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World Radio Conference (WRC-03)

CGMS is informed by ESA about the results of the World Radio Conference (WRC-03) relevant for Earth Observation.

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World Radio Conference (WRC-03)

The World Radio Conference (WRC-03) took place in Geneva from the 9 th of June to the 4 th of July. More than 2300 delegates attended the Conference, representing approximately 150 national administrations and several so-called Sector Members (ESA being one of them).

Before discussing the Earth Observation specific issues (see Annex), it is worth presenting some general considerations.

1. Despite the fact that some compromises were necessary in some areas with respect to our original positions, the global results can be considered as very positive for ESA. Some new allocations/regulations will open the way for new space missions (e.g. P-band SAR), will give enhanced capabilities to future missions (e.g. wideband downlink at 26 GHz for space science missions like JWST - James Webb Space Telescope) or will simply better guarantee the protection of microwave sensors bands (e.g. the 31 GHz range for AMSU on Metop).

Where some compromises were needed, due consideration had to be given to the "size" of the opposition to our position.

2. The proposals presented at the Conference by CEPT (European Conference of Postal and Telecommunications Administration) representing 45 European nations, were very well in line with the ESA position on all the issues of interest to us, due to the intensive ESA activities during the CEPT preparatory process. This represents a very welcome evolution from the situation at WRC-97 (and in some cases also WRC-00) when ESA often found itself fighting against the European administrations, including those representing ESA Member States. This evolution is made evident also by the fact that for the first time an ESA person (Björn Rommen of the Directorate of Earth Observation Programmes) was nominated European Coordinator on a specific Agenda Item. Our active participation in the CEPT work as well as our consistent approach of pursuing targets only when "reasonable" and technically well justified, have created a very good cooperative spirit between ESA and CEPT. We expect this to go well beyond this WRC and be a permanent feature of our relationship with CEPT.

3. The traditional very good cooperation between ESA and Eumetsat has been essential in the WRC preparation phase as well as during the WRC itself. A well-organised share of the workload and the usual teamwork have allowed to achieve optimal results in all the fields of common interest to the two agencies.

4. The Space Frequency Coordination Group (SFCG) is an informal group created on ESA initiative 23 years ago. It comprises representatives of 25 Space Agencies from all over the world. ESA is given the permanent task of SFCG Executive Secretary. As already happened in the past, the SFCG work has resulted in a world-wide coordination of the WRC position of all the Member Agencies, with the effect that similar proposals in the interest of space science have been submitted by several

administrations. In addition this WRC explicitly required the SFCG support to solve a complex coordination problem, therefore allowing to close positively a difficult agenda item. This represents the first official recognition of the role and importance of SFCG by WRC and by the ITU in general.

5. The exponentially growing demand for spectrum by new commercial telecom initiatives is putting increasing pressure on the institutional, scientific and military RF applications. Coexistence with these new systems within the bands used by ESA projects or adjacent to them is becoming a key issue and will continue to require:

a. theoretical compatibility studies and statistical computer simulations,
b. improvements in satellite design (data links, RF instruments, transponders), also in terms of unwanted emissions outside the necessary band, and
c. monitoring by the operators/users to detect any interference and report it to the ESA Frequency Management Office.

6. As usual, the end of a cycle marks also the start of a new one, in preparation or the next WRC in 2007. Active participation will be required in the work of all the relevant for a:

a. CEPT and its various committees
b. ITU-R and its Study Groups (here ESA will maintain the chairmanship of Working Party 7C)
c. SFCG (here ESA has also the role of Executive Secretary)

The Annex firstly provides information about the achievements at WRC-03 related to Earth observation. Secondly, it gives the agenda items for the next conference (WRC-07) where Earth observation is directly involved.

The official International Telecommunications Union ITU press release on the WRC-03 results can be found at

http://www.itu.int/newsroom/press_releases/2003/19.html

ANNEX

1. Earth Observation

Several items at this WRC were of interest for Earth Observation (EESS in ITU terminology):

a) New allocation in the 432-438 MHz for P-band SAR applications
b) Protection of the band 31.3-31.5 GHz (used by AMSU on Metop) from unwanted emissions by HAPS (High Altitude Platform System) in the adjacent band
c) Protection of the 1.4 GHz band (to be used by SMOS) from unwanted emissions by new Mobile Satellite feeder links in nearby bands
d) Protection of the band 50.2-50.4 GHz (used by AMSU on Metop) from unwanted emissions by High Density Fixed Satellite Systems (HDFSS) operating uplinks in the lower adjacent band
e) Protection of the EESS active sensors operating in the band 5250-5350 MHz (e.g. SAR on ERS-1 and Envisat) from new wireless LANs to be deployed in this band
f) Extension of the allocation to EESS active sensors in the 5 GHz range from the current 210 MHz bandwidth to 330 MHz (Main application: future high resolution altimeters or SARs in C-band)
g) Elimination of some legal uncertainty on the use of the 35.5-36 GHz band by rain radars
h) Definition of regulatory limits for unwanted emissions into bands reserved for EESS passive sensors only
i) Protection from proposed allocations to mobile satellite systems in various bands used by meteorological satellites.

