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REPORT FROM THE 27th MEETING OF THE SPACE FREQUENCY COORDINATION GROUP

In response to CGMS Action 34.11

The document reports on the outcome of the SFCG-27 meeting which took place from 17 to 27 September 2007 in Maspalomas, Spain. The main results related to the Meteorological Satellite Service and the Earth Exploration Satellite Service relevant to CGMS are included.

REPORT OF THE SPACE FREQUENCY COORDINATION GROUP MEETING 27

1 INTRODUCTION AND BACKGROUND

The annual meeting of the Space Frequency Coordination Group (SFCG-27) took place in Maspalomas, Spain from 17 - 27 September 2007. The meeting was attended by 60 delegates from space agencies and observers from international organizations.

In accordance with a decision of CGMS-34 the WMO and CGMS were represented by Mr Robert Wolf.

2 MAIN MEETING RESULTS

The main meeting results related to the Meteorological Satellite Service (MetSat) and the Earth Exploration Satellite Service (EESS) are listed in the following paragraphs.

2.1 PREPARATION FOR THE WORLD RADIO CONFERENCE 2007

The World Radio Conference 2007 (WRC-2007) organized by the ITU will take place from 22 October to 16 November 2007 in Geneva, Switzerland. The positions of WMO on the various WRC agenda items were presented and discussed at the SFCG meeting. It can be concluded that the SFCG will support all space-related positions of WMO during WRC-2007. WMO will be represented by J.M. Rainer and Philippe Tristant (Météo France).

SFCG has updated Resolution 23-1R4 "SFCG Objectives for World Radio Conferences". This document gives guidelines and technical background information to be used at WRC 2007 but also includes positions for future WRCs. A copy of the SFCG Resolution is attached as an Annex.

2.2 EXTENSION OF THE METSAT ALLOCATION AT 7750-7850 MHz

To accommodate increased frequency spectrum requirements for future polar orbiting MetSat systems, an extension by up to 100 MHz of the primary allocation to NGSO MetSat at 7750 - 7850 MHz is needed. This will be discussed at WRC-2007 in WRC-11 of the agenda.

2.3 RECOGNITION OF THE INCREASINGLY ESSENTIAL ROLE OF EARTH OBSERVATION CARRIED OUT BY METSAT, METAIDS AND EESS

WRC-2007 has received a proposal "to consider, in accordance with **Resolution [EUR/XX5] (WRC-07)**, the adequacy and possible improvement of the regulatory status and recognition of the increasingly essential role of Earth observation carried out in the Earth Exploration Satellite Service (active and passive), the Meteorological Satellite Service, the Meteorological Aids Service and Radiolocation Service".

On the proviso that such a proposed agenda item would not call for regulatory changes at WRC-2011, SFCG supports inclusion of an agenda item of this nature calling for the recognition of the essential role that Earth observation systems contribute toward the Societal Benefit Areas as defined by the Group on Earth

Observation (GEO)¹, in particular in relation to environmental and disaster monitoring.

2.4 OUTPUTS OF PASSIVE MICROWAVE SENSING WORKSHOPS

NOAA presented a document summarizing the outcome of the three passive microwave sensing workshops conducted by NOAA. The document includes an initial comparison of frequency bands for four major meteorological measurement areas. These comparisons were based on specific evaluation criteria developed and utilized by the three workshops.

SFCG discussed how best the outcome of the three workshops could be appropriately reflected in SFCG Resolution 21-2R2. It was concluded that the information as presented cannot simply be merged into the table of SFCG Resolution 21-2R2 as this resolution focuses on the protection requirements of passive sensing in different bands while the three workshops focused more on the measurement functions. As a result, SFCG considered it most appropriate to set up a new action item (SWG-3/2) to investigate on how to present the information gathered by the three workshops either by revising SFCG Resolution 21-2R2 or by the development of a companion document and to present a proposal to SFCG-28.

2.5 USE OF THE BAND 6.9 - 7.3 GHz FOR SEA SURFACE TEMPERATURE MEASUREMENTS

JAXA provided information on GCOM-W1 which will be launched in 2011 with an AMSR-2 sensor building upon the AMSR-E operated on AQUA. In order to cater for the interference problems at 6.9 GHz, GCOM-W1 will in addition use 7.3 GHz. Experiments over Japan showed smaller interference from the fixed service at 7.3 GHz as at 6.9 GHz. Measurements were only performed over land. The situation over the sea, in order to assess e.g. the influence from FSS downlink reflections from the sea surface, was not included in the experiment. JAXA is seeking information on the use of the 7.3 GHz band on a worldwide basis in order to get an idea of the interference situation on a global basis at 7.3 GHz as compared to 6.9 GHz.

The document also highlights the missing regulatory status in the RR and the missing possibility to discuss this issue at a future WRC to improve the situation. SFCG supports the importance of the 6.9/7.3 GHz band for sea surface temperature measurements. In order to make a first step in identifying the sharing situation and the possibilities for a burden sharing approach for this 6.9/7.3 GHz band an initiative in the framework should be initiated for example by a JAXA contribution to ITU-R Working Party 7C.

2.6 IMPACT OF WRONG OR MISSING DATA DUE TO CORRUPTED MEASUREMENTS OF PASSIVE SENSORS

CNES highlighted the impact of wrong or missing data on meteorological forecast and climate modelling due to corrupted measurements of passive radiometers. SFCG concurred with the issue raised in the document that generally the impact of RFI or wrong measurements derived from non-natural or man-made transmissions within satellite passive bands, and the consequential impact on the meteorological

1. http://earthobservations.org/about/about_GEO.html

forecast and climate modelling in the framework of NWP is not precisely known. The only sensible way identified that could improve the knowledge of the impact of wrong or missing data might be the establishment of an expert group, with a few experts from the field of meteorological forecasting and climate modelling together with a few frequency management experts who could establish a work plan on how to identify and determine the impact of corrupted data.

