

CPG07(2007)096 Annex VIII 2

Draft CEPT Brief on agenda item 1.2

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 742 (WRC-03) and 746 (WRC-03)

Issue 1

Resolution 742 deals with the use of the frequency band 36 – 37 GHz and resolves to invite ITU-R to conduct 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.

Preliminary CEPT position

CEPT supports the protection of the passive services while not placing undue constraints on the other allocated services.

It is therefore proposed that single entry emission limits taking into account the results of the compatibility analysis (as contained in Table 1 below) be included in a Resolution referred to in a footnote of Article 5 of the Radio Regulations. Those limits would be non-retroactive for all FS and MS stations brought into use before the date of entry into force of WRC-07 final acts.

Background

The issue of sharing between the active and the passive services in the band 36 – 37 GHz was dealt with under WRC-2003 agenda item 1.12, however, was not finally resolved. For the purpose of defining appropriate sharing criteria Resolution 742 was adopted.

The band 36-37 GHz on one hand is allocated to the Earth exploration-satellite service (EESS) (passive) and to the space research service (SRS) (passive) and on the other hand the band is allocated to the fixed and mobile service, all on a primary basis.

In such a constellation, EESS (passive) and SRS (passive) operating in this band could receive interference from the emissions of systems of active services. Therefore, sharing criteria between the passive services and the active services need to be defined for the band 36 – 37 GHz.

The band 36-37 GHz is vital for the study of global water circulation: this band is able to monitor the rain, the snow, the ocean ice and the water vapour for ocean and land surfaces. Observations in the band for sensing the melting of snow near the surface are of very high interest. A number of passive sensors and radio altimeters are already using or are planned to use this frequency band in the near future (e.g. CMIS, MIMR, AMSR, AMSR-E, AMR, SMMR, SSM/I, SSMI/S, TMI, MEGHA-TROPIQUE and MWRS) for such measurements. These measurements are fully operational (regular use of the data, continuity of service, several usable data products) and are used on a world-wide basis. The retrieved data are used and exchanged between the meteorological organisations in all regions. The retrieved parameters are actually derived from a set of measurements performed at five frequencies which are interrelated (6, 10, 18, 24 and 36.5 GHz).

Prior to WRC-2003, CPM concluded the following:

“Based upon preliminary studies conducted so far, the deployment of a limited number of fixed stations operating at the maximum power given in Recommendation ITU-R F.758 may cause unacceptable interference to a passive sensor. Taking into account the scattering effect, the interference level may be increased. Land area measurements would be degraded rather than ocean measurements. If passive services

were to be protected to the levels of Recommendation ITU-R SA.1029-1, in order to meet the data availability requirements specified in this Recommendation, it may be necessary to limit the deployment of the fixed and mobile services.”

The CEPT position to WRC-2003 was the following:

“In spite of the lack of information on FS and MS military systems, preliminary studies performed by WG SE have shown that identification of the maximum e.i.r.p of fixed and mobile links could provide a means for suitable protection of passive services (EESS and SRS) in the band 36-37 GHz, but ITU-R sharing studies need to be completed before a more definitive position can be taken. CEPT supports the adoption of a Resolution inviting ITU-R to develop a Recommendation for adequate sharing conditions between all affected services in the band 36-37 GHz. In Europe, plans exist for the near future to operate several passive instruments in this band.”

Sharing studies between passive sensors and the FS in preparation for WRC-07 using consolidated sharing criteria as well as technical and operational characteristics for FS and MS were presented to the November 2005 meeting of WP 7C. These simulations addressed several different assumed P-P and P-MP FS deployment models and examined trade-offs between FS power/EIRP and FS deployment density. Simulations were also conducted to determine the effectiveness of controlling certain technical and operational characteristics of EESS (passive) and FS stations operating in this band in mitigating interference levels. The studies conducted to this November 2005 meeting of WP 7C indicated that compatibility between future FS operations and the passive sensors currently operating in this band can be achieved if the FS EIRP/power and deployment densities are moderate.

A sharing study between a passive sensor and mobile service stations was conducted showing similar interference results with the compatibility studies for fixed service stations. If an activity factor of mobile service stations is introduced, the sharing situation may be improved.

In the course of reviewing the results of the studies a number of technical and operational characteristics of the EESS (passive) instrument, FS and MS systems were considered and evaluated by WP 7C as possible approaches to mitigate or minimize the chance of interference to the passive sensors. Control of a combination of some or all of the identified operational and technical characteristics were considered to greatly help the sharing between EESS (passive) on one hand and the fixed and mobile services on the other hand.

Working Party 8A in its March 2006 meeting reviewed the WP7C contributions regarding the technical characteristics of mobile services and the draft CPM-Text. WP 8A provided technical and operational characteristics of ENG systems deployed in the band 36-37 GHz in the mobile service that differ slightly from those used for fixed service and concluded that, as a consequence, the limitations proposed on the fixed service may not be applicable to the mobile service. In particular, ENG systems operating under the mobile allocation in these bands have the possibility to transmit the signal to airborne relay station. Therefore, the provisional limitation of maximum elevation angle and transmitter power to the mobile services proposed in the draft CPM text put significant constraint on the operation of ENG systems. Considering the parameters provided a maximum e.i.r.p. limit of 34 dBW in the band 36-37 GHz is acceptable for WP8A (Doc. 7C/217).

