

## **OUTCOME OF THE WORLD RADIO CONFERENCE 2000**

This document presents the results of the World Radio Conference 2000 related to the Meteorological Satellite Service, Space Research Service, and Earth Exploration Satellite Service.

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### **1 INTRODUCTION**

The World Radio Conference 2000 (WRC-2000) was held in Istanbul from 8 May to 2 June 2000. More than 2000 participants were registered from 130 administrations, numerous observers and ITU sector members.

A number of very important items regarding Space Research, Earth Exploration by Satellite, Meteorology and Space Operations were on the agenda of this conference. In general, it can be said that the results achieved are very satisfactory. The majority of agenda items were completed at this conference but a few items remained for consideration at WRC-2003. In addition, several new items of interest to CGMS were added to the agenda of WRC-2003.

### **2 OUTCOME ON RELEVANT AGENDA ITEMS**

#### **Earth Station Coordination Parameters (AI 1.3)**

Agenda item 1.3 considered the results of ITU-R studies related to Appendix S7 of the Radio Regulations on the method for determination of the coordination area around an Earth station in frequency bands shared among space services and terrestrial radiocommunication services. A number of proposals were received regarding the scope of the systems covered, the methodologies employed, the applicable frequency ranges, the applicable time percentages, propagation aspects, and the table of system parameters. The modifications adopted by WRC-2000 will have an impact on separation/coordination areas for new or modified earth stations operating in various frequency bands, in particular in the 1675-1710 MHz range, in the 26 GHz, the 32 GHz and the 38 GHz range. Resolution COM5/30 includes Appendix S7 in one of its considerations justifying a review of separation distances determined in earlier studies.

#### **Passive Sensors and High Density Fixed Service Systems around 56 GHz (AI 1.4)**

Agenda item 1.4 dealt with High Density Fixed Service (HDFS) applications and their impact on co-primary services. Several frequency bands have been identified for HDFS, some of them being shared with space science services. One of these is the band 55.78 – 56.26 GHz. This is one of the key bands for passive sensing and the unconstrained introduction of HDFS systems may have resulted in harmful interference to the spaceborne sensors. It was therefore necessary to ensure that some constraints for HDFS be included in the Radio Regulations in order to assure that this band is not contaminated to a useless extent. Whereas there was more or less general agreement that some constraints were required and acceptable to the fixed

service community, there was extensive discussion regarding the detailed protection requirement in

particular between Europe and the US. In the end, a compromise solution was found by adopting a footnote specifying a power density level of -26 dBW/MHz into the antenna of a fixed service system. It was furthermore agreed that neither a mask nor an elevation angle restriction shall apply and that no further studies would have to be conducted. These decisions allow now for an introduction of HDFS in this band without the risk of interference to passive sensors on-board satellites.

### **IMT-2000 (International Mobile Telecommunication –2000) extension candidate bands (AI 1.6)**

Agenda item 1.6.1 for WRC-2000 addressed the identification of additional frequency bands for IMT-2000 and making the necessary changes to the Radio Regulations. Two of the target bands originally identified for introduction of high-density mobile systems were the bands 2025 - 2110 MHz and 2200 - 2290 MHz which are the bands used for telecommanding and telemetry of many satellite systems including meteorological satellites. During preparatory work, it was possible to exclude these bands from further consideration as extension bands. This was an important decision in view of the enormous investments made in these bands. The key bands finally identified for IMT-2000 are now 1710-1885 MHz and 2500-2690 MHz. In addition, some bands below 1 GHz have also been identified but with different emphasis and band boundaries in the 3 ITU Regions. A resolution COM5/24 was adopted which highlights these bands for introduction of IMT-2000.

### **Resolution 213 – Proposed MSS Allocation in the band 1683 – 1690 MHz (AI 1.9)**

The band 1670 - 1710 MHz is the main frequency band for meteorological satellite operations. In this band there are main data links as well as down-links for user stations. The band is used for geostationary as well as polar orbiting spacecraft.