2.7 OUT-OF-BAND (OOB) EMISSIONS OF ACTIVE SENSORS

NASA presented a document providing a comparison of the various types of computation of the out-of-band (OOB) emission limits derived from spaceborne radar, especially concerning the 40 dB bandwidth. An action item was agreed within SFCG to collect data concerning the out-of-band emission limits. Space agencies and administrations are invited to provide any data, facts, measurements or calculations concerning the level of OOB emissions due to EESS (active). The collection of those elements would allow a possible revision of Annex 8 (OOB limits for primary radar systems) of ITU-R Recommendation SM.1541.

2.8 RF POWER INCREASE FOR UNLICENSED FIXED SERVICE DEVICES AROUND 60 GHz

During SFCG a specific issue was raised concerning potential RF power increase for unlicensed fixed service devices around 60 GHz, as noted in a FCC NPRM (Notice of Proposed Rule Making). The proposed change would affect AMSU (Advanced Microwave Sounding Unit) channels around 60 GHz, as well as future possible spectrometer-based observations such as high altitude sounding channels that are critical for upper tropospheric, stratospheric and mesospheric temperature profiling.

Due to potential in-band interference to EESS (passive) bands used for weather forecasting, SFCG members would like to conduct compatibility analysis between existing and future observation systems and unlicensed devices as planned according to technical standards contained in Part 15 basis in the 57-64 GHz frequency range.

Therefore, the SFCG Executive Secretary will send a letter noting the concerns raised by this possible increase of power to the existing and operational observation satellites to the contact person in charge of this NPRM, at the FCC Office of Engineering and Technology. In order to complete a preliminary analysis, it would be necessary to know the average density of transmitters per km² within urban and rural areas, RF characteristics of the transmitters around 60 GHz (RF power, description of the antenna pattern (antenna gain)) and market penetration of the proposed systems. SWG-3/4 contains an Annex to be attached to this letter from SFCG.

3 CONCLUSIONS

CGMS Members are invited to take note of the listed SFCG activities and provide support in the form of technical data if required.

In particular it would be important to indicate the names of experts related to meteorological forecast and climate modelling in the framework of NWP.

ANNEX

***SPACE FREQUENCY
COORDINATION GROUP***

Resolution 23-1R4

**SFCG OBJECTIVES FOR
WORLD RADIOCOMMUNICATION CONFERENCES**

The SFCG,

CONSIDERING

- a) that its member agencies are vitally interested in achieving changes to the ITU Radio Regulations (RR) in order to enhance future space science system operations, and to improve Disaster Prediction, Disaster Detection and Disaster Mitigation space systems;
- b) that changes to the RR can only be accomplished at World Radiocommunication Conferences (WRCs);
- c) that on the agendas of all of these WRCs, items of interest to SFCG member agencies may be included;
- d) that it is essential for SFCG member agencies to coordinate their conference preparations and to provide the necessary rationale for their requirements in order to achieve the desired results at WRCs;

NOTING

that consideration of the frequency allocations required to implement space systems to be used in Disaster Prediction, Disaster Detection, Disaster Mitigation and Environmental Monitoring is critical for Public Safety and Property Protection,;

RESOLVES

1. that consideration of SFCG WRC Objectives for the next and subsequent competent conferences identified in Annex 1 is vital for member agencies;
2. that, in preparation for WRCs, Annex 1 shall be up-dated in the light of conference agendas and evolving Objectives;
3. that Annex 2 shall list items of interest to SFCG members for consideration at a future conference, but not yet sufficiently mature for inclusion in Annex 1.
4. that member agencies will urge their administrations to make proposals to competent WRCs which satisfy these Objectives.

Annex 1 to SFCG Resolution 23-1R4

SFCG WRC-07 OBJECTIVES

Introduction

These are the objectives of SFCG members relative to the space science services on the agenda of the 2007 World Radio Communication Conference (WRC-07). The contents may be used by SFCG members to inform their Administrations, and to facilitate conference preparation and WRC consideration.

The presentation is organized to align with Agenda for the WRC-07 as presented in Resolution **802 (WRC-03)**. Not all of the items in that agenda are of interest to the SFCG and therefore only those specific agenda items, relating to SFCG issues, are discussed herein.

SFCG promotes the use of space-based passive sensors to provide vital ecological and environmental data that is unobtainable by any other means. Such passive sensors depend for their successful operation on frequency bands that are defined by the physical laws of the atmosphere.

SFCG also promotes spectrum efficiency and recognizes the need for and the value of sharing frequency bands between more than one radio service, in cases where mutually agreed sharing and protection criteria have been established based on the results of ITU-R studies.

As at the time of SFCG-27 the national, regional and organizational positions have largely been determined for the WRC-2007. It is noted that there has been a high degree of success in achieving alignment with the SFCG Objectives with most members acknowledging that their preparatory work has been greatly assisted by the succinct presentation of desired outcomes and the supportive rationale behind each objective presented in this SFCG Resolution.

The major purpose of SFCG Res 23-1 has therefore been achieved and this version has retained some dated background "Status" information for (hopefully) useful historical reference only. The exceptions are in those areas where recently refined objectives relating to a potential expansion of agenda item 1.3 and discussions of future agenda items for WRC-2011 will be included for probable debate at WRC-2007 and these are presented as updated or additional text in this document.