Working Party 9D at its June 2006 meeting has made substantial progress towards a preliminary draft new Recommendation for techniques that can be undertaken by the fixed service (FS) to facilitate sharing between the fixed service and the Earth exploration-satellite service (EESS) (passive) in the 36-37 GHz band (Document 9D/219, Annex 5), as well as on a working document towards a draft new report summarizing the sharing studies conducted by Working Party 9D (Document 9D/219, Annex 8).

Working Party 9D provided to the August 2006 meeting of Working Party 7C proposed modifications to the Draft CPM-Text (Document 7C/230) including proposals on the acceptable sharing criteria for Working Party 9D (maximum P-P transmitter power < -10 dBW, power setting control including [10 dB] ATPC, elevation angle range <[20], but no limits on deployment density and no maximum P-P eirp).

Working Party 7C at its August 2006 meeting further refined the sharing studies (Document 7C/259 Annex 11) taking into account the information provided by Working Party 9D and concluded about technical and operational characteristics of passive sensors in the Earth exploration-satellite (passive) and space research

(passive) services to facilitate sharing with the fixed and mobile services in the band 36-37 GHz (Document 7C/259 Annex 8 (Draft New Recommendation ITU-R RS.[10/36 GHZ MITIGATE] adopted by SG7 in February 2007)). The study results described in the Preliminary Draft Reports from Working Party 7C and 9D (Document 7C/259 Annex 11 (Draft New Report ITU-R RS.[36-37 GHZ SHARING] adopted by SG7 in February 2007)) and Document 9D/219 Annex 8) indicate that compatibility between FS operations with their current parameters and the passive sensors currently operating in this band can be achieved if deployment densities are sufficiently low. Sharing criteria based on these current FS parameters would therefore not pose an undue burden on the FS. As deployment densities increase, the simulations indicate that the EESS (passive) interference levels will exceed the criteria of Recommendation ITU-R RS.1029-2. Nevertheless, such a result is considered acceptable for EESS (passive) systems in view of the need to find an equitable burden sharing in establishing sharing criteria for the services sharing this band. Sharing studies between the EESS (passive) and the mobile service were also conducted and the interference level does not exceed the permissible interference criteria for current and future passive sensors. In the sharing study, the effect of the activity factor of MS stations was included.

At its February 2007 meeting, SG7 adopted the Draft New Report ITU-R RS.[36-37 GHZ SHARING] (Document 7/65) on sharing of the 36-37 GHz band by the fixed and mobile services and the Earth exploration-satellite service (passive), summarising the result of the studies performed by WP 7C in close liaison with WP 9D and 8A. Furthermore SG7 adopted the Draft New Recommendation ITU-R RS.[10/36 GHZ MITIGATE] (Document 7/67) on technical and operational characteristics for passive sensors in the Earth exploration-satellite service (passive) to facilitate sharing of the 10.6 – 10.68 GHz and 36 – 37 GHz bands with the fixed and mobile services.

A number of technical and operational characteristics of EESS (passive) sensors and FS and MS systems were considered and evaluated as possible approaches to mitigate or minimize the level of interference. Table 1 below which is also included in the final CPM text identifies possible limits on the technical and operational characteristics of these systems that can facilitate the sharing of the 36-37 GHz band between EESS (passive) on one hand and the FS and MS on the other hand.

Table 1
Possible sharing criteria in the band 36-37 GHz

EESS (passive)	Fixed service	Mobile service
incidence angle ≤ 60 degrees, where the incidence angle is defined as the angle at the Earth's surface between the local vertical and the centre of the passive sensor antenna beam	elevation angle range $\leq 20^\circ$	
spatial resolution ≤ 50 km, where the spatial resolution is defined as the maximum cross-section of the passive sensor -3dB contour on the Earth's surface	maximum P-P transmitter power ≤ -10 dBW (Note 1) maximum P-MP transmitter power: ≤ -5 dBW hub stations ≤ -10 dBW customer stations	Maximum transmitter power ≤ -10 dBW maximum transmitter power ≤ -3 dBW (if activity factor less than 40%)
main beam efficiency ≥ 92 %, where the main beam efficiency is defined as the energy (main and cross-polarization components) within 2.5 times the -3 dB beamwidth region, relative to the total energy within all angles	maximum P-MP hub station eirp $\leq +12$ dBW	

NOTE 1 – In the case of FS P-P systems using ATPC, the maximum transmitter power may be increased by a value corresponding to the ATPC range up to a maximum of -7 dBW.

Each of the individual entries in this table, such as maximum power, is based on simulations that assume that no mitigation techniques are applied by the active service. The limits indicated in the table may be relaxed if multiple sharing criteria or mitigation techniques are applied simultaneously. Possible mitigation techniques

include flexible power setting, power level control (ATPC) to mitigate fading and use of high performance directional antennas. The interference levels to EESS (passive) indicated by the results of simulation studies using the values indicated in this table exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 for some of the deployment models considered in the sharing studies. Nevertheless, such a result is considered acceptable for EESS (passive) systems in view of the need to find an equitable burden sharing in establishing sharing criteria for the services sharing this band.

At CPM only few modifications were introduced to the draft text without any modifications to the methods to satisfy the agenda item.

