CGMS-XXX- USA-WP-20
Prepared by USA
Agenda Item: I/1
To be discussed in WG I

Information from Recent Telecommunication Meetings
Summary of SFCG-21 Topics

This document provides a summary of radio frequency topics involving meteorological satellites discussed at recent meetings of the Space Frequency Coordination Group and the International Telecommunication Union's Working Party 7 C.

Information from Recent Telecommunication Meetings
Summary of SFCG-21 Topics

8.1 SWG-1: International Telecommunication Union Matters and Preparation of the 2003 World Radiocommunication Conference (WRC-03)

Special Working Group 1 (SWG -1) considered several inputs documents representing the current views of the 2003 World Radiocommunication Conference (WRC-03) preparedness from the Asian-Pacific Telecommunity (APT), the U.S. and the European Conference of Postal and Telecommunications Administrations (CEPT). It was agreed that the NASA document would form the basis of the output document, which was to be an update to Resolution 18-1R2, i.e. SFCG Objectives for World Radiocommunication Conferences. Texts produced by SWG-3 were incorporated with the texts generated previously and the whole text was reproduced as Resolution 18-1R3, which was agreed and forwarded to Plenary for consideration and approval.

The Chairman opened the floor for discussion of RES 18-1R3, and in particular its Annex containing the SFCG Objectives for WRC-03. The document was adopted with only minor editorial changes.

8.2 SWG-2: General Frequency Management

SWG-2 was assigned responsibility for topics considering frequency bands used for telecommunication, navigation, search and rescue, and information management. The bands 8025-8400 MHz and 25.5-27 GHz were addressed jointly with SWG-3.

The work of SWG-2 included three topics of interest to CGMS, viz.,

- use of 1544-1545 MHz for search and rescue downlinks
- issues related to ultra wideband devices
- use of 8025-8400 MHz and 25.5-27 GHz bands for EESS downlink

Use of 1544-1545 MHz for Search and Rescue Downlinks

NOAA presented a document entitled “Status of Plans for Efficient Modulation Schemes Regarding the Search and Rescue 1544-1545 MHz Band”. The document addressed an issue before the COSPAS-SARSAT Joint Committee related to efficient utilization of the search and rescue downlink band in 1544-1545 MHz. Two approaches to efficient use of the band were presented. The presentation also highlighted the concern that various search and rescue satellite systems are being implemented in differing orbits giving rise to significant concern over potential interference between systems. Future RNSS systems (GPS follow-on and Galileo) are planning to implement search and rescue capability, which could result in over 60 spacecraft down linking in the 1544-1545 MHz band. It was decided that the Executive Secretary should forward a Liaison Statement from SFCG to the chairman of the COSPAS-SARSAT Joint Committee bringing to the committee's attention the potential for interference between such systems operating at differing orbital altitudes. The Liaison Statement, including the cover letter, is found in Annex 1.

Issues Related to Ultra Wideband Devices (UWBs)

Two secondary documents providing information on possible impact of ultra wideband devices on space science services were reviewed and discussed.
An ESA paper entitled "Ultra Wide Band Devices and Their Impact on EESS Sensors" highlighted the concern of the passive sensor community over the potential for raising the noise floor as a result of UWB operations in bands used for passive sensing. More information is needed regarding the antenna characteristics of UWB devices and methods for aggregating UWB device transmissions to fully assess the potential impact to EESS passive sensors. The document highlighted that intentional emissions in exclusively passive bands are prohibited through application of footnote 5.340, which states that "all emissions are prohibited."

CNES presented a document entitled "The Ultra Wide Band (UWB) Debate and the Main Risks for Space Scientific Applications". The document reviewed various studies that have taken place, primarily in the U.S. regarding sharing of UWB applications with allocated services. It was pointed out that interference to GPS systems has been demonstrated and that search and rescue system receivers could suffer interference from a single UWB device operating within 3-6 km of a search and rescue local user terminal. The document also highlighted the concern over possible interference to passive sensors. While ample cause for concern was highlighted by these documents, it was noted that the UWB technology itself holds promise for possible member agency applications.

Use of 8025-8400 MHz (X band) and 25.5-27 GHz (Ka band) for Earth-Exploration Satellite Service Downlink

This topic was addressed in a joint session of SWG's 2, 3 and 4. Two input documents were discussed. A decision was also taken with respect to the status of two related existing recommendations. CNES presented a document entitled, "On the Use of X and Ka-Band for EES". The document examined the possible use of X-band (8025-8400 MHz) and Ka-band (25.5-27 GHz) accommodating increasing EESS downlink data requirements. CNES operational experience has indicated that interference in X-band has been minimal to date due to high spatial discrimination. Various propagation effects were compared and contrasted between the two bands for two elevation angles, 5 and 15 degrees. It was found that for several of the current CNES Earth station locations (e.g. Singapore), attenuation due to atmospheric gases and rain attenuation was considerably more severe for Ka-band at low elevation angles. CNES also expressed concern over the cost of developing Ka-band ground infrastructure and spaceborne hardware. For these reasons, CNES has opted to utilize high order modulation (4D 8-PSK TCM) to allow up to three broadband channels in X-band versus making the move to Ka-band at this time. CNES also indicated that they have recently upgraded their X-band ground stations with 3.5-5 m antennas, replacing the standard 9-10 m EES antennas. (It was mentioned to CNES that they may want to study whether the smaller antennas will still allow the necessary spatial discrimination needed to minimize interference).