Agenda Item 1.2 “to consider allocations and regulatory issues related to the Earth exploration-satellite (passive) service, space research (passive) service and the meteorological satellite service in accordance with Resolutions **746 (WRC-03)** and **742 (WRC-03)**”

Resolution 746 (WRC-03) resolves 1 calls for sharing analyses between geostationary meteorological satellites operating in the space-to-Earth direction and the fixed, fixed-satellite and mobile services in the band 18-18.4 GHz to define appropriate sharing criteria with a view to extending the current 18.1-18.3 GHz geostationary meteorological satellites allocation in the space-to-Earth direction to 300 MHz of contiguous spectrum. This will satisfy the requirement for the transmission of data from high resolution sensors on the next generation geostationary meteorological satellites, which will be launched in the time-frame 2015-2020.

SFCG Objective

SFCG supports the expansion of the current 18 GHz allocation for transmission of high rate data from geostationary meteorological satellites. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07. Either sub-band within 18.0-18.4 GHz would be acceptable but it would be preferred to have a global allocation.

Status

Working Party 7B has documented a description of the instruments and measurements that are foreseen for the third generation MetSat systems and conducted a series of sharing studies. Working Party 4A actively participated in the sharing studies to define the impacts of the geostationary meteorological satellites frequency band extension. Working Party 7B updated the sharing studies based on suggestions from Working Party 4A and used that to develop CPM text. Two sub-bands have been considered for extension of the current allocation in the band 18.1-18.3 GHz, i.e. 18.0-18.1 GHz and 18.3-18.4 GHz. Agreement among the interested parties has been achieved that sharing would be feasible in both sub-bands under certain conditions. The CPM text is available at <http://www.itu.int/md/R07-CPM-R-0001/en>

Resolution 746 (WRC-03) resolves 2 calls for sharing analyses between the EESS (passive) and the SRS (passive) and the fixed and mobile services in the band 10.6-10.68 GHz to determine appropriate sharing criteria. The EESS (passive) operating in the band 10.6-10.68 GHz may experience harmful interference from the emissions of systems of active services. The band 10.6-10.68 GHz is primarily used for the measurement of rain, snow, sea state, ocean wind and soil moisture.

SFCG Objective

SFCG supports the protection of this EESS (passive) allocation that is critically required to provide continued availability of satellite-based data used in the disaster prediction and in the development of global weather and climate models, from interference from the active service systems operating in the 10.6-10.68 GHz band. Revisions to RR No. **5.482**, that specify operational limits on the technical characteristics of the terrestrial active services sharing the band (FS and MS), are needed. SFCG prefers that the values of the existing No. **5.482** be modified using single-entry emission limits identified in Method B1 in the CPM Report, with impacts on both the active and passive services in the band. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07.

Status

Sharing studies using dynamic models have been completed. CPM text can be found <http://www.itu.int/md/R07-CPM-R-0001/en>. Some of the methods include mitigating factors that might be undertaken by the EESS (passive) service and possible limits on some technical characteristics of the FS and MS systems in this band taking into account inputs from Working Parties 8A and 9D. Working Party 7C has produced a Preliminary Draft New Recommendation ITU-R RS.[10 GHz MITIGATE] on technical and operational constraints on EESS (passive) systems to facilitate sharing with the FS in this band. WP 9D is developing a Recommendation regarding technical and operational constraints on the FS to facilitate sharing in the 10.6-10.68 GHz band with the EESS (passive). Studies have identified elevation angle, transmitter power and e.i.r.p limitations for both Point-to-Point (P-P) and Point-to-Multipoint (P-MP) FS systems in the band to facilitate sharing. Additionally, WP 9D has suggested automatic power control as an interference mitigation technique. Recent measurements performed in the 10.6-10.68 GHz band show that over a few countries (for example Australia, Japan and Italy), passive sensors are currently interfered at such a high level that corresponding data have to be discarded. Passive sensors are not normally able to discriminate between these natural radiations and man-made radiations, except when interference levels are at several orders of magnitude compared to the sensitivity threshold. These interference levels, that did not exist a few years ago, are symptomatic of a problem and justifying the need to review current power limits in RR No. **5.482**.

Resolution 742 (WRC-03) calls for sharing studies between the passive services and the fixed and mobile services in the band 36-37 GHz in order to define appropriate sharing criteria. EESS (passive) systems may experience harmful interference if a high density of fixed or mobile service stations is deployed in the band 36-37 GHz. The band 36-37 GHz is primarily used for the measurement of rain, snow, ocean ice, oil spills and clouds.

SFCG Objective

SFCG supports the protection of this EESS (passive) allocation that is critically required to provide continued availability of satellite-based data used in the disaster prediction and in the development of global weather and climate models, from interference from the active service systems operating in the 36-37 GHz band. Studies have shown that limitations on the technical characteristics of the terrestrial active services sharing the band are needed. SFCG prefers that the limits identified in Method C1, in the CPM Report, which will impact both the active and passive services in the band, be included in Article 5 of the Radio Regulations. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07.

Status

Sharing studies using dynamic models have been completed. The methods available are provided in the CPM Report at <http://www.itu.int/md/R07-CPM-R-0001/en> and include mitigating factors that might be undertaken by the EESS (passive) service and possible limits on some technical characteristics of the FS and MS systems in this band. Working Party 7C produced a Preliminary Draft New Recommendation ITU-R RS.[36 GHz MITIGATE] on technical and operational constraints on EESS (passive) and SRS (passive) systems to facilitate sharing with the FS in this band. WP 9D is developing a Recommendation regarding technical and operational constraints on the FS to facilitate sharing in the 36-37 GHz band with the EESS (passive). Studies have identified elevation angle, transmitter power and e.i.r.p

limitations for both Point-to-Point (P-P) and Point-to-Multipoint (P-MP) FS systems in the band to facilitate sharing. Additionally, WP 9D suggested automatic power control as an interference mitigation technique.

