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CEPT BRIEF ON AGENDA ITEM 1.6

1.6 to consider possible additional primary allocations:

1.6.1 to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;

1.6.2 to the fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU‑R studies, in accordance with Resolutions 151 (WRC‑12) and 152 (WRC‑12), respectively.

# ISSUE

## Resolution 151 (WRC-12)

“The WRC-12, considering

a) that the existing unplanned bands for the fixed-satellite service (FSS) in the 10-15 GHz range are extensively used for a large variety of applications, and these applications have triggered a rapid rise in the demand for this frequency range …

g) that there is a need to resolve the shortage of spectrum in Region 1 and Regions 2 and 3 …, such that the rapid growth of spectrum demand in considering a) could be met and the limited spectrum resources could be used in an efficient and economical way in accordance with the principle of Article 44 of the ITU Constitution …,

resolves to complete, for WRC-15

i) studies of possible bands for a new primary allocation to the fixed-satellite service of 250 MHz in both directions in Region 1 within the bands 10-17 GHz, with particular focus on the frequency range that is contiguous (or near contiguous) to the existing fixed-satellite service allocations, taking into account sharing and compatibility studies, while protecting the existing primary services in the band(s); …”

Resolution 152 (WRC-12)

“resolves to complete, for WRC-15:

i) studies of possible bands for a new primary allocation to the fixed-satellite service in the Earth-to-space direction of 250 MHz in Region 2 and 300 MHz in Region 3 within the bands 13-17 GHz, with particular focus on the frequency range that is contiguous (or near contiguous) to the existing fixed-satellite service allocations, taking into account sharing and compatibility studies, while protecting the existing primary services in the band(s); …”]

# CEPT position

Agenda Item 1.6.1

СEPT supports the need for additional primary allocations of 250 MHz (Earth-to-space and space-to-Earth) to the GSO-FSS in frequency bands between 10 and 17 GHz in Region 1. Studies should demonstrate compatibility with the existing services before a primary allocation is to be made to the FSS in a particular frequency band.

Based on the sharing studies results, CEPT identifies the frequency band 13.4-13.65 GHz for a new primary allocation (space-to-Earth) of 250 MHz to GSO FSS subject to implementation of the relevant mitigation technique(s).

There is no European Common Proposal (ECP) for FSS (Earth-to-space) allocation.

Mitigation measures need to be implemented to protect the existing services, as well as RAS in the adjacent band 15.35-15.4 GHz (RR 5.340).

Moreover, the deployment of transmitting Earth stations for the ACES systems in the band 13.4-13.75 GHz operating under the standard frequency and time signal-satellite would need to be ensured without additional constraint that may result from the protection of FSS receiving Earth stations.

CEPT does not support additional allocation to FSS in frequency bands 10.6-10.68 GHz and 15.35-15.4 GHz due to the difficulty of sharing with passive services operating in these bands.

CEPT does not support additional allocation to FSS (Earth-to-space) in the frequency band 13.25-13.75 GHz due to the difficulty of sharing with RNS/ARNS and EESS operating in this band.

Agenda Item 1.6.2

CEPT considers that any additional allocation of 250 MHz to FSS (Earth-to-space) in Region 2 and 300 MHz in Region 3 in frequency bands between 13 and 17 GHz to achieve worldwide primary allocation could be made only while ensuring compatibility with existing services in these frequency bands, in particular to radio services also allocated in Region 1.

CEPT does not support additional allocation to FSS (Earth-to-space) in the frequency bands 13.25-13.75 GHz and 15.35-15.4 GHz due to the difficulty of sharing with active and passive services operating in these bands.

# Background

During study cycle leading up to WRC-12, it was highlighted that there is a demand for additional spectrum allocation to fixed-satellite service (FSS) in all three Regions in Ku band. The existing unplanned bands for FSS in the 10-15 GHz range are extensively used for a large variety of applications, and these applications have triggered a rapid rise in the demand for this frequency range. Europe alone demonstrates that the FSS spectrum in the 10-15 GHz range is effectively exhausted and becoming increasingly more congested resulting in more cases of harmful interference.

Therefore, to solve the Ku FSS spectrum shortage WRC-12 adopted Resolution 151 (WRC-12) and Resolution 152 (WRC-12) proposing to consider, as a matter of urgency, additional primary allocations to unplanned FSS to address the asymmetry in Earth-to-space and space-to-Earth FSS allocations in Regions 2 and 3, and also to consider possible additional primary allocations to the unplanned FSS (Earth-to-space and space-to-Earth) in Region 1.

It should be noted that a world-wide allocation to FSS has a significant advantage over a regional one. For example, unified FSS allocation in Regions 1 and 3 is important in terms of planning and designing of satellite networks, as well as achieving effective coverage area.

Also, in terms of improving spectral efficiency and convenience of communication system architecture, it is desirable that an additional spectrum for FSS be allocated in a continuous part of the spectrum that is contiguous to the existing fixed-satellite service allocations.