The Mobile Satellite Service (MSS) has, since 1992, a primary allocation in Region 2 (North and South America) which proved to be unusable up to now. However, the situation is different in the other ITU Regions. Whereas there are relatively few main stations in Region 1 (Europe and Africa), there are several hundred stations operating in Regions 2 and 3 (Asia and Australia), which would make coordination with mobile up-link transmissions in the mobile satellite service very difficult and may be impossible in some countries.

The European Conference of Postal and Telecommunications Administrations (CEPT) had prepared a European Common Proposal (ECP) on this issue in the frame of agenda point 1.9 for WRC-2000. It was proposed to allocate MSS on a co-primary basis to MetSat in the sub-band 1683 – 1690 MHz. Long discussions took place on this item, especially related to the technical basis for sharing. Because of very controversial views in this respect, the actual discussion on the planned MSS up-link bands was rather short and hectic. It was finally concluded that Resolution 213 (established 1992) which was asking for MSS allocations co-allocated with MetSat should be suppressed and replaced by a new Resolution COM5/30, which reflects the need for further studies in particular with respect to GVAR and S-VISSR stations. It was also agreed that a review of recommendation ITU-R SA.1158 would be required to verify the results for the separation distances based on the adopted coordination

parameters for Appendix S7 of the Radio Regulations. Together with studies for a suitable down-link allocation, this item will again be considered for WRC-2003. It is important to note

that the band identified for sharing studies is only 1683 – 1690 MHz in contrary to the old resolution (213), which covered the full band 1670 to 1710 MHz.

#### **Resolution 219 – Proposed MSS Allocation in the band 405-406 MHz (A.I. 1.11)**

Resolution 219 regarding studies for an introduction of mobile satellite service systems in the band 405-406 MHz was suppressed despite strong opposition from the USA. It was concluded that continued operation of radiosondes in this band would be required and that this part of the spectrum could not be released in the foreseeable future. However, Resolution 214 was maintained in a slightly modified way, which invites to study any frequency bands below 1 GHz. Therefore, this item might come up again at the next conference via consideration of Resolution 214.

#### **Passive Sensor Re-allocations above 71 GHz (A.I. 1.16)**

Agenda item 1.16 considered the allocation of frequency bands above 71 GHz to the Earth exploration-satellite (passive) and the radio astronomy services, taking into account Resolution 723. A review was necessary as many of the current spaceborne passive sensing allocations between 71 and 275 GHz were decided at WARC-79. In the meantime a number of technological and scientific advances have occurred and these allocations needed to be revised to reflect present and foreseeable future requirements for spaceborne passive sensing for many earth observation applications. For the time being and until sharing studies demonstrate that passive bands can be shared with active services according to Resolution COM5/4, only exclusive allocations were made to the passive services wherever it was questionable that sharing would be feasible with active services. A second resolution (COM5/5) was adopted which invites the ITU-R to study compatibility issues between active services in bands above 71 GHz. The proposed modifications in the corresponding ECP, which was basically identical with the Conference Preparatory Meeting (CPM) report and proposals from other administrations, were adopted by WRC-2000 without any difficulties thanks to very good, perfectly timed and globally coordinated preparations.

#### **Earth Exploration Satellite Service Upgrade in the band 18.6-18.8 GHz (A.I. 1.17)**

Agenda item 1.17 addressed a possible world-wide allocation for the earth exploration-satellite (passive) and space research (passive) services in the band 18.6 – 18.8 GHz taking into account the results of relevant ITU-R studies. This item was already heavily debated at WRC-1997 and significant progress was made in the mean-time. A breakthrough compromise was achieved at the Conference Preparatory Meeting (CPM) and accompanied by a corresponding ECP. Regarding the Fixed Service, some discussions arose around the input power level into the antenna but in the end Canada did not press its view and it has finally been agreed that the individual carrier power delivered to the antenna of a fixed service station shall not exceed –3 dBW. At Plenary level, several Arabian administrations, lead by the United Arab Emirates, proposed a new footnote to the surprise of everybody, which would have kept the allocation to the EESS (passive) in their administrations on a secondary status.

The matter could be resolved with the help of the chairman of Committee 5, who proposed another new footnote which protects existing systems in the territory of the affected administrations. It is very

unlikely, though, that these administrations have actually systems operating beyond the agreed power limits for the fixed service.