The studies indicated that compatibility between future FS operations and the passive sensors currently operating in this band could be achieved if the FS EIRP/power and deployment densities are moderate.

Agenda Item 1.3 “in accordance with Resolution **747 (WRC-03)**, consider upgrading the radiolocation service to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (active) and the space research service (active) in the band 9 500-9 800 MHz without placing undue constraint on the services to which the bands are allocated”

Resolution 747 (WRC-03) calls for the technical characteristics, protection criteria, and other factors of radiolocation, radionavigation, EESS (active) and space research (active) systems that ensure compatible operations in the band 9 300-9 500 MHz and the study of the compatibility between terrestrial radars of the radiolocation and radionavigation services, and spaceborne radars of the Earth exploration-satellite and space research services in the band 9 300-9 500 MHz. In the event that sharing studies in the 9 300-9 500 MHz band lead to unsatisfactory conclusions which do not fully satisfy the requirement for an increase by up to 200 MHz of contiguous spectrum for EESS (active) and space research (active) services, additional sharing studies in the alternative frequency range 9 800-10 000 MHz are to be performed.

SFCG Objective

SFCG supports a 200 MHz extension to the current 9.5-9.8 GHz allocation to both the EESS (active) and SRS (active). SFCG prefers the extension to be in 9.3-9.5 GHz band as given in Method A in the CPM Report. SFCG also supports the need for an additional 100 MHz allocation to EESS (active) and SRS (active) above 9800 MHz to enable enhanced measurement resolution via wideband active sensing systems. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07.

Status

Working Parties 8B and 7C have completed the sharing studies to define the impacts of extending the current 9.5-9.8 GHz allocation to the EESS (active). Sharing studies have been performed in both the 9.3-9.5 GHz band and the 9.8-10.0 GHz band to assess compatibility between systems that may operate in the EESS (active) and the radiodetermination services. Studies have also been performed to assess compatibility between EESS (active) and the fixed service in the 9.8-10.0 GHz band. The results of these studies indicate that sharing a contiguous 500 MHz is feasible between EESS (active) and other services in either the 9.3-9.8 GHz band or the 9.5-10.0 GHz band. Working Party 7C developed a Preliminary Draft New Report ITU-R RS.[9GHz COMPAT] that summarizes all of the compatibility studies pertaining to the EESS extension.

Subsequent to the above, a new CEPT proposal suggested that (on the basis that extension of the band for EESS (active) by 200 MHz in either the upper or lower directions was feasible) given that there are now plans for EESS (active) systems with bandwidths of up to 600 MHz,

the WRC-2007 may consider the extension of 300 MHz to accommodate these new systems. This would call for an allocation from 9.3 GHz to 9.9 GHz. The 100 MHz above 9.8 GHz would be used only by these imminent new ultra-broadband active sensor systems.

Agenda Item 1.4 “to consider frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 taking into account of the results of ITU-R studies in accordance with Resolution **228 (Rev.WRC-03)**”

Any allocation to the IMT-2000 systems in bands already allocated to the meteorological aids, meteorological-satellite, Earth exploration-satellite, and space research services could pose a threat to those services.

SFCG Objective

The SFCG objective is to protect space science services allocations that may be considered for allocation to IMT-2000 and future systems, and support suppression of Resolution **228 (Rev. WRC-03)**. The 410-430 MHz and 2700-2900 MHz bands have been identified as candidate bands for IMT-2000 and systems beyond IMT-2000. SFCG members view the identification of these two bands for IMT-2000 and systems beyond IMT-2000 with concern, realising the possibility of interference to manned space systems and meteorological radars and are encouraged to take an active role in the development of proposals and positions within their respective Administrations’ preparatory processes for the WRC-07.

Status

Working Party 8F developed draft text for the CPM Report, including a large list of candidate bands. The 410-430 MHz and 2700-2900 MHz bands were identified as two of these candidate bands for IMT-2000 and systems beyond IMT-2000.

Agenda Item 1.5 “to consider spectrum requirements and possible additional spectrum allocations for aeronautical telecommand and high bit-rate aeronautical telemetry, in accordance with Resolution **230 (WRC-03)**”

Resolution **230 (WRC-03)** calls for additional allocations between 3 and 30 GHz for wideband aeronautical telemetry and associated telecommand. The impacts to existing allocations to meteorological aids, meteorological satellite, Earth exploration-satellite, and space research need to be considered as new allocations to wideband aeronautical telemetry and associated telecommand are pursued.

SFCG Objective

The SFCG objective is to protect existing space science services allocations and to support the efforts that may lead to appropriate additional allocations in the 3 to 16 GHz band for aeronautical telecommand and high bit-rate aeronautical telemetry, which may also be used during atmospheric testing by space agencies. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations’ preparatory processes for the WRC-07.

Working Party 8B developed draft CPM text which identifies portions of the 4400-4940 MHz, 5030-5250 MHz, and 5925-6700 MHz bands for aeronautical telemetry under the aeronautical mobile service. Bands above 16 GHz are no longer being pursued. Studies in Region 1 support a spectrum requirement of 105 MHz while studies in Region 2 lead to a 650 MHz requirement.