According to Resolution 151 (WRC-12) and Resolution 152 (WRC-12), studies of possible bands should be conducted for the purpose of identifying additional spectrum of 250 MHz to the fixed-satellite service (Earth-to-space and space-to-Earth) in frequency bands between 10 and 17 GHz in Region 1 and of 250 MHz to the fixed-satellite service (Earth-to-space) in Region 2 and of 300 MHz in Region 3 within the range 13-17 GHz. The band 14.5-14.8 GHz (Earth-to-space) is being considered, noting that the band is already allocated for the fixed-satellite service (Earth-to-space) limited to feeder links for the broadcasting satellite service outside Europe.

ITU-R Sharing and Compatibility study results

The following frequency bands were considered during the study: 10-10.45 GHz, 10.45-10.5 GHz, 10.5-10.55 GHz, 10.55-10.6 GHz, 10.6-10.68 GHz, 13.25-13.4 GHz, 13.4-13.75 GHz, 14.5-14.8 GHz, 14.8-15.35 GHz, 15.35-15.4 GHz, 15.4-15.7 GHz, 15.7-16.6 GHz and 16.6-17 GHz.

The frequency band 15.35-15.4 GHz was excluded from consideration due to the difficulty of sharing with passive services (EESS, SRS and RAS).

Study results for proposed FSS (space-to-Earth) allocation

The current results of ITU-R study for proposed FSS (space-to-Earth) allocation showed that in frequency band:

* 10-10.6 GHz

The sharing with FS and RLS is not possible without the use of additional mitigation techniques and restrictions to new FSS. E.g. e.i.r.p. spectral density of FSS space station should be decreased by 6 dB (to 34 dBW/MHz) and appropriate pfd limits to FSS space stations should be applied to protect FS stations. For protection of RLS e.i.r.p. spectral density of FSS space station should be decreased by 24 dB (pfd level –146 dBW/m2 • MHz).

* 10.6-10.68 GHz

Interference protection level of passive services (EESS, SRS) and RAS isn’t met and sharing with FS is not possible without the use of mitigation techniques and restrictions to new FSS (similar to those described for the frequency band 10-10.6 GHz).

* 13.25-13.4 GHz

Compatibility between the FSS (space-to-Earth) and EESS (active) may be possible after considering the simultaneous allowable level of aggregate interference caused from all EESS (active) systems to FSS ES. FSS (space-to-Earth) operations would be compatible with EESS (active) systems, assuming a backscatter coefficient of 14 dB for altimeters and of -5 dB for precipitation radars. The simulation is based on a scenario where each GSO, amongst a fleet of 120 GSO deployed every 3° on the GSO arc, looks at a specific Earth station and transmits 40 dBW/MHz. A pfd limit on the ground of -122 dB(W/m2 • MHz) for all elevation angles is adequate to protect EESS (active) operating in the 13.25-13.75 GHz band, and should this limit be adopted for the FSS downlink around 13.5 GHzand it must become compulsory in the RR.

Given the features of the use of SRS (active) in the frequency band 13.25-13.4 GHz, problems of compatibility with the FSS (space-to-Earth) proposed is not expected.

Interference generated by FSS (space-to-Earth) proposed towards ARNS (DNS systems on board airplanes) in the common frequency band 13.25-13.4 GHz significantly exceeds the ARNS DNS protection criteria levels by a large margin of 14 dB. No studies have been performed to assess the probability and duration of interference from ARNS systems on the receive FSS ES.

* 13.4-13.75 GHz

The sharing with FS, MS, RLS, RNS is possible by applying appropriate pfd limits to FSS space stations. A pfd limit on the ground of -122 dB(W/m2 • MHz) for all elevation angles is adequate to protect EESS(active) operating in the 13.25-13.75 GHz band, and should this limit be adopted for the FSS downlink around 13.5 GHz, it must become compulsory in the RR.

Sharing with SRS could be achieved through coordination and technical measures e.g. application of RR No. 9.7 and RR No. 9.21 together with setting minimum orbital separation at the GSO between SRS DRS space station and nearest FSS space stations and limiting e.i.r.p. spectral density for FSS downlinks. No difficulty is expected with regard of sharing with SFTSS (Earth-to-space).

ARNS DNS systems operating in 13.25-13.4 GHz may cause out-of-band interference into the FSS (space-to-Earth) in the band 13.4-13.75 GHz near the 13.4 GHz edge of the band.

* 14.5-14.8 GHz and 14.8-15.35 GHz

Protection from FSS (space-to-Earth) to AMS/MS and FS can be achieved by appropriate pfd limits imposed to FSS space stations, however AMS could create interference to FSS earth station at distances up to 572 km considering alignment FSS ES, AMS GS, MS aircraft and GSO FSS satellite. With respect to AMS and MS interference into FSS earth stations, one study shows that the FSS protection criterion may be exceeded at distances of up to 572 km and 46 km, respectively (not accounting for terrain obstructions).

Compatibility between FSS (space-to-Earth) and SRS DRS forward link is achievable with coordination measures, considering the same status for SRS and FSS. Taking into account that SDS DRS inter-orbit links are restricted to the band above 14.8 GHz, sharing between FSS and SRS in frequency band 14.5-14.8 GHz is feasible and subject to coordination under RR No. 9.7.