a) New allocation in the 432-438 MHz for P-band SAR applications

This long-standing issue, already discussed unsuccessfully at WRC-97, has finally been positively resolved with a 6 MHz secondary allocation at this Conference. The operational limitations to be applied to the SARs operating in this band (ITU-R Recommendation SA.1260-1) will still allow them to cover forest biomass and Antarctic ice measurements, the two main observation targets identified for this type of instrument, with a spatial resolution of 100 meters. This result has been possible on the basis of an agreement that all future operators of these satellites will publish in advance on the SFCG web site the observation areas and schedule of their campaigns, so that the other users of the band can be aware of the planned use beforehand.

b) Protection of the band 31.3-31.5 GHz (used by AMSU on Metop) from unwanted emissions by HAPS (High Altitude Platform System) in the adjacent band

Very stringent limits on the unwanted (out-of-band and spurious) emissions by HAPS (High Altitude Platform Systems) uplink stations have been put in the ITU Radio Regulations. This will guarantee the protection of the "window" for the meteorological vertical sounders and at the same time will allow the development of HAPS systems around 31 GHz in a number of interested countries, mainly in Asia,

but including also Russia. This represents also the very important first case of having a hard limit specified for unwanted emission levels in the Radio Regulations; this should open the door for similar protection levels needed for other bands used for satellite passive sensing.

c) Protection of the 1.4 GHz band (to be used by SMOS) from unwanted emissions by new Mobile Satellite feeder links in nearby bands

The US industry made a strong attempt to get an allocation for MSS feeder link despite the unfavourable conclusions of compatibility studies conducted by the relevant ITU-R Working Parties and the incompleteness of these studies. The result has been an unusual legal construction where a secondary allocation has been given to these systems, but it cannot be used until the compatibility studies are completed and the results are reported to and considered by WRC-07. In other words no MSS system can start operation before 2007 and the technical/operational limitations to be applied to the MSS feeder links are still to be defined by the relevant ITU-R Study Groups, with retroactive effect on any systems filed before that date. Discussions are still on going with the ITU Bureau on the exact interpretation of this rather unorthodox procedure, but in any case previous commonly agreed studies have already indicated the technical limitations that will be needed to protect the passive sensors in the 1.4 GHz band.

d) Protection of the band 50.2-50.4 GHz (used by AMSU on Metop) from unwanted emissions by High Density Fixed Satellite Systems (HDFSS) operating uplinks in the lower adjacent band.

The exact description of this issue would require discussion of very detailed regulatory elements, therefore some points are “simplified” to help the understanding of readers not familiar with the Radio Regulations.
In a nutshell, the countries in Region 2 (the Americas) have decided to identify the band adjacent to the lower end of 50.2-50.4 GHz for use by future High Density Fixed Satellite Service (HDFSS) systems in the uplink direction, while the European countries are planning to use the band in the downlink direction. These systems, whose deployment in this band is not expected to take place before at least 2010, will be characterised by very small ground dishes (30 cm-60 cm) and very large bandwidth. Given also the high atmospheric attenuation at those frequencies, sizable transmission power will be needed, making it difficult to control the levels of unwanted emission in the adjacent band below the levels required to protect the meteorological vertical sounders operating there. In the uplink direction this translates into a signal transmitted directly into the antenna of the sounder. Because of some regulatory dispositions, it was not possible to object to the HDFSS identification for uplinks in Region 2. Nevertheless it has been possible to insert in the associated Resolution some text inviting Administrations to limit HDFSS uplink deployments in the frequencies next to 50.2 GHz until proper ITU studies will have identified mechanisms to protect the sensors in the 50.2-50.4 GHz band. Although the threat is not imminent (some even question if these high frequency bands are really suitable for HDFSS applications), studies are needed in this area in the future.