Agenda Item 1.6 “to consider additional allocations for the aeronautical mobile (R) service in parts of the bands between 108 MHz and 6 GHz, in accordance with Resolution **414 (WRC-03)** and, to study current satellite frequency allocations, that will support the modernization of civil aviation telecommunication systems, taking into account Resolution **415 (WRC-03)**”

Resolution **414 (WRC-03)** calls for a review of bands allocated to aeronautical systems in the frequency range between 108 MHz and 6 GHz, and to determine whether additional allocations to the aeronautical mobile (R) service are required. The band 5 091-5 150 MHz is of particular interest.

Existing allocations to meteorological aids, meteorological-satellite, Earth exploration-satellite, and space research need to be taken into account during the studies of possible new allocations to the aeronautical mobile service.

SFCG Objective

The SFCG objective is to protect existing space science services allocations in the 108 MHz to 6 GHz band. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07.

Status

Working Party 8B has developed draft CPM text which identifies portions of the 960-1024 MHz and 5000-5150 MHz bands for AM(R)S to support long-range bi-directional air-ground voice and data communications and broadband airport surface communications.

Agenda Item 1.7 “to consider the results of ITU-R studies regarding sharing between the mobile-satellite service and the space research service (passive) in the band 1 668-1 668.4 MHz, and between the mobile-satellite service and the mobile service in the band 1 668.4-1 675 MHz in accordance with Resolution **744 (WRC-03)**”

Resolution **744 (WRC-03)** calls for studies relating to provisions to protect space research (passive) space stations from harmful interference from mobile earth stations in the band 1 668-1 668.4 MHz.

SFCG Objective

SFCG supports the protection of the space research service (passive) allocation in the band 1668-1668.4 MHz by means of e.i.r.p. limits applied to output of MSS stations. Interested SFCG members are encouraged to take an active role in the development of proposals and positions within respective Administrations' preparatory processes for the WRC-07.

Status

Two relevant space-VLBI systems that will use 1668-1668.4 MHz band were identified by Working Party 7D.

Agenda Item 1.8 “to consider the results of ITU-R studies on technical sharing and regulatory provisions for the application of high altitude platform stations operating in the bands 27.5-28.35 GHz and 31-31.3 GHz in response to Resolution **145 (WRC-03)**, and for high altitude platform stations operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in response to Resolution **122 (Rev.WRC-03)**”

Resolution **145 (WRC-2003)** calls for technical sharing criteria or high altitude platform stations (HAPS) system design conditions to ensure that HAPS applications in the fixed service operate successfully on a non-harmful interference, non-protected basis in the bands 27.5-28.35 GHz and 31-31.3 GHz. The 31.3-31.8 GHz band is allocated to the radio astronomy, Earth exploration-satellite (passive) and space research (passive) services. WRC-03 amended No. **5.543A** to specify signal levels that would protect satellite passive services and radio astronomy stations in the band 31.3-31.8 GHz.

SFCG Objective

SFCG supports the need for protection of the 31.3-31.8 GHz allocation to the radio astronomy, Earth exploration-satellite (passive) and space research (passive) services. The maximum levels of unwanted emissions by HAPS in the passive band contained in RR No. **5.543A** must continue to apply. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07.

Status

Studies focused on issues related to HAPS sharing with broadband wireless access and fixed-satellite service systems, and no consideration was given to revisiting the EESS (passive) sharing criteria.

Agenda Item 1.12 “to consider possible changes in response to Resolution **86 (Rev. Marrakesh, 2002)**: “Coordination and notification procedures for satellite networks” in accordance to Resolution 86 (WRC-03)

Resolves 1 of Resolution 86 calls for consideration of any proposals which deal with deficiencies in the advance publication, coordination and notification procedures of the Radio Regulations for space services which have either been identified by the Board and included in the Rules of Procedure or which have been identified by administrations or by the Bureau, as appropriate.

Currently Appendix 4 makes many fields optional for the case of “Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9”. These fields include i) the necessary bandwidth; ii) the carrier frequency or frequencies of the emission; iii) the maximum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type; iv) the minimum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type; v) the minimum power

density, in dB(W/Hz), supplied to the input of the antenna for each carrier type; and vi) the required C/N ratio. While most administrations have been supplying this information with their API filings, there have been instances where the information was not made available since many of the fields are optional. In order to do an interference analysis this information is required. To have this information not required until the notification stage makes any analysis too late to benefit either administration.

There is a significant difference between space telecommunication systems and EESS/SRS satellite systems employing active/passive sensors. The data set to be submitted in accordance with the current Appendix 4 of RR does not take into account the specificity of active/passive sensors. It would be preferable to introduce an additional column(s) into “Table of characteristics to be submitted for space and radio astronomy services” (Annex 2 to Appendix 4 RR) similar to the existing column for Radio astronomy.

SFCG Objective

SFCG supports regulatory/procedural modifications to Appendix 4:

- to require information that is currently optional in the Advance publication of non-geostationary satellite networks not subject to coordination under Section II of Article 9 to become mandatory. The recommended Appendix 4 data is given in Section 6/1.12/9 of the CPM Report.
- to permit recording and publication of appropriate data pertaining to EESS and SRS active and passive sensors in the International Master Frequency Register (MIFR) by introducing appropriate modifications to Appendix 4 to the Radio Regulations as given in Section 6/1.12/10 of the CPM Report. .

SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations’ preparatory processes for WRC-07.