Compatibility of the GSO FSS systems with HEO NGSO SRS systems in the 14.8-15.35 GHz band (space-to-Earth) could be feasible, assuming the same regulatory status for existing SRS applications and FSS. Taking into account that there is a potential of interference into FSS downlinks from NGSO SRS downlinks (I0/N0 may exceed –12.2 dB for up to 1.75% of time for the same service area case), new FSS allocation in the 14.8-15.35 GHz (space-to-Earth) could be implemented on a condition that GSO FSS systems shall not claim protection from existing SRS applications (HEO NGSO SRS downlinks).

The calculation results of unwanted emissions in the spurious domain in the RAS frequency band 15.35-15.4 GHz from FSS (space-to-Earth) satellite operating in the frequency band 14.85-15.1 GHz showed that compatibility is feasible.

* 15.4-17 GHz

Sharing with RLS could be achieved with appropriate pfd limits imposed to FSS space station. pfd limits ranging from -98 dB(W/(m2 • MHz)) to -142 dB(W/(m2 • MHz)) would be required to protect existing RLS systems operating in this band.

Sharing studies between ARNS and FSS (space-to-Earth) were not conducted.

FSS receiver earth stations not having sufficient discrimination (up to 60 dB) at low elevation angle could be subject to interference from ARNS allocated at 15.4-15.7 GHz and RLS (airborne and ground-based systems).

Study results for proposed FSS (Earth-to-space) allocation

The current results of ITU-R study for proposed FSS (Earth-to-space) allocation showed that in frequency band:

* 13.25-13.4 GHz

FSS (Earth-to-space) emissions will exceed the protection criteria for EESS (active) altimeter measurement areas of interest (inland lakes, rivers, reservoirs, coasts) as well as EESS (active) precipitation radars. No mitigation technique to address this incompatibility has yet been identified.

Given the features of the use of SRS (active) in the frequency band 13.25-13.4 GHz, problems of compatibility with the FSS (Earth-to-space) proposed is not expected.

Interference generated by FSS (Earth-to-space) proposed towards ARNS (DNS systems on board airplanes) in the common frequency band 13.25-13.4 GHz significantly exceeds the ARNS DNS protection criteria levels by very large margin +53.7 dB.

* 13.4-13.75 GHz

FSS (Earth-to-space) emissions could have significant impact on RLS without mitigation techniques and restrictions to new FSS such as indicated in RR No. 5.502 for frequency band 13.75-14 GHz. For the HIWRAP system, further regulatory mechanisms may be needed to ensure that protection can be achieved in the above provisions.

ARNS DNS systems operating in 13.25-13.4 GHz may cause out-of-band interference into the FSS (space-to-Earth and Earth-to-space) in the band 13.4-13.75 GHz near the 13.4 GHz edge of the band.

Sharing of FSS (Earth-to-space) with SRS DRS return feeder links is achieved by providing sufficient separation between FSS uplink earth stations and the DRS downlink earth stations. Necessary separation distances could be defined though coordination process (application of RR No. 9.17A). Sharing of FSS (Earth-to-space) with SRS DRS (System 1) forward links will not be ensured without adequate mitigation techniques which have not been identified. The impact on SRS DRS (System 2) forward links from FSS (Earth-to-space) links was not studied.

FSS (Earth-to-space) emissions will exceed the protection criteria for EESS (active) altimeter measurement areas of interest (inland lakes, rivers, reservoirs, coasts) as well as EESS (active) precipitation radars without specific mitigation technique which has not been identified.

There is some uncertainty about sharing between the FSS (Earth-to-space) and the SFTSS (Earth-to-space). This allocation will be used by the ESA system ACES, which receiver will be on board of ISS.

* 14.5-14.8 GHz

Eight studies were performed and the results from all show that interference from the FSS (Earth-to-space) into the AMS exceed the protection criterion depending on the distance between the AMS receiving station and the FSS earth station. Nevertheless, the AMS (aircraft and land) stations are mobile in nature; therefore, setting a minimum separation distance with respect to a transmitting FSS earth station is not possible in practice.

* Study #1 (static analysis) showed that VSAT FSS earth stations exceed the AMS protection criterion at distances up to 575 km when the airborne station operates at 19 km in altitude
* Study #1A (static analysis) showed that the percentage of total square area where the AMS protection criteria is exceeded ranges from 475 km² or 0.05% to 7 000 km² or 5.57% of the area considered in this study (see Figure 10-27) when the FSS earth station is located at distance from 550 km, 1.10% at 400 km and 0.15% to 200 km with respect to the AMS ground station
* Study #2 (dynamic analysis) showed that the percentages of interference occurring from a VSAT FSS earth station into an AMS airborne station operating at 19 km and 2.4 km were 0.9% and 7.3% respectively
* Study #3 (static analysis) showed that using characteristics from Appendix 30A feeder-links currently allocated in this band exceed the AMS protection criteria at distances of 400 – 500 km when the AMS airborne station operates at 19 km in altitude
* Study #4 (dynamic analysis) showed that FSS earth station antenna size is irrelevant to the occurrence of interference that exceeds the I/N protection criterion of the AMS. The percentage of exceeding the protection criterion of an AMS station operating at 19 km was approximately 4% when a separation distance of 250 km is considered between the AMS ground station and FSS earth station
* Study #4A (dynamic analysis) showed that the interference relationship between the FSS earth station with the AMS airborne station is dependent on (1) the distance between the FSS earth station and AMS ground station and (2) the altitude of the AMS airborne station where the likelihood of interference occurring from an FSS earth station into an AMS airborne station operating at 19 km was 0% when a separation distance of 482 km is considered between the AMS ground station and FSS earth station
* Study #5 (dynamic analysis) showed that considering an AMS aircraft operating at altitudes between 1000 m and 20000 m, the probability that the interference from an FSS earth station exceeds the AMS protection criterion is as follows :