List of relevant documents

Document PT2(04)23, from NATO, listing parameters of military systems in the 36-37 GHz band

Document PT2(04)27, from Russia, listing parameters of point to point fixed system in the 36-37 GHz band

Document 7C/217, Liaison Statement to WP 7C regarding studies relating to WRC-07 AI 1.2

Document 9D/219 Annex 5, Working document toward preliminary draft new recommendation – Technical and operational characteristics of systems in the fixed service to facilitate sharing with the Earth exploration-satellite (passive) and space research (passive) services in the band 36-37 GHz

Document 9D/219 Annex 8, Working document towards preliminary draft new Report ITU-R F.[36 GHz FS-EESS] – Sharing studies between fixed stations and passive sensors in the frequency band 36-37 GHz

Document 7C/230, Liaison statement from Working Party 9D to Working Party 7C on studies relating to Agenda item 1.2 and draft CPM Report text

Draft New Report ITU-R RS.[36-37 GHz SHARING] (Document 7/65) on sharing of the 36-37 GHz band by the fixed and mobile services and the Earth exploration-satellite service (passive)

Draft New Recommendation ITU-R RS.[10/36 GHz MITIGATE] (Document 7/67) on technical and operational characteristics for passive sensors in the Earth exploration-satellite service (passive) to facilitate sharing of the 10.6 – 10.68 GHz and 36 – 37 GHz bands with the fixed and mobile services.

Actions to be taken

None.

Proposals from outside CEPT

Regional telecommunications organisations

APT (January 2007)

With respect to the sharing criteria between active and passive services in the band 36-37GHz, the preliminary APT common view is as follows:

The protection of passive services should not place additional undue constraints on other allocated services. Sharing criteria should be appropriately defined based on the results of the ITU-R studies.

CITEL (October 2006)

Canada and Brazil supports the participation in ITU-R studies on this issue to ensure that any new regulatory measures that may be developed would not put undue constraint on services allocated in this band.

Uruguay considers that any regulatory measure that is adopted on how to protect passive services (SETS-SIES) should not impose any unnecessary constraints on the services to which the band is attributed.

RCC (December 2006)

The frequency band 36-37 GHz is used by the EESS (passive) systems, the protection ratio, for which are given in Recommendation ITU-R SA.1029-2.

This frequency band is currently used as well by the FS stations.

The conditions of the sharing usage of the frequency band 36-37 GHz by FS and passive services shall not place constraint on the usage of this band for FS.

International organisations

NATO (February 2007)

NATO Military Position

In the band 36-37 GHz, military mobile radio stations need spectrum support for roaming without geographical constraints. Sharing criteria must not unduly constrain this military use.

WMO and EUMETNET (January 2007)

WMO and EUMETNET stress the need for the protection of the 36-37 GHz passive band and propose identification of maximum e.i.r.p and power for fixed and mobile links as given in Table 1.2-2 of the CPM text to ensure such protection.

Regional organisations

Issue 2

Resolution 746 resolves to invite ITU-R to conduct 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.

Preliminary CEPT position

To support the extension of the METSAT allocation by 100 MHz to provide a common world-wide allocation of 300 MHz under the same regulatory conditions as in the band 18.1-18.3 GHz in order to ensure adequate protection of the existing services.

Having due regard to the potential limitations due to coexistence with BSS plan feeder links in the 18-18.1 GHz band that are subject to Appendix 30A, Europe proposes to extend the provisions of RR footnote 5.519, currently applying to the band 18.1-18.3 MHz, to the 18.1-18.4 MHz band.

In case an extension of the MetSat allocation in the band 18.3 – 18.4 GHz should not be possible on a world-wide basis and thus the inter-operability of MetSat systems between ITU-R Regions should be hindered an extension into the band 18.0 – 18.1 GHz would be the alternative option (see Attachment 1).

Background

CEPT forwarded an ECP to WRC-2003 proposing an agenda item for WRC-2007 to consider the expansion of the allocation for the Meteorological Satellite Service (N°5.519) from the present bandwidth 18.1-18.3 GHz to 18.1-18.4 GHz. This proposal is reflected in Resolution 436 to which WRC-2007 agenda item 1.2 is referring to.

The current footnote RR No. 5.519 provides spectrum between 18.1 – 18.3 GHz for the Meteorological Satellite Service (space-to-Earth) limited to the use by geostationary satellites and shall be in accordance with the provision of Art. 21, table 21-4. The band 18-18.4 GHz is allocated to the fixed, fixed-satellite (space-to-Earth and Earth-to-space (limited to BSS feeder links)) and mobile services.

The reason for the proposed extension of the 18 GHz MetSat allocation is the bandwidth requirements for transmission of data from high-resolution sensors on next generation geostationary meteorological satellites that are to be launched in the time frame 2015-2020.

Bandwidths exceeding 200 MHz will be required for the downlink of sensor data from 3rd generation geostationary meteorological satellites to major ground stations of MetSat systems. The bandwidth requirements are determined by the use of high-resolution sensors, imagers, UV and IR sounding units which all together will have a total information bit rate of 370 Mbit/s. Such an amount of data would require a frequency spectrum allocated to the MetSat service at 18 GHz of 300 MHz taking into account the need for coding to provide for sufficient error correction and detection capabilities as well as the requirement for frame error detection. Furthermore, a higher level modulation scheme will have to be used since the currently often applied QPSK would result in a bandwidth which could not be transmitted within a bandwidth of 300 MHz. Assuming a symbol rate of 740 Ms/s and 8PSK modulation additional pulse shaping and/or filtering will have to be applied to fit the signal within a bandwidth of 300 MHz. For details see Document PT2(05)07.

The implementation of the first spacecraft of the 3rd generation will be in the timeframe 2015 – 2020. With a view to permitting a timely implementation of geostationary meteorological satellite systems in this band a decision on the potential extension of the MetSat allocation is required in the timeframe of WRC-07. The number of such stations will be less than 5 per Region.