NASA presented a paper entitled, “Transition of EESS missions from the 8025-8400 MHz Band into the 25.5-27 GHz Band”. Whereas CNES has opted to stay in X-band and utilize efficient modulation to the maximum extent, NASA has indicated its intent to transition broadband EESS missions to Ka-band and not require use of high order modulation beyond that required in X-band. Like the CNES document, this paper indicated that there currently exists substantial spatial discrimination that facilitates sharing in the X-band. NASA therefore will continue to use X-band for many missions and is currently evaluating the appropriate bandwidth at which point a mission would be instructed to use Ka-band. While a final decision has not been made, a maximum channel bandwidth of 100-150 MHz was discussed. The document also discussed a number of factors affecting the transition to Ka-band and described an initiative being undertaken at GSFC called the Ka-band Transition Plan. Both space and ground segment hardware is under development. In addition, the TDRSS H has Ka-band crosslink capability. SFCG members were encouraged to support efforts at WRC-2003 to gain a primary allocation in the 25.5-27 GHz band for space research as such use would help to spur development of ground and space hardware for use in EESS applications. NASA concluded that it would be premature for SFCG to develop a recommendation at this time.

Considerable discussion ensued regarding these two documents. It was pointed out that most EESS missions utilize high latitude earth stations and the atmospheric effects at these stations were generally less severe than at other locations. Observations were also made that interference at X-band is occurring for some missions already and that these effects are compounded by broadcast mode operations by some EESS missions. The need to make use of the Ka-band allocation was emphasized. Relative costs between X and Ka-band options were also discussed. While specific numbers were not available, CNES speculated that Ka-band transition would be more costly than X-band enhancement. The group decided that a new action item should be generated to determine the status of Ka-band hardware development and information regarding operational constraints (e.g. available Ka-band propagation data).

8.2 SWG-3: Earth-Exploration Satellites and MetSats

The work of SWG-3 included the following topics:

Ultra Wide Band (UWB) devices
Passive sensors
WRC Preparation

EESS and Meteorological satellites services
Review of actions from SFCG-20
Review of SFCG Recommendations and Resolutions

A joint session was held with SWG-2 (General Frequency Management) and SWG-4 (Efficient Use of the Radio Frequency Spectrum) to discuss the use of the 8 GHz and 26 GHz bands. The results of this session are found above in the SWG-2 Chairman's report.

Ultra Wide Band (UWB) devices

ESA presented a document entitled "Ultra Wide Band Devices Impact on EESS Sensors". It is a document already submitted to CEPT by ESA, analyzing the potential impact by UWB devices below 10 GHz on the operation of passive and active EESS sensors in that range. In particular, the document shows the high level of interference possibility that can already be identified for the passive services. The document stresses that the exact characteristics of the real UWB devices are largely unknown, as is their expected density and aggregate effect. This can only make the situation even more critical than the study already indicates. A shift of the UWB devices operations to higher frequencies would only shift the problem to other passive bands equally of fundamental importance to EESS (passive). CNES presented another UWB document entitled "The Ultra Wide Band (UWB) Debate and the Main Risks for Space Scientific Equipment" informing SFCG about the results of some studies made by various entities to verify the compatibility of some UWB devices with systems like GPS, COSPAR/SARSAT and EESS (passive). Nearly all the sharing scenarios present criticalities with single transmitters, even before the concept of aggregate interference by multiple UWB devices is tackled. The IUCAF (Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science) representative stressed the importance of keeping the current version of ITU-R Footnote 5.340, prohibiting any emission in the purely passive bands. ESA and the others agreed that any compromise on that point will open the door to less and less restrictive interpretation of the footnote and will nullify the work ongoing in ITU-R Task Group 1/7. All these concepts have been reflected in a new SFCG resolution (see Annex 2).

<u>Passive sensors</u>

Protection From Unwanted Emissions

There was one document on unwanted emissions presented by ESA. This document dealt with the protection of passive services from unwanted emissions. Within the ITU-R, this topic is under the purview of Task Group 1/7. The paper provided an overview of the work being done and summarized the progress to date. The limits for spurious and out-of-band emissions have been shown to be inadequate to protect the passive services; however, the values needed to protect the passive services may place an undue burden on those active services that are operating in bands far removed from the passive bands. Therefore, it was decided that in order to satisfy the protection criteria for the passive services, it was necessary to consider the various passive bands and their neighboring or adjacent active bands individually on a band-by-band basis. These detailed band-by-band studies are needed to adequately describe possible solutions required to protect the passive services in these bands. Task Group 1/7 has first addressed the need for an agreed upon methodology for these band-by-band studies. The first two meetings of TG 1/7 mainly dealt with this methodology. TG 1/7 came up with a list of bands to be studied with respect to the radio astronomy service and passive sensors. This list only identifies active services in adjacent or nearby bands that are already allocated. Allocations that are being sought at WRC-03 and affect passive services are being dealt with elsewhere.

Two main points are considered regarding the studies with EESS (passive). First of all, the concept of burden sharing needs to be considered. This, of course, is somewhat difficult since the ways in which passive sensors can protect themselves are extremely limited. NASA commented that other than offering improved filtering, which was already within the best interest of the sensor community, there was little burden sharing that could truly be done by the sensors. Second, the apportionment of the interference criteria to each interfering service has not been included in the methodology. This is supposedly because such an apportionment would be unfair to a new service entering a nearby band later, since the existing services would already presumably take up the entire interference budget. NASA stated that this concept was not logical since the active services always apportion their interference budget to the available services with which they share a band. There is nothing different about doing this with the passive sensors as well.

CNES provided a document on the protection of passive bands from unwanted emissions. This document provides information on passive sensing instruments that are planned for use by CNES using three of the bands that are to be studied; near 10.7 GHz, 23.8 GHz and 31.4 GHz. CNES also made the point that the band 21.2-21.4 GHz should be removed from the list of passive bands to be studied since it is not used by anyone. ESA stated that the band was used for terrestrial passive sensing. Although ESA agreed that the band may not need to be studied and certainly was not a priority, they would prefer that we do not indicate the band is not needed. The WMO representative agreed that the band was not needed for EESS (passive). NASA stated that there was no point in giving up the allocation unless someone else did the work to study such a possibility. Thus there was no need to make special point of this band other than to say that it was not a priority in TG 1/7.