Between 24% and 32% for an AMS aircraft station operating between 0 to 200 km from the FSS earth station. Up to 10% for an AMS aircraft station operating between 0 to 450 km from the FSS earth station.

* Study #6 (dynamic and operational analysis) showed that a single FSS earth station generates a zone where interference exceeds the protection criterion extending up to 61.7 km in length and 26.7 km in width (with an associated probability varying from 1% to 100%) aligned with the main-lobe of the FSS earth station. Considering various aircraft speeds (up to 200 m/s) and altitudes (3 000 m to 10 000 m), when the I/N protection criterion is exceeded for AMS systems, the link recovery procedure could imply a service interruption duration up to several minutes with unacceptable operational impacts on AMS.

Views on the Summary of the studies on FSS (Earth-to-space) with respect to AMS/MS:

View 1: “The band 14.5-14.8 GHz is already allocated to the FSS (Earth-to-space) in all Regions except over Europe but is limited to BSS feeder links. This sharing situation is similar to current sharing between the FSS (Earth-to-space) feeder links for the broadcasting-satellite service (BSS) and the MS/AMS. For example, results obtained in all studies with AMS are similar to Study #3 which represents the current sharing situation with AP30A feeder-link. Previous experience has demonstrated practical possibility of coexistence between FSS (E-s) and AMS. Therefore, provision of compatibility conditions between FSS (Earth-to-space) and MS/AMS stations in frequency band 14.5-14.8 GHz is possible based on coordination measures and application of geographic separation using RR Appendix 7 methodology. WRC-07 approved a specific mechanism under Table 10 of Appendix 7 to address compatibility between AMS and other services as FSS (Earth-to-space). A predetermined coordination distance of 500 km was approved to ensure a mutual coexistence between services. This distance of 500 km was validated by WP4A studies as it’s fully in line with results performed by WP4A studies.

In addition, the compatibility analysis shall only address compatibility at the border between 2 countries and not within the country, as each country could decide which services it wants to implement on its own territory as soon as the decision of an administration will not impose constraints of its neighbours. Therefore, as the current regulatory mechanism (coordination distance of 500 km) ensure full protection of AMS operation, the sharing between the proposed FSS and the incumbent AMS is feasible.”

View 2: “It is essential to realize that although a coordination procedure is currently in place in Regions 2 and 3 for the coordination between FSS (Earth-to-space) feeder links and the MS/AMS, no FSS earth station is currently notified in this band and associated to an operational FSS space station in this band; in consequence, there is no evidence that the sharing situation is real and currently implemented. Moreover, in the case that non-notified FSS earth stations were in operation under this allocation, there is no evidence that they can effectively coexist with the AMS without imposing undue operational constraints to AMS systems. It is also noted that the coordination procedure is impractical to implement given the ubiquitous nature of AMS network. Even in the case that a coordination procedure would be completed, it will impose large exclusion zones to the operation of AMS systems.

It shall be noted that the AMS land station can be fixed or transportable. Due to the ubiquitous nature of the AMS aircraft position, all the studies (statics and dynamics/operational), confirm that the protection of AMS systems can only be achieved when separation distances between the transmitting FSS earth station and the AMS aircraft station are in the range of 400-575 km for aircraft altitude of 19 km and in the range of 150-180 km for aircraft altitude of 2.4 km. In addition, when considering aircraft to aircraft communications, there is a high probability of interference even for larger separation distances. Probabilities of interference reach 10% in case of AMS aircraft-FSS earth station separation distance in the range of 0 to 450 km and between 24% and 32% in case of AMS aircraft-FSS earth station separation distance in the range 0 to 200 km. The results for this scenario do not depend on the AMS land station position. Moreover, it has been demonstrated by two studies that the implementation of one FSS earth station creates an exclusion zone of operation for the AMS aircraft of several hundred thousand square kilometres. The results of studies confirm that the sharing between the proposed FSS and the incumbent AMS is not feasible.”

The percentage of the potential interference impact from AMS into FSS GSO receiver is very limited (i.e. FSS availability greater than 99.96% considering a G/T of 7 dB/K). However taking into account the interference environment due to the present FSS (Earth-to-space) allocation under RR No. 5.510 and existing coordination provisions it could be conclude that sharing between FSS (Earth-to-space) not subject to RR No. 5.510 and AMS/LMS also is feasible at least outside Europe.