In order to achieve maximum compatibility and to simplify coordination with the FSS, WP7B on the request from WP 4A refined at its March 2005 meeting the system parameters and link budget examples for next

generation MetSat systems, adopting the system concepts, sharing and coordination principles of GSO FSS systems. Consequently, ITU-R WP7B adjusted the interference and sharing criteria for direct readout systems in the meteorological satellite (GSO) service at 18 GHz and developed a separate PDNR for these criteria rather than incorporating them in the existing Recommendations ITU-R SA.1159, SA.1160, and SA.1161 as originally intended. . At the November 2005 meeting of ITU-R WP7B meeting this PDNR was turned into a DNR and sent to ITU-R SG7 for adoption.

On the aspect of sharing between MetSat and the FS, the results of a first sharing study (Doc. 7B/36) presented to WP7B in March 2004 are not negatively influenced by the modifications to the MetSat system parameters and link budget. The study concluded that the currently applicable power flux density limits as given in RR Table 21-4 for the MetSat service in the band 18.1 – 18.3 GHz to protect the fixed service can be respected still with significant margin. WP9D reviewed the study and concurred with its results.

A sharing study with GSO FSS as well as with BSS feederlinks was presented (Doc. 7B/78) to WP7B in March 2005 with the conclusion that with the adjusted MetSat system design sharing in both sub-bands 18.0 – 18.1 GHz and 18.3 – 18.4 GHz is feasible in all cases (even with HDFSS). Given the maximised level of homogeneity between FSS and MetSat systems, this will not only result in maximum compatibility but also facilitate coordination applying the sharing and coordination principles used among FSS systems.

A sharing study with NGSO FSS systems was presented to the November 2005 meeting of WP7B (doc. 7B/104) using representative NGSO FSS systems with characteristics as contained in Recommendation ITU-R S.1328. The study concludes that no harmful interference is caused by meteorological satellites to NGSO FSS Earth stations even when collocated with a MetSat Earth station. Under worst case assumptions the required NGSO-FSS protection levels can still be met with large margins. With regard to the potential of interference from NGSO-FSS satellites into a MetSat earth station significant margin will be available to even co-located NGSO-FSS Earth stations with small antennas, thus no coordination would be required with NGSO-FSS systems with ubiquitously deployed small earth stations.

WP6S at its March 2006 meeting acknowledged the draft CPM-Text and the contained conclusions with regard to sharing between GSO MetSat and BSS feederlinks. WP 6S notes that the 18.0-18.1 GHz band segment is governed by Appendix 30A (see RR No. 5.516) and shall not be constrained by this new MetSat allocation (Doc. 6S/122).

At its March 2006 meeting WP8A reviewed the Draft CPM-Text and studies developed by WP7B and acknowledged that no sharing studies were performed since there is no current use of the band by the mobile service. Furthermore, WP8A informed WP7B that there are no known plans to use this band by the mobile service in the foreseeable future. Therefore, WP 8A concludes that the draft CPM text for WRC-07 agenda item 1.2 (Resolution 746) regarding the possible extension of the existing MetSat allocation in 18.1-18.3 GHz can be agreeable from a mobile service point of view (Doc. 7B/124).

WP4A at its March 2006 meeting reviewed the WP7B sharing studies between GSO MetSats and NGSO FSS and the corresponding draft CPM-Text concluding that the interference predicted from the non-GSO FSS into the future MetSat systems that was potentially already low was even overestimated due incorrect assumptions and not considering operational characteristics of non-GSO FSS in the compatibility analysis. Due to epfd limits in Article 22, the MetSat systems are effectively provided protection from non-GSO FSS systems equivalent to that provided to GSO FSS and BSS networks also using the band (Doc. 7B/128).

Working Party 9D at its June 2006 meeting provided a final feedback on the Draft CPM text (Doc. 7B/133) which was taken into account by Working Party 7B at its August 2006 meeting in the development of the final draft for the CPM text.

At its February 2007 meeting, SG7 adopted the Draft New Recommendation ITU-R SA. [MET 18 GHZ] (Document 7/68) on system characteristics and interference criteria for meteorological satellite systems operating around 18 GHz.

At CPM after some discussion on a proposal from China to modify Methods A1 and A3 to propose a table allocation rather than a modification of FN 5.519 and an attempt to delete Method A2, the draft CPM text finally remained unchanged.

List of relevant documents

Document 7B/36, Sharing assessment between the meteorological satellite and the fixed service around 18.2 GHz

Document 7B/78, Compatibility assessment between the meteorological satellite and the fixed satellite service around 18.2 GHz

Document PT2(05)07, Background for the additional spectrum requirements for next generation Meteorological Satellite Service Systems at 18 GHz

Document 7B/104, Compatibility assessment between the meteorological satellite service and NGSO satellites operating in the fixed satellite service around 18.2 GHz Document 9D/171 Annex 07, Draft Liaison Statement to WP7B with proposed Draft CPM-Text for WRC-07 Agenda Item 1.2 (18 GHz)

Document 6S/122, Liaison Statement to WP7B on studies relating to WRC-07 Agenda Item 1.2 (18 GHz)

Document 7B/124, Liaison Statement to WP7B on studies relating to WRC-07 Agenda Item 1.2

Document 7B/128, Response to Liaison Statement from WP7B on proposed draft CPM text for WRC-07 Agenda Item 1.2 (Resolution 746 (WRC-03), 18 GHz)

Document 7B/133, Liaison statement to WP 7B on proposed draft CPM text for WRC-07 Agenda item 1.2 (Resolution 746, 18 GHz)

Draft New Recommendation ITU-R SA. [MET 18 GHz] (Document 7/68) on system characteristics and interference criteria for meteorological satellite systems operating around 18 GHz.