Status

At the October 2005 SFCG meeting in Beijing, initial comments were gathered regarding the specific parameters that could be included in Appendix 4 in order to facilitate the filing of active and passive sensors. A follow up meeting took place informally during the November 2005 Working Party meetings of Study Group 7. At its December 2005 meeting, the Special Committee (SC) considered a U.S. input (Document SC-WP/46, see at: <http://www.itu.int/md/R03-SC.WP-C-0046/en>) suggesting new station classes and particular data elements that could be included in Appendix 4. As a result of deliberations, in order to facilitate the review by administrations of the International Frequency Information Circular (BR IFIC - Space Services, see at: <http://www.itu.int/ITU-R/space/brific/index.html>) and to provide ability to distinguish active and passive sensors from other applications within the EESS/SRS in advance publication information (API) and notification information, the BR, responding to a request from the scientific and research community in the framework of Working Parties of ITU-R Study Group 7, has defined four new classes of stations for Table 3 in the Preface to the BR IFIC (see at: <http://www.itu.int/ITU-R/space/preface/index.html>), as follows:

- E1** - Space research (active sensor) space station;
- E2** - Space research (passive sensor) space station;
- E3** - Earth exploration-satellite (active sensor) space station;
- E4** - Earth exploration-satellite (passive sensor) space station.

The BR Director provided information and guidance to administrations on these new symbols to the class of station by Circular Letter CR/256 (see at: <http://www.itu.int/md/R00-CR-CIR-0256/en>)

At its December 2005 meeting, the Special Committee (SC) also considered a U.S. input (Document SC-WP/41, see at: <http://www.itu.int/md/R03-SC.WP-C-0041/en>) and liaison statement from Study Group 7 (Document SC-WP/33, see at: <http://www.itu.int/md/R03-SC.WP-C-0033/en>) regarding the benefits of making optional data elements mandatory.

As a result of these deliberations, the Special Committee sent a liaison back to Study Group 7 (Document 7/46, see at:) and WP 7B (Document 7B/116) summarizing their discussions, including the concerns of some administrations, and inviting SG 7's views with respect to both subjects.

A responding Liaison Statement from ITU-R Study Group 7 was developed and submitted to the Special Committee.

Agenda item 1.17 “to consider the results of ITU-R studies on compatibility between the fixed-satellite service and other services around 1.4 GHz, in accordance with Resolution **745 (WRC-03)**”

Resolution **745 (WRC-03)** calls for studies, including the measurement of emissions from equipment that would be employed in operational systems, to validate that the systems meet all requirements for the protection of passive services in the band 1 400-1 427 MHz from unwanted emissions from FSS feeder links for non-GSO satellite systems in the MSS with service links operating below 1 GHz, and to study the power flux-density (pfd) values required to protect sensors of the EESS (passive) operating in the band 1400-1427 MHz.

SFCG Objective

SFCG supports the suppression of the provisional allocation made to FSS feeder links for non-GSO satellite systems in the MSS with service links operating below 1 GHz (RR No. **5.339A**) - (Method 1 in the CPM text). It is further recognised in the CPM text that MSS is not compatible with RLS and MS.

Status

ITU-R has approved Recommendation ITU-R M.1747 “Protection of the Earth exploration-satellite service (EESS) in the band 1 400-1 427 MHz from unwanted emissions of MSS feeder links operating in the bands 1 390-1 392 MHz (Earth-to-space) and 1 430-1 432 MHz (space-to-Earth)” This Recommendation specifies maximum power levels for unwanted emissions of MSS feeder links. A summary of the studies completed to derive these levels is included in the Recommendation as Annexes 1 and 2. The CPM text suggests a single method of satisfying the Agenda Item by suppressing the conditional MSS allocations.

Agenda item 1.18 “to review pfd limits in the band 17.7-19.7 GHz for satellite systems using highly inclined orbits, in accordance with Resolution **141 (WRC-03)**”.

Resolution **141 (WRC-03)** calls for studies to determine whether the current pfd limits for non-GSO systems in the FSS in Article 21 are adequate to protect the fixed service in the 17.7-19.7 GHz band from non-geostationary systems without unduly constraining the use of

these non-GSO FSS systems, and to determine whether there are technical and operational measures in the band 17.7-19.7 GHz that could be implemented in the fixed service to mitigate interference from FSS space stations. The band 18.1-18.3 GHz is allocated to the meteorological-satellite service (space-to-Earth) on a primary basis, limited to geostationary satellites and in accordance with the provisions of Article 21, Table 21-4, under RR No. **5.519**. Modification to pfd limits may adversely impact the sharing situation with the MetSat service in the required 100 MHz extension within the range 18.0 to 18.4 GHz. The band 18.6-18.8 GHz is allocated to EESS (passive) and SRS (passive).

SFCG Objective

SFCG supports the protection of existing science services allocations. Potential modifications to the pfd limits should not be permitted to have an adverse impact on the extension of the MetSat allocation in the range 18.0 to 18.4 GHz. WRC decisions should not relax the pfd limits that protect the passive service allocation in 18.6-18.8 GHz. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations’ preparatory processes for the WRC-07.

Status

The CPM Report is available at <http://www.itu.int/md/R07-CPM-R-0001/en> and summarizes conflicting study results including those that conclude that no changes are needed to the current PFD limits to those that conclude that a more restrictive PFD limit on non-GSO FSS systems is necessary to protect the fixed service.

Agenda item 1.20 “to consider the results of studies, and proposals for regulatory measures regarding the protection of the Earth exploration-satellite service (passive) from unwanted emissions of active services in accordance with Resolution **738 (WRC-03)**”

Resolution **738 (WRC-03)** calls for studies on the compatibility analyses between EESS (passive) and the corresponding active services in certain bands listed below with a view to updating Recommendation ITU-R SM.1633 or developing additional Recommendations.