The percentage of the potential interference impact from AMS into FSS GSO receiver is limited (i.e. FSS availability greater than 99.96% considering a G/T of 7 dB/K). However taking into account the interference environment due to the present FSS (Earth-to-space) allocation under RR No. 5.510 and existing coordination provisions it could be conclude that probability of AMS causing harmful interference to the GSO FSS space station receiver not subject to RR No. 5.510 is negligible at least outside Europe.

* With respect to the BSS feeder links under RR No. 5.510, sharing is possible with appropriate regulatory provisions and technical coordination criteria for the new FSS assignments to ensure protection and integrity of AP 30A Plan and List assignments.
* Compatibility between FSS (Earth-to-space) and SRS is achievable with coordination measures, considering the same status for SRS and FSS. Taking into account that SDS DRS inter-orbit links are restricted to the band above 14.8 GHz, sharing between FSS and SRS in frequency band 14.5-14.8 GHz is feasible and subject to coordination under RR No 9.7.

Compatibility is ensured between FSS (Earth-to-space) and radioastronomy service (RAS), operating in the adjacent band 14.47-14.5 GHz. The protection criteria of RAS stations under FSS unwanted emissions impact are met without any limitations.

* 14.8-15.35 GHz

Regarding compatibility with the MS, the same conclusions as in the band 14.5-14.8 GHz apply.

Compatibility between FSS (Earth-to-space) and SRS (except return inter-orbit links) is achieved with coordination measures, considering the same status for SRS and FSS. Compatibility of the FSS uplinks with respect to the SRS DRS return inter-orbit links will not be met without adequate mitigation techniques which need to be defined (e.g. minimum orbital separation between DRS and FSS satellites, limits on off-axis e.i.r.p density of associated FSS earth stations, etc). Further studies between FSS uplinks and NGSO SRS downlinks are required.

Interference from FSS (Earth-to-space) into the FS may exceed the protection criteria at hundreds of km without careful siting of stations, off-axis antenna gains of both systems, shielding, and avoidance of overlapping channels. The coordination between FSS (Earth-to-space) and FS is manageable for a small number of FSS earth stations.

* 15.4-17 GHz

Separation distance up to 486 km are required to ensure protection of ARNS allocated in the frequency band 15.4-15.7 GHz from FSS uplinks. Moreover if FSS receiving space stations do not have sufficient antenna discrimination, these may be subject to interference from existing ARNS systems in this band.

Separation distances of about 420 km (not taking into account terrain obstructions) are required to ensure protection of RLS airborne systems operating in this band. Moreover, if FSS receiving space stations do not have sufficient antenna discrimination at low elevation angles, these may be subject to interference from existing RLS airborne systems in this band. Coordination distances up to 304 km are required to protect RLS System 5 (Recommendation ITU-R M.1730-1) operation in the frequency band 15.7-16.6 GHz. Separation distances ranging between 5 and 53 km are required when FSS earth station PSDs is reduced from –55 dBW/Hz to–60 dBW/Hz to ensure protection of RLS ground-based systems.

# List of relevant documents

* Doc. 4/112 - Draft new Report ITU-R S.[R1.FSS] – Assessment on use of spectrum in the 10-17 GHz band for the GSO fixed-satellite service in Region 1.
* Doc. 4/115 - Draft new Report ITU-R S.[R2R3.FSS] – Assessment on use of spectrum in the 13-17 GHz range for the GSO fixed-satellite service in Regions 2 and 3.
* Doc. 4/108 - Draft new Report ITU-R S.[FSS.DEPLOYMENT] – GSO FSS deployment characteristics in the 14-14.5 GHz band
* Final Report of the CPM15-2 to WRC-15, Chapter 4 - Satellite services, Agenda item 1.6.

# Actions to be taken

none

# Relevant information from outside CEPT (examples of these are below)

## European Union (date of proposal)

## Regional telecommunication organisations

APT (July2015)

Document APG15-5/OUT-13 (31 July 2015)

AI 1.6.1 APT’s Views and Position:

APT Members are of the view that it should be ensured that the possible additional allocations to the FSS (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1 under the WRC-15 Agenda item 1.6.1 shall not cause any constraints to the existing primary services in Region 3.

APT Members support no change (NOC) method in the frequency bands 10-10.68 GHz, 13.25-13.4 and 14.8-17 GHz due to incompatibility with existing services.

APT Members do not support the additional allocation to the FSS (Earth-to-space) in Region 1 in the frequency band 13.4-13.75 GHz due to incompatibility with existing services.

APT Members do not support the additional allocation to the FSS (space-to-Earth) in Region 1 in the frequency band 14.5-14.8 GHz due to incompatibility with existing services.

APT Members support to make an additional allocation of 250 MHz to the FSS (space-to-Earth) in Region 1 in the frequency band 13.4-13.65 GHz.

APT Members are of the view that, if consideration is given to the band 13.4-13.75 GHz for possible allocation to the FSS (space-to-Earth) in Region 1, the protection of EESS (active) should be ensured and No. 22.2 shall not be applied between FSS in Region 1 and EESS (active) in Region 3.

Some APT Members have different views on the additional frequency allocation of 250 MHz to the FSS (space-to-Earth) in Region 1 in the frequency band 13.4-13.65 GHz.