Actions to be taken

None.

Proposals from outside CEPT

Regional telecommunication organisations

APT (January 2007)

With respect to the extension of current 18.1-18.3 GHz geostationary meteorological satellites allocation in the space-to-earth direction to 300MHz of contiguous spectrum, the preliminary APT common view is as follows:

- a). In order to provide the necessary frequency spectrum for the next generation geostationary meteorological satellite (MetSat) systems, APT supports the extension of the existing 18 GHz MetSat allocation by 100 MHz;
- b). Sharing criteria should be appropriately defined based on the results of the ITU-R studies on the possibility of sharing with other allocated services, including the frequency bands allocated to BSS feeder link plan in Region 1 and 3. The existing pfd limits given in Table 21-4 are appropriate in whichever the direction the extension may be made;
- c). Existing services (FS, FSS including feeder-links for the BSS Plan (Regions 1 and 3) and MS) must be protected from harmful interference due to the possible extension of the MetSat allocation.

CITEL (**October 2006**)

Brazil and Canada believe that, to protect the fixed and mobile services, any expansion of the MetSat service (s-E) allocation beyond the band 18.1-18.3 GHz for geostationary applications will be required to conform to the existing pfd limits given in Table 21-4.

Brazil and Canada believe that any expansion of the MetSat allocation into the band 18.0-18.1 GHz should be governed by the same coordination conditions with the FS and MS as are currently applied in the band 18.1-18.3 GHz.

The United States, Canada and Brazil support ongoing ITU-R studies on this issue in both the 18.0-18.1 GHz and the 18.3-18.4 GHz bands.

The Brazilian Administration is in favor of an extension of MetSat allocation into 18.0-18.1 GHz. Although this band is being extensively used in Brazil, sharing analysis between existing services with MetSat service (s-E) indicates that this extension is feasible.

The United States and Canada are not in favor of an extension of the MetSat allocation into the 18.3-18.4 GHz band in Region 2 if it necessitates imposition of additional constraints on the FSS in this band.

The United States and Canada believe that, if an additional 100 MHz is allocated to the MetSat service in the 18 GHz band in Region 2, the lower sub-band at 18.0-18.1 GHz, could be favored under certain restrictions, due to the likelihood of sharing difficulties identified by WP4A between HDFSS GSO systems and MetSats in the upper sub-band at 18.3-18.4 GHz.

Uruguay considers that, in the event attribution to the meteorology service by satellite is extended beyond the band of 18.1-18.3 GHz, the same criterion set forth in footnote No. 5,519 should be applied.

RCC (December 2006)

The extension of the band by 100 MHz is possible subject to the application in the extended frequency band of the limitations indicated in Table 21-4 of Article 21 of the Radio Regulations, and ensuring the protection of the existing and planned terrestrial radio services under No. 5.519. The protection of the planned stations of the fixed satellite service will be ensured at carrying out the coordination procedure of the satellite networks in accordance with Article 9 of the Radio Regulations.

Arab Group (CPM07-2)

Statement of a list of Arab countries included in the CPM-Report:

“The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia **object** to any regulatory solution imposing hard limits on the use of FS and MS in the band 10.6-10.68 GHz and on proposing the use of the band 18.0-18.1 GHz.”

International organisations

NATO (February 2007)

NATO Military Position

An extension of the current meteorological-satellite service allocation up to 300 MHz in the 18 GHz band is supported.

WMO and EUMETNET (January 2007)

WMO and EUMETNET support the extension of the MetSat allocation at 18 GHz on a primary basis and are of the view that such an extension will not constrain existing services provided that the same regulatory conditions as in the 18.1-18.3 GHz band (e.g. Article 21 pfd limits) are applied. WMO and EUMETNET do not favour one of the options over the other (18-18.1 GHz band or 18.3-18.4 GHz band) but a worldwide allocation in a single band is preferred, since Meteorological Satellite operating at a given orbital position are

able to be moved to another orbital position over another Region. Regarding the methods to satisfy Issue A of Agenda Item 1.2, WMO and EUMETNET do not support Method A2. According to this method MetSat systems in Regions 1 and 3 would have to operate under a secondary status with respect to BSS feeder links which is not acceptable given the importance of this band for geostationary meteorological satellites.

Regional organisations

ASBU (Arab States Broadcasting Union)

Efforts should be made to avoid placing undue constraints on the use of the AP30A feeder link band and the feeder link band for the future BSS.

Alternative ECPs for Issue 2

[MOD EUR/XXA2/1]

5.519 *Additional allocation:* the band 18.0-18.3 GHz is also allocated to the meteorological-satellite service (space-to-Earth) on a primary basis. Its use is limited to geostationary satellites and shall be in accordance with the provisions of Article 21, Table 21-4.

Deleted: 1

Reasons: In order to provide the required spectrum for the next generation meteorological satellite (MetSat) systems, an extension on a world-wide basis of the existing allocation to the MetSat Service by 100 MHz under the same regulatory conditions that apply in the already allocated frequency band 18.1 – 18.3 GHz is proposed. Studies for the band 18.0 – 18.1 GHz conclude that sharing between the MetSat Service and the other allocated services (FSS, BSS feeder links, FS and MS) is feasible.

[MOD EUR/XXA2/2]

ARTICLE 5

15.4-18.4 GHz

Allocation to services		
Region 1	Region 2	Region 3
...		
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE ADD 5.519	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.518 5.515 5.517 <hr/> 17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE ADD 5.519	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE ADD 5.519
18.1-18.4	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE MOD 5.519 5.521	

Reasons: Consequential modifications to the table of allocations to reflect the proposed modification of FN 5.519 (EUR/XXA2/1) for the extension of the 18 GHz allocation to the Meteorological Satellite Service.