Revision of ITU Recommendations on Passive Sensing

There were six documents on this topic as well as an action item from SFCG-20 to be reviewed. ESA presented the first document. This was a very comprehensive document contributing to the ongoing debate on the revision of Recommendations ITU-R SA.515, 1028 and 1029, which consider EESS passing sensing. The document presents some general considerations about passive sensing in relation to the contents of the Recommendations and suggests possible changes to the most critical Recommendation, SA.1029, with respect to the delta T (temperature sensitivity) values and the directly related interference criteria values. The approach favored by ESA made three main points with respect to the scientific requirements, the technical feasibility, and how and when the values in the Recommendations will come into force. With respect to the scientific requirements, there are at least three types of radiometric measurements that can be linked to the characteristics of the emissions to be measured:

- The measurements performed integrating across relatively wide bandwidth channels, typical of the low frequency emissions often observed for meteorological applications;
- The atmospheric vertical sounding measurements for meteorological applications that are performed by measuring multiple channels inside the allocated bandwidth to characterize the curve of the emission and derive three-dimensional information including vertical distribution;
- The atmospheric limb sounding with spectroradiometers to characterize weak emissions by atmospheric gases, which are generally above 100 GHz.

The technical feasibility in achieving the scientifically required sensitivity must also be considered and is linked to the system noise temperature, the integration time, and the instrument bandwidth. That is, some sensitivities are not technically feasible given a certain integration time and instrument bandwidth unless the radiometer is cryogenically cooled. Finally, it is not wise to revise the Recommendations in such a way that may indicate that we wish to revisit all previous sharing studies. There can be no retroactive effect from these revisions. Therefore, existing sharing conditions must be taken into account in revising the temperature sensitivities for each passive sensing band. NASA commented that they were very pleased on ESA's logical, sensible approach to this subject and stated that their paper took a similar view of the situation. ESA stated that the Recommendations should not be changed for five years or so. The WMO representative believes that the Recommendations should be built with a 10-year perspective. NASA stated that 5-10 years was about right, and the exact amount of time did not matter as long as the best possible values were used in the Recommendations based on the philosophy described in the ESA document.

The WMO (also sponsored by the International TOVs working group or ITWG) paperrelated to the passing sensing recommendations, appears to offer only questions and not answers. The document mentions that a delta T of 0.1 K and a data availability of 99.99% for the nadir sounding bands and their associated windows was a realistic number. The situation was not so clear with the imaging bands. ESA stated that some of the imaging bands will be used in the future for input into the Numerical Weather Prediction models and this needed to be considered as well. The WMO representative also stated that we should urge manufacturers to avoid using non-allocated bands for operational use of passive sensing instruments.

NASDA presented a document providing information with regard to the NASDA limb sounding instrument JEM/SMILES, to be flown on the International Space Station (ISS). To achieve an extremely high sensitivity in the 630 and 640 GHz bands, SMILES employs a low-noise heterodyne receiver that is comprised of a superconductor-insulator-superconductor (SIS) mixer at 4 K and HEMT amplifiers at 20 K (obviously cryogenically cooled). NASDA would like this instrument considered in the revised

Recommendations. The NOAA document provided information on further revisions to the Recommendations SA.515, 1028 and 1029. A meeting was held via teleconference sponsored by NOAA on 13 September 2001 to further discuss this topic. This meeting resulted in a new summary table not contained in the document, but distributed by e-mail and by hand to interested parties. The WMO stated that this table was not an accurate summary of the meeting. NASA commented that there were many inaccurate statements in the table as well. Particularly noted were statements that an allocation near 4.3 GHz was unlikely, which was contested by NASA and others, and that it was necessary to protect the allocation around 6.9 GHz, which isn't really an allocation and which is completely contaminated over land and near coastal regions with terrestrial telecommunications transmissions.

NASA presented a document summarizing the characteristics of various passive sensing instruments that are used or will be used by NASA in the next several years of Earth remote-sensing missions. The document also presented an approach for reaching an agreement on the revisions to the three passive sensing recommendations. NASA stated that it was reprehensible that the versions of the Preliminary Draft Revised Recommendations produced at Working Party 7C in May 2001 were not based on any input documents to the meeting. Many others agreed with this statement. The NASA document states three important considerations for updating the delta T values in the Recommendations:

- Use a planning horizon of 5-10 years based on the normal planning horizon that most agencies use for remote sensing missions;
- Update the percentage of data availability to a more stringent value where appropriate, as this is the most important parameter for protecting the sensor data;
- Update the delta T values in purely passive bands in unused areas of the spectrum.

These ideas, taken into consideration with the principles presented in the ESA document, will provide important guidance in the revision of these Recommendations.

CNES presented an information document a portion of which pertained to the required delta T value and percentage of data availability for the 1400-1427 MHz passive sensing band.

Based on these documents and the discussion in SWG-3, it was decided that the interested parties in the group should get together and produce a table of appropriate values for use in preparing inputs to the next Working Party 7C meeting concerning the updating of these Recommendations. After much discussion, the group also decided that it would be helpful to present the agreed upon principles and this table in a new SFCG Resolution on passive sensing (see Annex 3) to provide guidance to member agencies. The group also decided that the information collection activity within SFCG could be considered completed and the rest of the work will take place within WP 7C.

For this reason Action Item 20/6 was considered closed as a result of creating the new SFCG resolution.