Some APT Members support the use of the band 14.5-14.8 GHz for FSS in Region 1 other than those referred to in RR 5.510. However, these Member States are of the view of that if such consideration is given, there is a necessity to take appropriate measures to ensure the integrity and adequate protection of the AP30A Plan and List from any new fixed-satellite service utilization of the bands and protection of the MS and AMS in the band should be ensured.

Views were expressed that to obtain the pfd coordination threshold, MSPACE simulations have been run to calculate the maximum pfd that a new assignment in Region 1 and 3 Feeder link Plan and List could produce in the orbital position of an existing BSS feeder link Plan assignment and not “affect” it. Views were also expressed that an assignment is considered as not affected when the equivalent protection margin (EPM) of the existing AP 30A assignment does not fall more than 0.45 dB below 0 dB, or, if already negative, more than 0.45 dB. Extrapolating, the pfd value obtained has been proposed as threshold for coordination for a new assignment in the FSS (Earth-to-space) allocation with respect to any existing BSS feeder link. Further information could be found in the CPM Report to the WRC-15.

Some APT Members support NOC to the Radio Regulations in the band 14.5-14.8 GHz.

Views were diverging and no consensus can be reached, with that, it was decided not to develop PACP regarding the modification to the existing FSS allocation in the Earth-to-space direction in Region 1 in the 14.5-14.8 GHz band.

APT Proposals (as PACP):APT Members support no change (NOC) method in the frequency bands 10-10.68 GHz, 13.25-13.4 and 14.8-17 GHz due to incompatibility with existing services.

APT Members do not support the additional allocation to the FSS (Earth-to-space) in Region 1 in the frequency band 13.4-13.75 GHz due to incompatibility with existing services.

APT Members do not support the additional allocation to the FSS (space-to-Earth) in Region 1 in the frequency band 14.5-14.8 GHz due to incompatibility with existing services.

APT Members support to make an additional allocation of 250 MHz to the FSS (space-to-Earth) in Region 1 in the frequency band 13.4-13.65 GHz.

Document APG15-5/OUT-14 (31 July 2015)

AI 1.6.2 APT’s Views and Position:

Some APT Members support an allocation but cannot agree which bands to be allocated for addition FSS (Earth-to-space).

APT Members support no change (NOC) method in the frequency bands 13.25-13.4GHz and 14.8-17GHz due to incompatibility with existing services.

Some APT Members are of the view that, the band 13.40-13.75 GHz should be excluded from the candidate bands under Agenda item 1.6.2 since ITU-R studies indicated that FSS (Earth-to-space) emissions will exceed the protection criteria for EESS and no mitigation technique to address this incompatibility has yet been identified. Some other APT members support the allocation for the FSS (Earth-to-space) in the band 13.40-13.75 GHz. Views were diverging and no consensus can be reached, with that, it was decided not to develop PACP in the 13.4-13.75GHz band.

Some APT Members support the use of the band 14.5-14.8 GHz for FSS other than those referred to in RR 5.510. However, these Member States are of the view of that if such consideration is given, there is a necessity to take appropriate measures to ensure the integrity and adequate protection of the AP30A Plan and List from any new fixed-satellite service utilization of the bands and protection of the MS and AMS in the band should be ensured.

Some APT Members are of the view that to obtain the pfd coordination threshold, MSPACE simulations have been run to calculate the maximum pfd that a new assignment in Region 1 and 3 Feeder link Plan and List could produce in the orbital position of an existing BSS feeder link Plan assignment and not “affect” it. An assignment is considered as not affected when the equivalent protection margin (EPM) of the existing AP 30A assignment does not fall more than 0.45 dB below 0 dB, or, if already negative, more than 0.45 dB. Extrapolating, the pfd value obtained has been proposed as threshold for coordination for a new assignment in the FSS (Earth-to-space) allocation with respect to any existing BSS feeder link. Further information could be found in the CPM Report to the WRC-15.

Some APT Members support NOC to the Radio Regulations in the band 14.5-14.8GHz.

Views were diverging and no consensus can be reached, with that, it was decided not to develop PACP in the 14.5-14.8GHz band.

APT Proposals (as PACP):

APT Members support the no change (NOC) method in the frequency bands 13.25-13.4GHz and 14.8-17GHz due to incompatibility with existing services.

ATU (July 2015)

Africa supports allocation in the band 10-17 GHz for FSS, but existing bands utilization should be protected, and specific bands will be identified after studies are completed.