Issue 3

Resolution 746 resolves to invite ITU-R to conduct sharing analyses between the EESS (passive) and the SRS (passive) on one hand and the fixed and mobile services on the other hand in the band 10.6-10.68 GHz to determine appropriate sharing criteria.

Preliminary CEPT position

CEPT supports the protection of the passive services while not placing undue constraints on the other allocated services

It is therefore proposed that single entry emission limits (as contained in Table 2 below) be included in a Resolution referred to in a footnote of Article 5 of the Radio Regulations. Those limits would be non-retroactive for all FS and MS stations brought into use before the date of entry into force of WRC-07 final acts.

Background

The band 10.6-10.68 GHz is allocated to the Earth exploration-satellite service (EESS) (passive), radio astronomy and space research (passive) services on a primary basis. Furthermore, this band is also allocated to the mobile, except aeronautical mobile, and the fixed services on a primary basis, taking into account No. 5.482.

The provisions given in No. 5.482 may not be sufficient to ensure the protection of the EESS (passive) in the band 10.6-10.68 GHz, therefore the sharing criteria between the EESS (passive) and the space research (passive) service on one hand and the other primary services on the other hand need to be reviewed.

The band 10.6-10.7 GHz is of primary interest to measure rain, snow, sea state and ocean wind for ocean and land surfaces. A number of sensors are already using or are planned to use this frequency band in the near future (e.g. CMIS, MIMR, AMSR, AMSR-E and TMI) for such measurements. These measurements are fully operational (regular use of the data, continuity of service, several usable data products) and are used on a world-wide basis. The retrieved data are used and exchanged between the meteorological organisations in all regions. The retrieved parameters are actually derived from a set of measurements performed at five frequencies which are interrelated (6, 10, 18, 24 and 36.5 GHz).

Within SE21 sharing between EESS (passive) and video SAP/SAB links in the band 10.6-10.68 GHz was studied. The results of those studies are contained in ECC Report 17. In this report it is concluded that sharing is not feasible between EESS (passive) and cordless portable video links and cordless cameras in the band 10.6-10.68 GHz. Sharing with temporary point-to-point links is only possible with a very limited number of links. Sharing with other applications in this band has not been studied within the framework of WGSE, for example within the fixed service with fixed wireless access systems (FWA) at 10.6 – 10.65 GHz.

Sharing studies between passive sensors and the FS in preparation for WRC-07 were presented to the November 2005 meeting of WP 7C. These simulations addressed several different parts of the world and their different assumed densities of P-P and P-MP FS station deployment. Some studies were performed using publicly available information on the FS facilities currently licensed in two countries while other studies used theoretical FS deployment model over a limited area. Both studies were useful in order to make a comparison of the results. Simulations were also conducted to determine the effectiveness of controlling certain technical and operational characteristics of EESS (passive) and FS stations operating in this band in mitigating interference levels.

The interference levels resulting from these studies exceed the permissible interference criteria of Recommendation ITU-R SA.1029-2 for current passive sensors by 5 to 25 dB over 0.1% of a passive sensor measurement area depending on the FS station deployment density, although areas for further study have been identified, which may reduce these calculated predicted interference levels. The simulations performed for the currently licensed FS stations in two countries indicate that the permissible interference criteria for current passive sensors may be exceeded by about 17-18 dB over 0.1% of the area in those countries.

A sharing study between a passive sensor and mobile service stations was conducted showing similar interference results with the compatibility studies for fixed service stations. If an activity factor of mobile service stations is introduced, the sharing situation may be improved.

In the course of reviewing the results of the studies a number of technical and operational characteristics of the EESS (passive) instrument, FS and MS systems were considered and evaluated by WP 7C as possible approaches to mitigate or minimize the chance of interference to the passive sensors. Control of a combination of some or all of the identified operational and technical characteristics were considered to greatly help the sharing between EESS (passive) on one hand and the fixed and mobile services on the other hand.

Working Party 8A in its March 2006 meeting reviewed the WP7C contributions regarding the technical characteristics of mobile services and the draft CPM-Text. WP 8A provided technical and operational characteristics of ENG systems deployed in the band 10.6 – 10.68 GHz in the mobile service that differ slightly from those used for fixed service and concluded that, as a consequence, the limitations proposed on the fixed service may not be applicable to the mobile service. In particular, ENG systems operating under the mobile allocation in these bands have the possibility to transmit the signal to airborne relay station. Therefore, the provisional limitation of maximum elevation angle and transmitter power to the mobile services proposed in the draft CPM text put significant constraint on the operation of ENG systems. Considering the parameters provided a maximum e.i.r.p. limit of 32 dBW in the band 10.6 – 10.68 GHz is acceptable for WP8A (Doc. 7C/217).

Recent measurements performed in the 10.6-10.68 GHz band (as described in Doc. ECC/CPG07 PT2(06)24) show that over few countries (mainly UK and Italy in Europe and Japan), passive sensors are currently interfered at such high levels (at least 24 dB above the protection threshold over a very large area) that these interference can be identified and corresponding data have to be discarded. Normally, passive sensors are not able to discriminate between these natural radiations and man-made radiations, except when interference are at several order of magnitude compared to the sensitivity. It has also to be noted that, in the light of this measurement, technical studies presented by Japan during WP7C based on their current active service deployment have exactly confirmed the measured interference in excess of 24 dB.