Passive Sensing In The 36-37 GHz Band

NASDA presented two documents on this topic. The first document is essentially the same as ITU-R Document 7C/72 from May 2001. The document presents a compatibility study on spaceborne passive sensors for Earth observation with other systems operating in the 36-37 GHz band. The document outlines the NASDA instruments AMSR mounted on ADEOS-II and AMSR-E, which is flying aboard NASA's AQUA mission. Some preliminary study results are presented on sharing with the fixed service assuming a certain type of fixed service set of parameters. NASDA pointed out that any studies of this type require an appropriate global deployment model for the fixed service transmitters and that more work is still needed. NASDA would like WP 7C to produce a new recommendation on this subject, placing a limit on the EIRP of fixed service stations in this band. NASA stated that a recommendation of this type would have to be agreed upon in a joint study effort with the fixed service proponents in WP 9D as well. The second document presented by NASDA offered draft CPM text with respect to WRC-03 Agenda Item 1.12 which addresses this topic. NASA stated that the SFCG did not recommend or author CPM text and that therefore this was really just information to SFCG members. NASA asked NASDA whether or not the Japanese administration might be submitting this text to WP 7E, the responsible group for this agenda item, but NASDA could not say since no decision had as yet been reached in Japan. Action Item SF20/7 pertains to this topic. The group decided that since the work had not yet been completed, the Action Item would be closed and a new Action Item containing the unfinished work would be generated.

WRC Preparation

There were three information documents and one discussion document pertaining to the SFCG objectives for WRC-03. NASDA presented a document containing the current APT positions and preliminary views. NASA's document contained the U.S. preliminary views on various WRC-03 Agenda Items of interest to SFCG members. Also made available, as information, was a CNES document on the CEPT current positions and preliminary views. Parts of the third document, presented by NASA, contained topics relevant to SWG-3 work items. SWG-3 decided to submit to SWG-1 changes on several pertinent agenda items to the Annex of the SFCG Objectives Resolution 18-1R2.

EESS and Meteorological Satellites Services

There were no input documents pertaining to EESS data transmission or to METSATs or METSAT issues at this meeting. SFCG-20 had placed Action Item 20/9 on several of its members regarding the potential for sharing between METSAT and MSS in the band 1683-1690 MHz. The responsible person, Robert Wolf (EUMETSAT), reported that the actions had been completed by the May 2001 meeting of WP 7C and that this Action Item could be closed.

Review of Action Items from SFCG-20

AI 20/6: Collection of information on EESS passive sensors technical characteristics towards the possible revision of information given in the tables contained in ITU-R Recommendations SA.515, SA.1028 and SA.1029. This action item has been completed and may be closed. The results are contained in the new SFCG Resolution 21-3.

AI 20/7: Action plan for sharing studies between EESS (passive) and other services in the 36-37 GHz band. This action was not completed and portions will be continued in a new Action Item.

AI 20/9: Sharing potential between METSAT and MSS in the band 1683-1690 MHz, WRC-03 Agenda Item 1.31. This Action Item has been completed and may be closed.

Review of SFCG Recommendations and Resolutions

RES 18-4R2, no modification
RES 19-5, no modification
RES 19-6R1, no modification

Plenary Discussion

The Plenary took note of the results presented by SWG-3, which once again had the heaviest workload of all SWGs. The three new RES proposed by the SWG were adopted with some editorial modifications. However, some discussion arose regarding Table 1 of RES 21-2 (Requirements, Performance, and Protection Criteria for EESS (passive) Sensors): Jean Pla, CNES, questioned whether the data availability level should not be raised from 99.9% to 99.99%. A number of delegates responded that 99.9% was more realistic, and if the level were to be raised to 99.99%, this would have to be done logically across the entire Table, which would cause significant problems. The meeting decided to leave the data availability level at 99.9%. Robert Wolf, EUMETSAT, questioned whether RES 19-5 (Terrestrial Atmospheric Passive Sensors above 200 GHz) was still appropriate or could be suppressed. Guy Rochard, ITOV/WMO, felt that the RES should be kept NOC. Gerry Block and Bob Taylor supported the suppression proposed by Robert. The meeting decided to suppress RES 19-5 and to replace it by a new one at the appropriate moment, when sufficient information is available (RES 19-5 SUP).

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ANNEX 1

LIAISON STATEMENT TO COSPAS/SARSAT COUNCIL

Mr. Daniel Levesque
Head of Cospas/Sarsat Secretariat
IMSO
99 City Road
London EC1Y 1AX
United Kingdom

Paris, 9th October 2001

Dear Sir,

The Space Frequency Coordination Group (SFCG), at its 21st annual meeting held in Cayenne French Guiana from 26 September to 4 October 2001, discussed among other issues, the use of the frequency band 1544 – 1545 MHz, by search and rescue payloads on geostationary and non-geostationary satellites.

The outcome of these discussions is that the SFCG formulated the attached liaison statement to the COSPAS/SARSAT Council, which the Group has asked me to bring to your attention.

I will be pleased to answer any query you may have regarding the SFCG.

Yours faithfully,

Gerhard F. Block
Executive Secretary
Head, ESA Frequency Management Office

Att.: Liaison Statement by the SFCG to the CSC

Liaison Statement to

COSPAS/SARSAT COUNCIL

1544 - 1545 MHz

At the 21st annual meeting of the Space Frequency Coordination Group (SFCG), held in Cayenne, French Guiana from 23 September to 4 October 2001, during discussion of efficient use of the 1544 - 1545 MHz spectrum, the issue of future planned uses of this band was discussed. It was noted that the COSPAS/SARSAT Council (CSC) will be considering a proposal from Canada to modify the Search And Rescue Repeater downlink for SARSAT satellites to be launched after 2009 to enable accommodation of proposed RNSS and other uses of the band. This group encourages any such action and further development of efficient use of the spectrum.