EESS (passive) band	Active service band	Active service
1 400-1 427 MHz	1 350-1 400 MHz	Fixed service (FS) Mobile service (MS) Radiolocation service
1 400-1 427 MHz	1 427-1 429 MHz	FS, MS (except aeronautical mobile service) and space research service* (Earth-to-space)
1 400-1 427 MHz	1 429-1 452 MHz	FS and MS
23.6-24 GHz	22.55-23.55 GHz	Inter-satellite service
31.3-31.5 GHz	30-31 GHz	FSS (Earth-to-space)
50.2-50.4 GHz ¹	50.4-51.4 GHz ¹	FSS (Earth-to-space) ¹
50.2-50.4 GHz ¹	47.2-50.2 GHz (Regions 2 and 3) 49.44-50.2 GHz ¹ (Region 1)	FSS ¹

¹Studies in this band must take into account No. **5.340.1** of the Radio Regulations.

* An apparent anomaly is present in the text of Resolution **738 (WRC-03)** with respect to the active services in the band 1 427-1 429 MHz. According to the Table in the Resolution, the fixed, mobile (except aeronautical mobile) and space research (Earth-to-space) services are to be considered in this band. In fact, the band 1 427-1 429 MHz is allocated to the fixed, mobile (except aeronautical mobile) and space operation (Earth-to-space) services.

Resolves 2 of Resolution **738 (WRC-03)** invites the ITU-R to further study the impact of implementing the values provided in *considering f)* and *g)* for unwanted emissions of fixed-service systems operating in Regions 2 and 3, taking into account that the impact on fixed-service systems in Region 1 has already been investigated.

SFCG Objective

SFCG supports the protection of these EESS (passive) allocations that are critically required to provide continued availability of satellite-based data used in disaster prediction and in the development of global weather and climate models. Appropriate mandatory power limits for unwanted emissions developed on a band-by-band basis, as identified by Method A in the CPM Report, would be most effective if included in the Radio Regulations. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the WRC-07 with the aim of developing appropriate measures to ensure the protection of the Earth exploration satellite service (passive) from unwanted emissions.

Status

Task Group 1/9 has completed compatibility studies. The analysis methodology used in studies was also reviewed, with emphasis on the emission and radiation model, the sensitivity analysis and frequency dependent rejection as well as documenting and quantifying approximations used in the studies. The CPM Report is available At <http://www.itu.int/md/R07-CPM-R-0001/en>.

Agenda item 7.1 “to consider and approve the Report of the Director of the Radiocommunication Bureau on inconsistencies encountered in the application of the Radio Regulations, and action in response to Resolution **80 (WRC-2000)**” Resolution 951 (WRC-03) calls for studies to be carried out by ITU-R to examine the effectiveness, appropriateness and impact of the Radio Regulations, with respect to the evolution of existing, emerging and future applications, systems and technologies, and to identify options for improvements in the Radio Regulations.

SFCG Objective

SFCG supports the opportunity to improve the Radio Regulations. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for WRC-07 in regard to the review and comment on the Report of the Director of the Radiocommunication Bureau. With respect to Resolution 951, SFCG supports maintaining the definitions used by the space science services (current practice).

In response to Resolution **951 (WRC-03)**, WP 1B has developed a preliminary draft report to the Director BR and identified three options in the report which are:

Option 1 -- Maintain current practice

Option 2 -- Reviewing and possibly revising some of the current definitions

Option 3 -- The introduction of a new provision in the Radio Regulations expanding the principle of substitutability (use one service allocation by systems of another service)

The SC-WP at its meeting in December 2005 developed a response to the WP-1B liaison statement, focusing on the differences in the coordination and notification procedures applicable to the fixed service, the land mobile service and the broadcasting service as they relate to the options identified by WP 1B. This SC-WP response is in Annex 17 of the SC-WP Chairman's Report, Revision 1 to Document SC-WP/57(see at:

<http://www.itu.int/md/R03-SC.WP-C-0057/en>).

Agenda Item 7.2 “to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **803 (WRC-03)**”

SFCG Objectives with respect to the draft Agenda for WRC 2011

SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes with a view to include the following items in the agenda of WRC-11:

- **WRC-2011 Agenda Item 2.2**

WRC-2011 preliminary draft Agenda item 2.2 “to consider frequency allocations between 275 GHz and 3 000 GHz taking into account the result of ITU-R studies in accordance with Resolution **950 (WRC-03)**”.

The SFCG supports replacement of this Agenda item with one that reviews and revises RR No. **5.565** to update the uses of the spectrum from 275 to 3 000 GHz by the Earth exploration-satellite (passive), radio astronomy, and space research (passive) services. Moreover, the lack of use by the various active services indicates that the consideration of frequency allocations between 275 GHz and 3 000 GHz taking into account the result of ITU-R studies in accordance with Resolution **950 (WRC-03)** is premature.

The revision of Resolution **950 (WRC-03)** is needed and the consequent replacement of the existing WRC-2011 Agenda Item 2.2.

- **Allocation for SRS within 22.55 – 23.55 GHz**

With a view to obtaining a new allocation, SFCG would like to get an agenda item on the WRC-2011 Agenda. This AI would request that the Conference consider adding a primary space research service (Earth-to-space) allocation, up to 500 MHz wide, which could provide the needed companion to the existing 25.5-27 GHz band. The preferred band would be 22.55-23.05 GHz due in large part to the greater separation from the important passive band at 23.6 – 24.0 GHz. Protection of existing services needs to be taken into consideration. Preliminary studies have shown that sharing appears to be feasible with the existing services.

- **Protection of 37 GHz**

The SFCG should advocate the introduction of a change to the Table of Frequency Allocations precluding the operation of aeronautical mobile transmissions in the band 37-38 GHz, to improve the sharing situation between the mobile service and the space research service.