These interference, that were not existing few years ago, are symptomatic of a problem and tend to show how extensive interference that cannot be identified could be, hence justifying the need to review current power limits in footnote 5.482. It is not clear whether the discrepancy between these measurement results and current ITU-R technical studies (less pessimistic) are due to a significant difference between the assumptions made in the studies and existing FS or MS deployments, or even to a non-compliance to limits in footnote 5.482. CEPT countries are hence encouraged to provide elements on their network deployment.

This issue is of great concern for meteorological community since these measurements are currently operational and are used on a world-wide basis, exchanged between the meteorological organisations in all regions to be inputted in Numerical Weather Models. It should be noted that measurements over a given country are not only used for weather forecasts over this country but lead to global modelling of the atmosphere used by all National Weather Services (NWS). It is hence a global responsibility from each individual country vis-a-vis all others, in particular with regards to their international commitments related to the World Weather Watch of the World Meteorological Organisation.

Working Party 9D at its June 2006 meeting has made substantial progress towards a preliminary draft new Recommendation for techniques that can be undertaken by the fixed service (FS) to facilitate sharing between the fixed service and the Earth exploration-satellite service (EESS) (passive) in the 10.6 – 10.68 GHz band (Document 9D/219, Annex 6), as well as on a working document towards a draft new report summarizing the sharing studies conducted by Working Party 9D (Document 9D/219, Annex 9).

Working Party 9D provided to the August 2006 [meeting of Working Party 7C](#) proposed modifications to the Draft CPM-Text (Document 7C/230) including proposals on the acceptable sharing criteria for Working Party 9D (maximum P-P transmitter power < [-13 to -18] dBW, maximum P-MP base station transmitter power ≤ [-20] dBW, maximum P-MP subscriber station transmitter power ≤ -10 dBW, maximum P-MP base

station eirp \leq [-7] dBW, power setting control including [10 dB] ATPC, elevation angle range $<$ [20], no limits on deployment density).

Working Party 7C at its August 2006 meeting further refined the sharing studies ([Document 7C/259 Annex 10](#)) taking into account the information provided by Working Party 9D and concluded about technical and operational characteristics of passive sensors in the Earth exploration-satellite (passive) and space research (passive) services to facilitate sharing with the fixed and mobile services in the band 10.6-10.68 GHz (Document 7C/259 Annex 7 ([Draft New Recommendation ITU-R RS.\[10/36 GHZ MITIGATE\] adopted by SG7 in February 2007](#))). The sharing studies between EESS (passive) and FS stations described in the Preliminary Draft Reports from Working Party 7C and 9D (Document 7C/259 Annex 10 ([Draft New Report ITU-R RS.\[10.6 GHZ SHARING\] adopted by SG7 in February 2007](#))) and Document 9D/219 Annex 7) indicate that the interference levels exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 of -156 dBW/100 MHz for current passive sensors by 5 to 25 dB over 0.1% of a passive sensor measurement area depending on the FS station deployment density or by 17 dB over 0.1% of the area of particular countries that carried out studies.

Sharing studies between EESS (passive) and MS stations were also conducted and the interference level exceeds the permissible interference criteria for current passive sensors by 14 dB. In this sharing study, the effect of activity factor of MS stations was included.

[At its February 2007 meeting, SG7 adopted the Draft New Report ITU-R RS.\[10.6 GHZ SHARING\] \(Document 7/66\) on sharing of the 10.6-10.68 GHz band by the fixed and mobile services and the Earth exploration-satellite service \(passive\), summarising the result of the studies performed by WP 7C in close liaison with WP 9D and 8A. Furthermore, SG7 adopted the Draft New Recommendation ITU-R RS.\[10/36 GHZ MITIGATE\] \(Document 7/67\) on technical and operational characteristics for passive sensors in the Earth exploration-satellite service \(passive\) to facilitate sharing of the 10.6 – 10.68 GHz and 36 – 37 GHz bands with the fixed and mobile services.](#)

A number of technical and operational characteristics of EESS (passive) sensors and FS and MS systems were considered and evaluated as possible approaches to mitigate or minimize the level of interference. Table 2 below which is also contained in the CPM text identifies possible limits on the technical and operational characteristics of these systems that can facilitate the sharing of the 10.6-10.68 GHz band between EESS (passive) on one hand and the FS and MS on the other hand.

Each of the individual entries in this table, such as maximum power, is based on simulations that assume that no mitigation techniques are applied by the active service unless specified in the table. The limits indicated in the table may be relaxed if multiple sharing criteria or mitigation techniques are applied simultaneously. Possible mitigation techniques include flexible power setting, automatic transmitter power control (ATPC) to mitigate fading, and use of high performance directional antennas. The interference levels to EESS (passive) indicated by the results of simulation studies using the values indicated in this table exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 for some of the deployment models considered in the sharing studies. Nevertheless, such a result is considered acceptable for EESS (passive) systems in view of the need to find an equitable burden sharing in establishing sharing criteria for the services sharing this band.