Given the likelihood of a significant increase in the number of systems providing search and rescue services in the future, SFCG would like to bring to your attention the possibility for interference among these systems. INMARSAT has filed for use of the subject band, as has Korea for use of a narrowband 1544.5 MHz channel on a GSO satellite with a spot beam into Korea (which must be in compliance with S5.356 of the Radio Regulations). In addition to the existing use of the spectrum by COSPAS/SARSAT and the previously noted filings, the GPS and Galileo organizations are discussing incorporating search and rescue (SAR) instruments on board their satellites which will use this downlink band. At maturity, the combination of GPS and Galileo could have as many as 60 satellites in orbit with SAR capability. The interference potential of NGSO to GSO systems would be greatly increased, and would require extensive coordination.

CSC may want to consider several methods of minimizing interference, including frequency separation, band segmentation of GSO/NGSO systems, signal structure/modulation, and use of Earth station antennas with higher beam efficiency. The
SFCG would like to offer its assistance, if desired by the CSC, to assist by suggesting possible solutions to potential interference coordination issues.

ANNEX 2

SFCG Ultra Wide Band Resolution

SPACE FREQUENCY
COORDINATION GROUP

Resolution 21-3

PROTECTION OF EESS (PASSIVE) SENSORS FROM ULTRA WIDEBAND DEVICE EMISSIONS

The SFCG

CONSIDERING

a) that passive microwave sensors on board spacecraft are an increasingly important tool for monitoring the Earth's environment;

b) that certain frequency bands are restricted to use by the passive services only and RR S5.340 stipulates that all emissions are prohibited in these bands;

c) that other frequency bands are allocated to the passive services and are shared with some active services;

d) that the passive sensing instruments by their nature are very sensitive to any emissions within the sensor band and operate by integrating a very low signal over time across a relatively large bandwidth (tens to hundreds of MHz);

e) that any emissions that raise the noise floor in bands allocated to Earth exploration-satellite (passive) service may constitute interference to the passive sensors using those bands;

f) that Ultra Wide Band (UWB) devices are based on emerging technologies using very narrow pulses that generates very wide bandwidth (greater than 25 % of the center frequency or greater than 1.5 GHz), but at low power levels;

g) that preliminary studies show that the extreme wideband nature of such devices may cause interference in frequency bands allocated to passive remote sensing, even if these bands are far removed from the UWB device center frequency;

h) that UWB technology enables a wide assortment of applications such as through- the-wall imaging, ground penetrating radars, collision avoidance radars as well as other communications and security applications;

i) that some administrations are examining potential rules for the operation of UWB devices on a license-exempt basis;

j) that the characteristics of such UWB devices are not well known and the aggregate effects of these devices are not well characterised;

RECOGNIZING

1. that the deployment of UWB devices may also impact other services in the EESS / Meteorological community, such as EESS (active), Search and Rescue, Metaids;

2. that most UWB devices applications are presently targeting frequencies below 3 GHz and that possible shift of UWB operation bands to higher frequencies, due to sharing problems with other services, will not improve the sharing conditions with passive sensors, since other passive sensing bands will be involved.

RESOLVES

1. that member agencies work within their administrations to ensure that UWB devices avoid emissions in bands exclusively allocated to passive services;

2. that member agencies work within their administrations to ensure that UWB devices avoid generating harmful emissions in the other bands allocated to passive sensors.

3. that member agencies continue to study the possible impact of the introduction of UWB devices into bands allocated to EESS (passive).

ANNEX 3

PASSIVE SENSOR RESOLUTION

SPACE FREQUENCY COORDINATION GROUP

Resolution 21-2

REQUIREMENTS, PERFORMANCE, AND PROTECTION CRITERIA FOR EESS (PASSIVE) SENSORS

The SFCG,

CONSIDERING

a) that due to the continuous technological and scientific development, the requirements, performance and protection criteria for EESS (passive) sensors must be periodically reviewed;

b) that the basic parameters related to requirements, performance and protection criteria for EESS (passive) sensors are contained in the ITU-R Recommendations SA.515, 1028, 1029;

c) that any revision to these Recommendations requires a large consensus and a coherent approach in the parameters definition across all the passive bands;

d) that three main categories of passive sensors can be identified for the use of these bands:

1. 3-dimensional vertical atmosphere sounders requiring very high data reliability and medium resolution over multiple channels,
2. Imaging radiometers requiring high data reliability, medium resolution, integration over relatively large bandwidth single channels,
3. Atmospheric limb sounders requiring medium data reliability at very high resolution over many small bandwidth channels.

e) that any performance requirement has to be based on known scientific requirements for the measurement; the data resolution and availability levels must therefore be scientifically meaningful with respect to the applications for which they are used;

f) that it has to be possible to implement and fly instruments capable to achieve the performance requirements set within a 10 year timeframe;

g) that the data availability parameter currently applied for imaging radiometers (99%) is considered inadequate for several applications associated to those measurements;

h) that the resulting values in these Recommendations will not be applied retro-actively to past agreements and to ongoing studies in preparation for WRC-03;

i) that the SFCG, at its 21st meeting (September 2001), on the basis of the principles indicated in the considerings above, generated a set of protection parameters considered as a good basis for this revision process;

RESOLVES

that Member Agencies submit to ITU-R WP 7C, directly or via their administrations, contributions for the updating of the ITU-R Recommendations listed in considering b), taking due consideration of the values given here in Table 1.