e) Protection of the EESS active sensors operating in the band 5250-5350 MHz (e.g. SAR on ERS-1 and Envisat) from new wireless LANs (RLAN) to be deployed in this band

This has been one of the most difficult issues at WRC-03. The ITU studies conducted on this issue in preparation of WRC-03 had concluded that a proper protection of the EESS active sensors could only be achieved by limiting the RLAN (Radio Local Area Network) to indoor use only and by imposing some additional technical constraints. This conclusion was supported by the European RLAN industry, which confirmed that these constraints were acceptable to them. Compatible European regulations in this area have been put in place already since 3 years. Unfortunately the US and Canadian national regulations allowed outdoor usage of these equipments as well as higher power and therefore these Administrations, supported by the North American wi-fi industry, objected to the results of the ITU studies. While the Canadian problem has been solved with a compromise that will allow limited outdoor usage only with antennas with strong attenuation above the horizontal plane, it has been very difficult to deal with the US objections. After endless discussions, the solution has been to introduce regulatory text that invites Administrations to encourage "predominantly indoor" systems, but at the same time allows Administrations to use alternative methods to protect the EESS systems. What these alternative methods may be is unclear, since all the technically meaningful methods have been analysed.
The argument of the US Administration has been that some of these systems are already deployed in the US and no interference claim has been received so far from the EESS data users. If interference will be shown in the future, they will take actions (still to be better specified) to solve the problem. A new footnote has been introduced in the Radio Regulation for this band, stating that no harmful interference shall be generated by the RLAN devices towards the EESS sensors. This implies that demonstrated interferences shall lead to the obligation of switching off the RLANs. At this point it is very important that the Envisat ASAR users and operators report to the ESA Frequency Management Office any instance of interference over North America that can be traced to these devices. The most critical areas are expected to be the large cities.

f) Extension of the size of the allocation to EESS active sensors in the 5 GHz range from the current 210 MHz bandwidth to 320 MHz.

This frequency extension was requested to allow future high-resolution altimeters or SARs in C-band, although ESA has currently no plans to develop these systems. The extension of the band allocated from 5250-5460 MHz to 5250-5570 MHz has been achieved at this WRC. The allocation has been given in the same band also to Space Research active systems (to be used for planetary exploration). The sharing scenario in the new part of the band 5460-5570 MHz is more critical than in the rest of the band, in particular considering that high power outdoor RLANs will be deployed there. This extension should therefore be used only when a bandwidth larger than 210 MHz will be needed and preferably should target applications over sea/ocean rather than land, to minimise the interference risk.

g) Elimination of some legal uncertainty on the use of the 35.5-36 GHz band by rain radars.

The previous footnote that was resulting in a de-facto secondary allocation to the EESS (active) systems in this band has been modified in a sense that both service operate on a quasi-equal basis. The only remaining restriction is a specific emission limit for EESS active sensors, which ensures protection of radiolocation systems whilst at the same time placing minimum constraints on the active sensors. It was possible to reject repeated attempts by few European military representatives for a clause not to be able to claim protection from harmful interference by high-power radiolocation systems.

h) Definition of regulatory limits for unwanted emissions into bands reserved or EESS passive sensors only

Despite strong resistance by some important Administrations, the WRC decided that the problem of unwanted emissions into passive bands will have to be studied and technical regulations should be put in place. This will constitute for ESA one of the most complex issues to be covered in the next study cycle.

i) Protection from proposed allocations to mobile satellite systems in various bands used by meteorological satellites.

A couple of agenda items on this subject have been closed with decisions that fully protect the frequencies used by meteorological satellites in the P and L band for various applications (e.g. data collection).

2. Agenda for the future WRC (WRC-07)

As usual the agenda for the next WRC-07 contains quite a mix of different subjects. 21 Agenda Items have been included. Those that are of direct interest to Earth observation are:

AI 1.2, related to sharing studies in the bands 10.6-10.68 GHz and 36-37 GHz between passive EESS sensors and terrestrial services, as well as to the extension by 100 MHz of the current Meteorological Satellite downlink band 18.1-18.3 GHz (to cover the higher data rates required by Meteosat third generation)

AI 1.3, related to the extension by 200 MHz of the EESS active sensors allocation in the band 9.5-9.8 GHz, to cover the sub-meter resolution required by sensors like the SAR on COSMO-SKYMED.

AI 1.17, related to the continuation of studies on compatibility between MSS feeder links and passive services around 1.4 GHz (SMOS)

AI 1.20, related to studies and regulatory measures to protect EESS passive sensors from unwanted emissions.