Regarding the fixed satellite service, it was agreed that the power flux density across the 200 MHz band 18.6-18.8 GHz produced at the service of the Earth by emissions from a space station under assumed free-space propagation conditions shall not exceed  $-95$  dBW/m<sup>2</sup>, except for less than 5% of time when the limit may be exceeded by up to 3 dB. Furthermore, a footnote was adopted which precludes the use of this band by non-GSO fixed satellite service systems to those with an apogee exceeding 20,000 km. Based on the above regulations, WRC-2000 adopted the proposed Earth exploration satellite service upgrade to a primary allocation in Regions 1 and 3.

### **3 RELEVANT AGENDA ITEMS FOR WRC-2003**

Each World Radio Conference establishes the agenda for the following conference to allow sufficient preparation time and discussions within the various ITU task groups. The following agenda items for WRC-2003 are of interest to CGMS.

#### **Agenda Item 1.8.1 – Boundary between Spurious and Out-of-Band Emissions**

This agenda item considers the results of studies regarding the boundary between spurious and out-of-band emissions with a view to include the boundary in Appendix S3 of the Radio Regulations. This item is important as it provides a mechanism to reduce interference to reception of meteorological and earth exploration satellites.

#### **Agenda Item 1.8.2 – Protection of Passive Services from unwanted Emissions**

This agenda item considers the results of studies and proposals for regulatory measures regarding the protection of passive services from unwanted emissions, in particular from space services transmissions, in response to recommends 5 and 6 of Recommendation 66.

#### **Agenda Item 1.13 - HAPS Up-link Emissions around 31.3 GHz**

This agenda items considers regulatory provisions and possible identification of existing frequency allocations for services which may be used by high altitude platform stations, taking into account S5.5RRR of the Radio Regulations and the results of ITU-R studies in accordance with Resolutions 122 and COM5/14. The band 31.3 – 31.5 GHz is a very important band for calibration of passive sensor measurements.

#### **Agenda Item 1.16 - New MSS feeder link allocations in bands near 1400-1427 MHz**

This Agenda Item considers allocations on a worldwide basis for feeder links in the bands around 1.4 GHz to the non-GSO MSS with service links operating below 1 GHz, taking into

account the results of ITU-R studies conducted in response to Resolution 127 provided that due recognition is given to passive services taking into account S5.340 of the Radio Regulations. The band 1400 to 1427 MHz is also a very important passive sensor band requiring very good protection.

#### **Agenda Item 1.20 – Additional MSS Allocations below 1 GHz**

This agenda item considers additional allocations on a world-wide basis for the non-GSO MSS with service links operating below 1 GHz in accordance with Resolution 214. This item needs to be closely monitored as several MetSat and MetAids applications could be affected.

#### **Agenda Item 1.31 – Additional MSS Allocations in the Range 1-3 GHz**

This agenda item considers additional allocations to the MSS in the range 1-3 GHz in accordance with Resolutions COM5/29 and COM5/30. Under this item it will be determined whether MetSat down-links have to share with MSS which imposes significant interference potential.

## **4 SUMMARY**

The outcome of WRC-2000 was very successful in relation to the needs of present and future programmes of CGMS Member organisations. The main achievements were the re-allocation of passive sensor bands in the area 71 to 275 GHz. These re-allocations have to be seen in context with re-allocations in the band 50 to 71 GHz, which were achieved at WRC-1997. The allocations for passive sensors above 50 GHz have now reached a very good level of protection but pressure remains on bands below 50 GHz.

Proposals for MSS allocations in bands presently allocated to the Meteorological Satellite Service and Meteorological Aids Service were once again rejected. Furthermore existing ITU resolutions unfavourable to MetSat were deleted, replaced, or modified in such a way that only very limited portions of the MetSat bands are now under consideration for WRC-2003.

There are several issues of interest to CGMS on the agenda of WRC-2003 and preparatory work has to be started now.

It shall be noted that the very good results of the conference were only possible due to the close co-operation of many organisations interested in Meteorological Satellite Service and Earth Exploration Satellite Service. Several CGMS Members had representatives in national delegations and in observer organisations. The coordination in the preparation process of the Conference was well organised. The nomination of delegates as agreed at CGMS XXVII (see action 27.10) worked well.