TABLE 1

Performance criteria for satellite passive remote sensing

Existing allocation(1) (GHz)	Total BW required (MHz)	Reference BW (MHz)	"Existing" Required ΔT_e (K)	SFCG Proposed Required ΔT_e (K)	SFCG Proposed Data availability (%)	Scan Mode N, L(4)
1.370-1.400s, 1.400-1.427P	100(1)	27	0.1	0.05	99.9	N
2.640-2.655s, 2.655-2.690s, 2.690-2.700P	45	10	0.1	0.1	99.9	N
4.200-4.400s, 4.950-4.990s	200	200	0.3	0.3/0.05*	99.9	N
6.425-7.250	200	200	0.3	0.3/0.05*	99.9	N
10.60-10.68p, 10.68-10.70P	100(1)	100	1.0	1.0/0.1*	99.9	N
15.200-15.350s, 15.350-15.400P	200	50	0.2	0.1	99.9	N
18.600-18.800p	200	200	1.0	1.0/0.1*	95/99.9*	N
21.200-21.400p	200	100	0.2	0.2	99	N
22.210-22.500p	300	100	0.4	0.4	99.9	N
23.600-24.000P(3)	400	200	0.2	0.05	99.99	N
31.30-31.50P(3), 31.50-31.80p(3)	500	200	0.2	0.2/0.05*	99.99	N
36.000-37.000p	1 000	100	1.0	1.0/0.1*	99.9	N
50.200-50.400P(3)	200	200	0.3/0.1	0.05	99.99	N
52.60-54.25P(3), 54.25-59.30p(3)	6 700(1)	100	0.3/0.1	0.3/0.05*	99.99	N
86.00-92.00P(3)	6 000	200	1.0	0.05	99.99	N
100.0-102.0P	2 000	200	0.2	0.005	99	L
109.5-111.8P	2 000	200	0.2	0.005	99	L
114.25-116.00P	1 750	200	0.2	0.005	99	L

116.00-122.25p(3)	6 250(1)	500	0.2	0.05/0.005(5)	99.99/99(5)	N, L
148.5-151.5P(3)	3 000	200	0.2	0.1/0.005(5)	99.99/99(5)	N, L
155.5-158.5p(2)	3 000	200	0.2	0.1	99.99	N
164.0-167.0P(3)	3 000	200	0.2	0.1/0.005(5)	99.99/99(5)	N, L
174.8-182.0p(3), 182.0-185.0P(3), 185.0-190.0p(3), 190.0-191.8P(3)	17 000(1)	200	0.2	0.1/0.005(5)	99.99/99(5)	N, L
200.0-209.0P(3)	9 000	3	0.2	0.005	99(5)	L
226.0-231.5P	5 500	200	0.2	0.1/0.005(5)	99.99/99(5)	N, L
235.0-238.0p	3 000	3	0.2	0.005	99	L
250.0-252.0P	2 000	3	0.2	0.005	99	L
275.0-277.0	2 000	3	0.2	0.005	99	L
294.0-306.0(3)	12 000	200	0.2	0.2/0.005(5)	99.99/99(5)	N, L
316.0-334.0(3)	18 000	200	0.2	0.3/0.005(5)	99.99/99(5)	N, L
342.0-349.0(3)	7 000	200	0.2	0.3/0.005(5)	99.99/99(5)	N, L
363.0-365.0	2 000	3	0.2	0.005	99	L
371.0-389.0(3)	18 000	200	0.2	0.3	99.99	N
416.0-434.0(3)	18 000	200	Not in Rec	0.4	99.99	N
442.0-444.0	2 000	3	Not in Rec	0.005	99	L
496.0-506.0(3)	10 000	200	Not in Rec	0.5/0.005(5)	99.99/99(5)	N, L
546.0-568.0(3)	22 000	200	Not in Rec	0.5/0.005(5)	99.99/99(5)	N, L
624.0-629.0	5 000	3	Not in Rec	0.005	99	L
634.0-654.0	20 000	200	Not in Rec	0.5/0.005(5)	99.99/99(5)	N, L
659.0-661.0	2 000	3	Not in Rec	0.005	99	L
684.0-692.0	8 000	3	Not in Rec	0.005	99	L
730.0-732.0	2 000	3	Not in Rec	0.005	99	L
851.0-853.0	2 000	3	Not in Rec	0.005	99	L
951.0-956.0	5 000	3	Not in Rec	0.005	99	L

(1) This bandwidth is occupied by multiple channels.

(2) This band is needed until 2018 to accommodate existing and planned sensors.

(3) This band is an atmospheric sounding band and requires the highest level of protection.

(4) N = Nadir; Nadir scan modes concentrate on sounding or viewing the Earth's surface at angles near Nadir. The scan terminates at the Earth's surface and weighting functions peak from the surface to the top of the atmosphere. L = Limb; Limb scan modes view the atmosphere "on edge" and terminate in space rather than at the surface, and accordingly are weighted zero at the surface and maximum at the tangent point height. Nadir-scanning sounders have superior horizontal resolution; limb sounders have superior vertical resolution.

(5) Second number for microwave limb sounding applications

* First number for current sharing conditions; second number for scientific requirement

Summary of ITU-R Working Party 7C February 2002 Meeting Regarding Topics of Interest to CGMS

Excerpts from the Chairman, Working Party 7C

REPORT TO WORKING PARTY 7C ON ITS MEETING (11-15 FEBRUARY 2002)

WITH A VIEW TO ITS NEXT MEETING (October 2002)

1 Introduction

Working Party 7C "Earth exploration satellite systems and meteorological systems" met in Geneva from 11 to 15 February 2002 and considered a record-breaking 102 contributions (Docs. 7C/105 to 7C/207). Three Working Groups carried out the work:
Working Group 1, chaired by Mr. **M. Gaudreau** (Canada), on active microwave sensors; Working Group 2, chaired by Mr. **J. Zuzek** (United States of America), on passive microwave sensors; Working Group 3, chaired by Mr. **R. Wolf** (Eumetsat), on metsat and metaids.

