerning sharing in 10.6-10.68 and 36-37 GHz between passive sensors and the active fixed and mobile services. There has been much exchange of information concerning protection of passive sensors between WP7C and Task Group (TG) 1/8 (Compatibility between UWB devices and radiocommunication services) and TG 1/9 (Compatibility between passive and active services, i.e. unwanted emissions into passive sensors).

ITU Task Group 1/8 (TG1/8) – Compatibility between ultra-wideband devices (UWB) and radiocommunication services

UWB devices operate at low power across relative large frequency bandwidths. The uses for such devices are many, including ground penetrating radars to locate hidden objects such as bodies buried in rubble caused by natural disasters such as earthquakes and hurricanes and automobile radars that are intended to avoid collisions and otherwise improve automobile safety. UWB is not a recognized ITU radio service, as are metsats, but because such devices use radio frequencies and are likely to become widespread in use, the ITU deemed it prudent and useful to investigate their compatibility with existing services. In the United States such devices are approved for operation under Part 15 of the Federal Communications Commission's rules (and found in the Federal Code of Regulations, section 47 Telecommunication). Part 15 devices operate on a non-interference basis, that is, such devices must accept interference and they may not cause harmful interference to other authorized radio devices in the frequencies which the devices operate.

The main concern to meteorological satellites from UWB operations is the widespread proliferation of proposed automobile radars operating in the exclusively passive Earth exploration-satellite service (EESS) allocation in 23.6-

24 GHz. This band continues to be used by metsats for monitoring and calibration of atmospheric water vapor, important for use in numerical weather prediction models. While the energy emitted by a single automobile radar is quite small, the aggregate from concentrations of large numbers of automobiles operating such radars in major metropolitan areas will likely be sufficient to cause harmful to metsat sensors. Since the United States has approved the use of UWB automobile radars, such policy must be espoused by all Federal agencies, including NOAA.

The question then becomes one of determining how frequently interference will be caused to passive sensors on metsats when passing over densely populated areas and whether such interference will exceed the ITU-R data availability criteria of 99.99%. NOAA completed a study on this subject that was discussed at a meeting of TG1/8 in May 2005 and proposed for adoption as part of the comprehensive ITU report on UWB devices. The NOAA study confirmed the numbers promulgated by the automobile radar industry for expected future use of these safety devices. The same numbers shown are likely to cause interference to passive metsat sensors.

The CGMS membership is encouraged to lobby among their administrations that such safety devices could also operate successfully near 77 GHz. Such use was approved in the United States (See CFR 47 section 15.253) prior to those at 24 GHz. In fact, devices operating near 77 GHz are currently being developed within the United States.

ITU TG1/9 – Compatibility between passive and active services

Agenda item 1.20 for the 2007 World Communication Conference (WRC-07) is to “consider the results of studies, and proposals for regulatory measures, if appropriate, regarding the protection of the Earth exploration-satellite service (passive) from unwanted emissions of active service”. Bands included in the agenda item used by passive sensors on metsats are 23.6-24 GHz, 31.3-31.5 GHz and 50.2-50.4 GHz. As a result of this agenda, TG1/9 (Compatibility between passive and active services) was created to study the issues and prepare text for the Conference Preparatory Meeting for resolution of unwanted emissions into the various bands.

The group has met three times with very limited inputs from the United States. However, at the recently completed meeting in September 2005, the U.S. presented two documents, viz., one on the results of a dynamic simulation of potential interference from fixed-satellite service (FSS) uplink earth stations into the AMSU passive sensor and another on various semi-static and dynamic analyses of unwanted emission levels from FSS uplinks in the 50.4-51.4 GHz band into an EESS passive receiver in the 50.2-50.4 GHz band. NASA and NOAA are working together on these simulations to assure the consistency of the results. These studies will hopefully lead to a final conclusion regarding what measures need to be taken by the active services to protect the exclusively passive bands under consideration.

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

The WMO's SG-RFC met at Perros-Guirec, France immediately prior to the SFCG-24 meeting to discuss topics related to metairds and metsats. NOAA presented two papers at the meeting, one entitled "Assessment of Interference Potential between Short Range Radars on Automobiles and passive Microwave Sensors in the 23.6 to 24.0 GHz Band" and one entitled "Sample Characteristics and Sharing Criteria for Geostationary Meteorological Satellites in the Band 18-18.4 GHz". Both of these papers updated on-going activities in the ITU-R. Other metsat topics discussed at the 2-day meeting included the potential interference between NPOESS and METOP data transmissions in 1698-1710 MHz and 7750-7850 MHz and frequency sharing between the meteorological aids service, meteorological satellite service (space-to-Earth) and the mobile-satellite service (Earth-to-space) within the frequency range 1 668.4-1 700 MHz.