Table 2

Possible sharing criteria in the band 10.6-10.68 GHz

EESS (passive)	Fixed service	Mobile service
incidence angle \leq 60 degrees, where the incidence angle is defined as the angle at the Earth's surface between the local vertical and the centre of the passive sensor antenna beam	elevation angle \leq 20°	
spatial resolution \leq 50 km, where the spatial resolution is defined as the maximum cross-section of the passive sensor -3dB contour on the Earth's	maximum P-P transmitter power: \leq -15 dBW In case ATPC is used, this power	maximum transmitter power \leq -17 dBW

surface	limit can be increased by a value corresponding to the ATPC range, up to a maximum of -3 dBW. maximum P-MP transmitter power: ≤ -17 dBW hub stations ≤ -10 dBW customer stations	
main beam efficiency ≥ 85 %, where the main beam efficiency is defined as the energy (main and cross-polarization components) within 2.5 times the -3 dB beamwidth region, relative to the total energy within all angles	maximum P-MP hub station eirp ≤ -4 dBW	

At CPM considerable discussion took place on different issues in relation to this band. In particular modifications were introduced to the draft CPM-Text in order to reflect the particular case of one-way broadcast auxiliary service (BAS) systems, to clarify the understanding of the influence of the use of ATPC on the maximum output power (Table 1.2.1 of CPM-Report = Table 2 above) as well as considerable revision to the regulatory and procedural considerations for Methods B1 and B2.

List of relevant documents

ECC Report 17 on sharing between EESS (passive) and video SAP/SAB links in the band 10.6-10.68 GHz

Document 7C/217, Liaison Statement to WP 7C regarding studies relating to WRC-07 AI 1.2

Document ECC/CPG07 PT2(06)24, Interference to passive sensors in the 10.6-10.68 GHz band

Document 9D/219 Annex 6, Working document toward preliminary draft new recommendation – Technical and operational characteristics of systems in the fixed service to facilitate sharing with the Earth exploration-satellite (passive) and space research (passive) services in the band 10.6-10.68 GHz

Document 9D/219 Annex 9, Working document towards a preliminary draft new report – Sharing studies between fixed stations and passive sensors in the frequency band 10.6-10.68 GHz

Document 7C/230, Liaison statement from Working Party 9D to Working Party 7C on studies relating to Agenda item 1.2 and draft CPM Report text

Draft New Report ITU-R RS.[10.6 GHZ SHARING] (Document 7/66) on sharing of the 10.6-10.68 GHz band by the fixed and mobile services and the Earth exploration-satellite service (passive)

Draft New Recommendation ITU-R RS.[10/36 GHZ MITIGATE] (Document 7/67) on technical and operational characteristics for passive sensors in the Earth exploration-satellite service (passive) to facilitate sharing of the 10.6 – 10.68 GHz and 36 – 37 GHz bands with the fixed and mobile services.

Actions to be taken

Proposals from outside CEPT

Regional telecommunication organisations

APT (January 2007)

With respect to the sharing criteria between active and passive services in the band 10.6 – 10.68 GHz, the preliminary APT common view is as follows:

The protection of passive services should not place additional undue constraints on other allocated services. Sharing criteria should be appropriately defined based on the results of the ITU-R studies.

CITEL (October 2006)

Canada currently licenses fixed systems in the band 10.6-10.68 GHz. In addition, Canadian manufacturers produce point-to-point and point-to-multipoint equipment for both the Canadian and foreign markets. There is also an interest from Environment Canada to use the data gathered by existing or planned missions such as the Advanced Microwave Scanning Radiometer (AMSR), the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and WINSAT. Since Canada has interest in both services, Canada intends to participate in ITU-R studies with a view to accommodate these Canadian interests.

The Brazilian Administration supports the studies ongoing within ITU-R WPs 7C and 9D. In addition, it should be noted that the band 10.5-10.65 is extensively used in Brazil for fixed wireless access systems according to Annex 1 of Recommendation ITU-R F.1568.

To the extent that, in Uruguay, the 10 to 10.68 GHz band is used by the fixed terrestrial service as envisaged by RR, the present Administration considers that, if band sharing criteria are established with SETS (passive), no unnecessary limitations should be imposed on the fixed service.

RCC (December 2006)

The frequency band 10.6-10.68 GHz is used by the EESS (passive) systems, the protection ratio for which are given in Recommendation ITU-R SA.1029-2.

The sharing criteria of usage of the frequency band 10.6-10.68 GHz by the fixed service (FS)/ mobile service (MS) and EESS (passive)/SRS (passive) systems shall not place constraint on the usage of this frequency band for the FS/MS (the limits indicated in RR 5.482 shall not be more stringent).

Arab Group (CPM07-2)

Statement of a list of Arab countries included in the CPM-Report:

“The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia **object** to any regulatory solution imposing hard limits on the use of FS and MS in the band 10.6-10.68 GHz and on proposing the use of the band 18.0-18.1 GHz.”

International organisations

NATO (February 2007)

NATO Military Position

Sharing criteria for the band 10.6-10.68 GHz must not adversely affect the use of the lower adjacent band by military radars.

WMO and EUMETNET (January 2007)

WMO and EUMETNET stress the need for the protection of the 10.6-10.68 GHz passive band (the band 10.68-10.7 GHz is covered under RR footnote 5.340). However, current deployments of FS and/or MS links in certain administrations already create significant levels of passive measurement degradation in this band. Measurement degradation in the 10.6-10.68 GHz passive band is unacceptable and therefore WMO and EUMETNET propose the identification of maximum power and eirp for fixed and mobile services to protect EESS (passive) in the 10.6-10.68 GHz band, such as those given in Table 1.2-1 of the CPM text.

Regional organisations

ASBU (Arab States Broadcasting Union)

The protection of passive services should not place additional undue constraints on other allocated services. Mitigation techniques for both EESS and FS/MS to reduce the interference level should be studied. The ASBU does not agree to strengthen the limitation on the transmitting power beyond those contained in the current No. 5.482 (eirp limited to 40 dBW and power delivered to the antenna of -3 dBW) or put any constraints regarding operation time of fixed or temporary nomadic TV links in this band.