APM15-4 Outcome (African Common Position):

|  |  |  |
| --- | --- | --- |
| Band No. | Band (GHz) | African Common positions |
| A | 10-10.5 | Earth-to space No Change  Space-to-Earth Method AA1 (NOC) |
| B | 10.5-10.6 | Earth-to space/Space-to-Earth (No change) |
| C | 10.6-10.68 | Earth-to space/Space-to-Earth (No change) |
| D | 13.25-13.4 | Earth-to space/Space-to-Earth (No change) |
| E | 13.4-13.75 | Space-to-Earth No common position (TBD)  Earth-to space Method E1 (No change) |
| F | 14.5-14.8 | Earth-to space Method F1 (No Change)  Space-to-Earth Method FF1 (No Change) |
| G | 14.8-15.35 | Earth-to space Method G1 (No Change)  Space-to-Earth Method GG1 (No Change) |
| H | 15.35-15.4 | Earth-to space/Space-to-Earth (No change) |
| I | 15.4-15.7 | Earth-to space Method I  Space-to-Earth Method II (No Change) |
| J | 15.7-16.6 | Earth-to space/Space-to-Earth (No change) |
| K | 16.6-17.0 | Earth-to space/Space-to-Earth (No change) |

Arab Group (August 2015)

ASMG Position:

1.6.1: Support an allocation of 250 MHz to the FSS (Space-to-Earth) in the band 13.4-13.75 GHz in Region 1 (Method EE2)

1.6.2: Ensure that the proposed allocations do not cause undue constrains to services allocated in these bands in Region 1

CITEL (August 2015)

WRC-15 AI 1.6.1: FSS (E-s and s-E) 250 MHz in Region 1 in 10-17 GHz

Method D1, E1, F1, G1, H1, I1, J1 and K1

* NOC to Article 5 for the:

13.25-13.4 GHz band because of incompatibility with EESS and ARNS systems

13.4-13.75 GHz band because of incompatibility with EESS from FSS (E-s)

14.5-15.4 GHz band because of incompatibility with MS and AMS systems

15.4-17.1 GHz band because of incompatibility with RLS systems

* SUP Resolution 151 (WRC-12)

WRC-15 AI 1.6.2: FSS (E-s) 250 MHz in Region 2 and 300 MHz in Region 3 in 13-17 GHz

Method D1, E1, I1, J1 and K1

* NOC to Article 5for the:

13.25-13.4 GHz band because of incompatibility with EESS and ARNS systems

13.4-13.75 GHz band because of incompatibility with EESS

15.4-17.1 GHz band because of incompatibility with RLS systems

* SUP Resolution 152 (WRC-12)

RCC (September2015)

Agenda item 1.6.1

The RСС administrations are in favour of the new primary allocation of 250 MHz to GSO systems in the fixed satellite service (GSO FSS) in both directions (Earth-to-space and space-to-Earth) in the bands 10-17 GHz in Region 1 subject to protection of incumbent services in the considered and adjacent frequency bands.

The RCC Administrations support the following frequency bands for the new allocation to GSO FSS in Region 1:

* 13.4-13.65 GHz or 14.85-15.1 GHz (space-to-Earth), based on the Methods EE2 or GG2 of the CPM15-2 Report;
* 14.5-14.75 GHz (Earth-to-space), based on the Method F2 of the CPM15-2 Report.

With it the RCC administrations consider a new allocation of radio frequency band 13.4-13.65 GHz for GSO FSS (space-Earth) as the preferred, given the benefits of the technical implementation of FSS systems in this frequency band, as well as taking into account the intensive use of radio frequency band 14.85-15.1 GHz, stations of the fixed service (FS). The new GSO FSS allocation shall not impose substantial additional constraints to existing frequency assignments or prevent development of the FS.

The RCC Administrations oppose allocation of the frequency bands 13.4-13.75 GHz and 14.8-15.35 GHz to the GSO FSS (Earth-to-space) in Region 1.

Agenda item 1.6.2

The RСС Administrations consider that with the new primary allocation of 250 MHz to GSO FSS (Earth-to-space) in Region 2 and 300 MHz in Region 3 in frequency bands between 13 and 17 GHz, incumbent services which have allocations in these frequency bands in Region 1 should be protected.

The RCC Administrations have no objections to the new allocations of the frequency band 14.5-14.75 GHz for GSO FSS (Earth-to-space) on a primary basis in Region 2 and 14.5-14.8 GHz in Region 3, based on the Method F2 of the CPM15-2 Report.

The RCC Administrations oppose allocation of the frequency bands 13.4-13.75 GHz and 14.8-15.35 GHz for GSO FSS (Earth-to-space) in Regions 2 and 3.

Agenda item 1.6.1 and agenda item 1.6.2

New FSS allocations are preferable in frequency bands which are contiguous with the existing FSS allocations, and also in frequency bands, where the allocation is possible on the worldwide basis.

The RСС Administrations consider that allocation of additional spectrum for the GSO FSS on the worldwide basis (in all three Regions) has advantage over regional allocation (in one Region) when planning satellite communication networks and providing efficient territory coverage.

The RСС Administrations consider that protection of the radio astronomy service (RAS) and separate applications within the space research service (SRS) having allocations on a secondary basis, from the impact of GSO FSS systems in the considered frequency bands and in the adjacent frequency bands, shall be ensured under existing SRS and RAS protection criteria. Necessary regulatory provisions and restrictions of the technical characteristics of GSO FSS systems should be included in the Radio Regulations.

The RСС Administrations oppose allocation of 10.6-10.68 GHz and 15.35-15.4 GHz frequency bands to the GSO FSS due to the complicated compatibility with stations of passive services operating in these frequency bands.