2 Work performed

2.2 Working Group 2: passive microwave sensors

2.2.1 A drafting group was formed to complete the work on revising the three existing Preliminary Draft Revised Recommendations on frequencies (Rec. ITU-R SA.515), performance criteria (Rec. ITU-R SA.1028) and interference criteria (Rec. ITU-R SA.1029) for spaceborne passive sensors. These were given further updates during the last meeting of Working Party 7C (May 2001). David McGinnis (USA) led the drafting group. The group used the information contained in input documents to finalize the three PDRRs and elevate them to

Draft Revised Recommendation status. The key debate since the last WP 7C meeting involved the DT_e levels for the revision to SA.1028. At the last meeting of the Space Frequency Coordination Group (SFCG) in September 2001, many of the participants came to a consensus on the methodology and philosophy for updating these Recommendations with respect to the DT_e values and appropriate data availability criteria. Since that time, some refinements were made through canvassing various passive sensing experts. The drafting group was able to come to agreement on three Draft Revised Recommendations. Some notable revisions include a clarification of the data availability criteria and a revised title for SA.1029 referring to permissible interference levels rather than interference criteria.

2.2.4 A liaison statement was received from WP 4-9S (Doc. 7C/147) regarding the possibility of using uplinks from Earth Station on-board Vessels (ESV) in the band 6 425 – 6 725 MHz. A reply liaison statement, Attachment 20 (source: Doc. 7C/TEMP/82) was sent to WP 4-9S indicating that while EESS (passive) sensors can use the band 6425-7075 MHz for passive sensing of the sea surface temperature parameter, no known sensors use the 6 425-6 725 MHz portion of this band.

2.2.5 For the issue of emissions in the 31.3-31.8 GHz band from High Altitude Platform Stations (HAPS), a drafting group was formed to consider the three input documents received on the subject. Manfred Otter led the group. Two documents were liaison statements from WPs 9D and 9B and WP 4-9S containing the updated draft CPM text on the 2003 World Radiocommunication Conference (WRC-03) Agenda Item 1.13. The third document contained a proposed Preliminary Draft New Recommendation (PDNR) on this sharing situation. The reason for the proposed PDNR is that while there are several Recommendations being developed regarding HAPS and this compatibility question, none of these Recommendations would necessarily be appropriate for incorporation by reference into the Radio Regulations. The purpose of the PDNR then is to provide a single out-of-band power flux density limit to protect the passive sensors using the passive band 31.3-31.8 GHz. Therefore, the group created a liaison statement to WPs 4-9S, 9B and 9D commenting on the various methods to satisfy the agenda item and proposing changes to the existing draft CPM text, approved the PDNR, and sent a liaison statement with the PDNR to WP 9D.

2.2.6 For the band 36-37 GHz there were six input papers (Docs. 7C/110, 130, 148, 161, 168 and 173) considered in WG 2. One document was a liaison statement from WPs 3M and 3J providing requested information on a scattering model to be used in sharing studies for the 36-37 GHz band. Another was draft CPM text from WP 7E on WRC-03 Agenda Item 1.12. But this document did not contain any instructions from WP 7E so it was merely noted. There was another input document containing proposed CPM text on this topic, but WG 2 decided that since WP 7E was the responsible group for Agenda Item 1.12 CPM text, such proposed text would be better submitted directly to WP 7E so this document was noted as well. Another document was a reply liaison statement from WP 9D on possible densities of the fixed service (FS) in this band. Unfortunately, there was not much information available on this topic from WP 9D at this time. Two of the input documents contained preliminary sharing studies between the EESS (passive) and FS in this band. These studies were discussed and they were brought to the attention of WP 9D and WP 8A via a liaison statement requesting their assistance in furthering these studies.

2.2.7 WP 7C received a liaison statement from WP 9D on the sharing around 118 and 183 GHz between the EESS (passive) and the FS. WP 9D acknowledges that WP 7C sees no urgency to sharing studies for these bands. This document was noted.

2.2.8 Three input documents were received pertaining to Question 235/7 on frequencies above 275 GHz. EUMETSAT submitted a very comprehensive study of possible sharing in the EESS (passive) bands from 275-1000 GHz. WG 2 was very impressed by this contribution and noted that it would be a good basis for future studies in this area of the spectrum. Another document supported inclusion of the future WRC Agenda Item on allocations above 275 GHz, while a third document proposed a Draft New Question on the need for frequency allocations above 275 GHz for EESS (passive) and SRS (passive). WG 2 decided that this contribution should be used to produce a Draft Revision of Question 235/7. Mr. Daniel Breton (France) and Mr. Glenn Feldhake (USA) agreed to produce such a DRQ. However, this document was met with many questions in the WP 7C Plenary and for the sake of expediency, it was decided to keep the DRQ as “preliminary”.

2.2.9 A rather large number of input documents were received on the protection of passive services from unwanted emissions related to the work of Task Group 1/7 and WRC-03 Agenda Item 1.8.2. Fifteen documents were introduced in WG 2 and a drafting group lead by Bjorn Rommen (ESA) was formed to consider various band-by-band studies, the band-by-band methodology being used in TG 1/7, and the draft CPM text on this agenda item. Mr. Rommen’s group worked very hard and produced a series of five liaison statements as their output, viz., a liaison statement to WP 4A and TG 1/7 regarding out-of-band emissions into the 23.6-24 GHz passive sensing band from ISS systems in the band 22.55-23.55 GHz, a liaison statement to TG 1/7 concerning issues with respect to the EESS (passive) band-by-band studies and the methodology to complete those studies, a liaison statement to WP 9B and 9D regarding compatibility between the FS and EESS (passive) operating in adjacent bands at 31 and 52 GHz, a liaison statement to WP 9D and copied for information to TG 1/7 regarding a sharing study concerning the band 31.5-31.8 GHz that is allocated to EESS (passive) on a primary worldwide basis and to the FS and MS in Regions 1 and 3 in certain administrations, and a liaison statement to TG 1/7 containing commentary on the methods to satisfy the agenda item as well as proposed changes to the draft CPM text for one of those methods.