- **EXTENSION OF THE METSAT ALLOCATION AT 7750 – 7850 MHZ**

To accommodate increased frequency spectrum requirements for future polar orbiting MetSat systems, an extension by up to 100 MHz of the primary allocation to NGSO MetSat at 7750 – 7850 MHz is needed.

- **Recognition of the increasingly essential roles of Earth observation.**

WRC-2007 has received a proposal “to consider, in accordance with **Resolution [EUR/XX5] (WRC-07)**, the adequacy and possible improvement of the regulatory status and recognition of the increasingly essential role of Earth observation carried out in the Earth Exploration Satellite Service (active and passive), the Meteorological Satellite Service, the Meteorological Aids Service and Radiolocation Service”.

On the proviso that such a proposed agenda item would not call for regulatory changes at WRC-2011, SFCG supports inclusion of an agenda item of this nature calling for the recognition of the essential role that Earth observation systems contribute toward the Societal Benefits as defined by the Group on Earth Observation (GEO)², in particular in relation to environmental and disaster monitoring.

Preliminary WRC-20[11] Agenda Items (see Resolution 803 (WRC-03)) that are of concern to the SFCG and should be closely monitored:

Agenda item 2.7

“to consider the progress of ITU-R studies concerning the technical and regulatory issues relative to the fixed service in the 81-86 and 92-100 GHz frequency bands, taking into account Resolutions **731 (WRC-2000)** and **732 (WRC-2000)**”

Agenda item 2.8

“to consider the progress of the ITU-R studies concerning the development and regulatory requirements of terrestrial wireless interactive multimedia applications, in accordance with Recommendation **951 (WRC-03)** and to take any appropriate action on this subject”

2. http://earthobservations.org/about/about_GEO.html

Annex 2 to SFCG Resolution 23-1R4

Items of interest to SFCG members for consideration at future conferences beyond WRC-2011.

Improve allocations for active sensors

Review RR footnotes Nos. **5.469A**, **5.476A**, **5.498A**, **5.501B** and **5.513A**, which affect active sensor operations in the following bands:

8550 – 8650 MHz
9500 – 9800 MHz
13.25 – 13.75 GHz
17.2 – 17.3 GHz

Improve allocation status at 24 GHz

Upgrade from secondary to primary the allocation to EESS (active) in the band 24.05-24.25 GHz

Possible Allocation for EESS (active) of 1 MHz bandwidth in the range 100 – 150 MHz

Consideration of an additional allocation of 1 MHz bandwidth to the Earth exploration-satellite service (active) within the 100-150 MHz band for the purpose of providing a companion band at a lower frequency to the existing secondary allocation in the 432-438 MHz band which would enable dual-frequency measurements of soil moisture under a substantial vegetation canopy while also reaching a useful depth within the uppermost soil layer.

SFCG-27 should examine the above-mentioned active sensor related issues with a view to determining the relevance of any or each of them to disaster management.

Future SRS (deep space) (space-to-Earth) Wideband Requirement

Allocation of up to 3GHz of spectrum in the range between 27.5 GHz and 31 GHz. The timeframe when this allocation is required is not later than 2015 to permit the implementation of systems (space- and ground-based) and components. SFCG should support this requirement being placed on the agenda of WRC-15 at WRC-11. The issue will be studied within ITU-R under a draft new Question raised within Working Party 7B and expected to be adopted at the April 2008 meeting of ITU-R Study Group 7. The DNQ is available as Annex 7 to the Chairmans Report from the February 2007 meeting and can be accessed at <http://www.itu.int/md/R03-WP7B-C-0168/en>

Improve allocation status at 26 GHz

Review the need for RR footnotes No. **5.536A** and No. **5.536B** appended to the space science services' allocations in the 25.5-27.0 GHz band.

Support Agenda item relevant Disaster Assistance through Space-based Remote Sensing

Earthquakes, hurricanes, typhoons, tornadoes et al. occur yearly throughout the world with devastating effects. The impact of these disasters in terms of the loss to human life and Gross Domestic Product of the nations affected by these disasters has escalated dramatically in the past 20 years due primarily to the increase of population in coastal areas and the significant GDP growth of developing countries.

Existing technologies cannot prevent the occurrence of natural disasters. However, existing and emerging technologies can be used to improve their prediction, detection and mitigation. The use of space systems (satellites) is required in efforts to better predict, detect and mitigate natural disasters on a global basis. The ability to predict, detect, and monitor the scope of disaster events is heavily reliant on terrestrial and space-based a sensor (active and passive) systems. To ensure that the next (and planned follow-on) passive sensor systems can operate at the efficacy required for disaster assistance, efforts are required in diverse fields such as industry and Academe, government, and relief agencies. In the area of Radio Regulations, it is a matter of some urgency that the radio frequency bands necessary for disaster assistance by sensors must be made more readily available to those sensors, and those bands must be protected from anticipated interference sources (from active emissions). In particular, the following actions should be considered:

- enhance the EESS (passive) allocation at 4.2-4.4 GHz to enable improved monitoring of soil moisture and sea surface temperature, to better understand global water circulation for oceans, global warming, and to improve weather prediction (review footnote RR No. **5.438**);
- enhance the EESS (passive) allocation at 6-7 GHz to enable improved monitoring of soil moisture and sea surface temperature, to better understand global water circulation for oceans, global warming, and to improve disaster and weather prediction (review footnote RR No. **5.458**); and
- possibly expand the bandwidth available to the L band SAR to improve monitoring of deformation of the Earth's surface with little influence from vegetation, and to improve monitoring of soil moisture with higher spatial resolution (review footnote RR Nos. **5.332** and **5.332A**).