2.2.10 WP 7C received a liaison statement from WP 1A and 1B regarding compatibility between Ultra Wide-Band (UWB) device emissions and radiocommunication services. This liaison statement invited comments on the two Draft New Questions on the topic that were attached to the document. WG 2 responded to this liaison statement with a reply liaison statement to WP 1A and 1B, that expressed the WP 7C concern about UWB emissions, especially emissions that intentionally occur in passive bands listed in footnote 5.340.

2.3 Working Group 3: Meteorological satellites and MetAids.

Data Collection and position location

Requirements and performance criteria
Interference
Sharing and coordination

The previous meeting of WP 7C stressed that ITU-R Recommendations shall be separated into Requirements and Performance criteria, Interference analysis, and Sharing conditions. It was therefore agreed to revise ITU-R SA.1162 and to separate into parts matching this scheme. The USA submitted a paper entitled "Telecommunication Requirements and Characteristics of EES and MetSat Systems for Data Collection and Platform location". The document included a proposal for a Preliminary Draft New Recommendation. Additional information was provided by the WMO.
The main information in the document is based on a revision of Annex 1 of ITU-R SA.1162-1.
It was concluded that operators of Meteorological Satellites are required to supply technical requirements regarding their regional Data Collection Systems to WP 7C.
The group produced a Preliminary Draft New Recommendation, necessitating modification of PDNR ITU-R SA.1162-1.

Sharing and Coordination with Mobile-Satellite Service (MSS)
A liaison statement was received from WP 8D giving comments on Preliminary Draft Revised Recommendations (PDRR) ITU-R SA.1264 (Sharing between the MSS and MetAids in 1675-1700 MHz) and ITU-R.1158 (Sharing between the MSS and MetSats in 1675-1710 MHz). The two topics were discussed separately although other input documents addressed both PDRRs. A WMO document replied to the comments of WP 8D on both PDRRs and provided additional information.

Resolution 227 Sharing MetSat/MSS
Among the 16 input documents regarding this topic were studies from France, EUMETSAT and the USA determining sharing possibilities between MSS and MetSat in the band 1683 –1690 MHz, including calculations related to required separation distances for MSS Mobil Earth Stations in order to protect MetSat Earth Stations in the band 1683 –1690 MHz. A drafting group, taking into account inputs provided by WP 8D, discussed the studies. It was concluded that Annex 1 of ITU-R SA.1158 had to be completely revised. As the first step a new Annex 1 was introduced describing system assumptions and methodologies to be considered as possible material to replace Annex 1 (and possibly Annex 5) of PDNR SA.1158-2.

A United Arab Emirates (UAE) contribution addressed spectrum in the band 1670 –1690 MHz, which was, in accordance with referenced information, not used by present MetSat systems. WMO issued a document commenting on the UAE contribution. This document included different figures. It was agreed that it would be necessary to update Annex 2 of ITU-R SA.1158 to reflect the present usage of the band. The required parameters have to be supplied by the satellite operators and shall be based on figures used in the notification process of the corresponding satellite system with the ITU. It was noted that Annex 2 will, after revision, supply a snapshot of the present situation and cannot reflect the requirements for future developments of MetSat systems. Annex 2 was put in square brackets.

After submission of a draft CPM text regarding agenda item 1.31 from WP 7E to WP 8D, WP 8D commented and modified this text. There were inputs received from the USA and UAE to modify the CPM text. The group discussed the proposed inputs and arrived at a modified version of the CPM text. This will be submitted to WP8D as an attachment to the liaison statement.
There were some points where agreement on the text could not be achieved during the work of the WG 3. This is reflected by insertion of square brackets. It has to be noted that due to the fact that Annex 2 of ITU-R SA.1158 does not contain up-to-date information on MetSat systems, it was not possible to agree on the availability of unused spectrum in parts of the band 1670 – 1690 MHz. The group drafted a liaison statement to WP 8D, a PDRR to ITU-R Recommendation SA.1158-2, and proposed CPM text for agenda item 1.31.

2.4 Plenary meeting

The plenary meeting approved all the 40 output documents from the Working Groups, with minor corrections. In particular, the plenary decided to keep the Draft Revised Question on frequencies above 275 GHz at the status of PDRQ, giving WP 7C the possibility of a further review at its next meeting. The plenary also took note of the various information documents. No action was required.

The United Arab Emirates delegate asked the following note to be attached to this Report: "This note is to confirm in writing that the Administrations of UAE and Syria do not support parts of the CPM text drafted by WP 7C on WRC-03 Agenda Item 1.31. Both Administrations consider that the data regarding MetSat service is not available to WP7C to support the conclusions drawn". The Chairman of Working Group 3 asked to add the following text, related to the same issue: "The Chairman of WG 3 stresses that the delegate from Syria did not attend the work of the relevant working group (WG 3) in WP 7C, where the CPM text and all the relevant documents were introduced and discussed".

Particular concerns were expressed during the WP 7C meeting about the introduction of unlicensed Ultra Wide Band (UWB) systems. WP 7C is pleased to see that Study Group 1 has now issued a question to study the characteristics and the possible effects of the introduction of these systems. Some delegations indicated the intention to submit their preliminary internal studies to future WP 7C meetings. But the main concern expressed was linked to the unofficial information received from several sources that these systems will be deployed well before any of the studies called by the question will be performed. This would represent a clear breach of the ITU rules and would create a serious precedent of a de-facto use of the band by a new service before any international agreement is reached. WP 7C therefore invites the ITU management and all the national administrations to take actions to prevent this from happening.

At the end of the meeting the WP 7C Chairman brought the following points to the attention of the delegates:

1. This was the last WP 7C meeting that could influence the CPM text.
2. Many PDNR /PDRR have progressed to DNR /DRR status and will be submitted to the next SG7 (2/03).

3 It is therefore expected that the next WP 7C meeting in October will present a lower number of contributions, allowing more time to concentrate on the technical issues still open.