## International organisations

IATA (date of proposal)

ICAO (August 2015)

Document WRC-15-IRWSP-15/3 (20 August 2015)

To oppose any new fixed satellite service allocation unless it has been demonstrated through agreed studies that there will be no impact on aviation use of the relevant frequency band.

IMO (date of proposal)

NATO (June 2015)

The NATO Military Position Statements for WRC-15

1.6.1 - NATO does not support additional allocations to the FSS in the bands 10.0-10.5 GHz and 13.25-17.0 GHz, in particular the band 14.62-15.23 GHz which is NATO harmonized for Fixed and Mobile applications (including aeronautical), unless technical studies show compatibility between FSS and existing primary services.

Recognizing resolves 4 of Resolution 151 (WRC-12), NATO supports focusing ITU-R studies in the frequency range 10.5-10.7 GHz and 11.7-12.5 GHz.

1.6.2 - NATO does not support additional primary allocations to the fixed-satellite service (FSS) (Earth-to-space) of 250 MHz in Region 2 and 300 MHz in Region 3 within the range 13-17 GHz.

SFCG (August 2015)

Doc. CPG15(15)INFO036

Agenda Item 1.6.1

SFCG supports the protection of existing space science service allocations. No additional allocation of spectrum to support FSS (E-s or s-E) should be made in space science service bands unless acceptable sharing conditions are agreed. There is particular concern with the possible allocation of FSS (Earth-to-space) in the 13.25-13.75 GHz band allocated to EESS (active). This band is used for active remote sensing (altimeters and scatterometers) by missions such as Cryosat, Jason-2, Jason-3, Jason-CS, Sentinel-3, and HY-2. Studies have shown incompatibility between these services. Therefore, SFCG supports no new allocation to FSS (E-s) in the band 13.25-13.75 GHz (Method E1).

Studies have shown that EESS (active) systems would be compatible with FSS (s-E) so SFCG could support a Region 1 allocation for FSS (s-E) within the 13.4-13.75 GHz frequency range (Method EE2) if:

* a provision is included in the RR such that FSS (s-E) shall not claim protection from EESS (active);
* relevant pfd limitations are introduced in RR Article 21;
* RR Article 22-2 does not apply.

Other services to be protected are the EESS (passive) and SRS (passive) in the band 10.6-10.7 GHz, eess (passive) and srs (passive) in the band 15.2-15.35 GHz, the srs in the bands 13.4-13.75 GHz and 14.5-15.35 GHz, and the standard frequency and time signal-satellite (Earth-to-space) service in the band 13.4-13.75 GHz.

The band 10.6-10.7 GHz is allocated to EESS (passive). RR No.5.340 prohibits all emissions in the band 10.68-10.7 GHz. Therefore, SFCG supports no new allocation to FSS (s-E) or FSS (E-s) in the band 10.6-10.7 GHz.

The frequency band 13.4-13.75 GHz is used by DRS systems for forward inter-orbit links and for return feeder links. The frequency band 14.5-15.35 GHz is used by DRS systems for return inter-orbit links and for forward feeder links and also for wideband SRS downlinks to transmit high rate scientific data from LEO, GSO or HEO SRS satellites. An FSS (E-s) allocation in the frequency range 14.5-14.8 GHz could be accommodated if the current secondary srs allocation was given equal status with the FSS (E-s) such that RR Article 9 coordination between FSS and SRS GSO data relay satellites applies. SFCG opposes any grandfathering of the co-equal status between FSS and SRS as given in the example Regulatory text for the allocation Methods included in the CPM Report.

In addition, the band 13.4-13.75 GHz will be used by the ACES system under the standard frequency and time signal-satellite (Earth-to-space) service and its future operation needs to be ensured. A suitable footnote is needed to ensure no undue limitations to the deployment of these very low power systems.

Agenda Item 1.6.2

SFCG supports the protection of existing space science service allocations. No additional allocation of spectrum to support FSS (Earth-to-space) should be made in space science service bands unless acceptable sharing conditions are agreed.

As is the case for AI 1.6.1, there is particular concern with the possible allocation of FSS (Earth-to-space) in the 13.25-13.75 GHz band allocated to EESS (active). This band is used for active remote sensing (altimeters, precipitations radars and scatterometers) by missions such as Cryosat, Jason-2, -3, Jason-CS, Sentinel-3, and HY-2. Prior and new studies have shown incompatibility between these services. In addition, the band 13.4-13.75 GHz will be used by the ACES system under the standard frequency and time signal-satellite (Earth-to-space) service and its future operation needs to be ensured, which will not be the case if an allocation is made to the FSS (E-to-s). Therefore, SFCG supports no new allocation to FSS (Earth-to-space) in the band 13.25-13.75 GHz (Method E1).

Other science services to be protected are the srs in the bands 13.4-13.75 GHz and 14.5-15.35 GHz and the eess (passive) and srs (passive) in the band 15.2-15.35 GHz.

The frequency band 13.4-13.75 GHz is used by DRS systems for forward inter-orbit links and for return feeder links. The frequency band 14.5-15.35 GHz is used by DRS systems for return inter-orbit links and for forward feeder links and also for wideband SRS downlinks to transmit high rate scientific data from LEO, GSO or HEO SRS satellites. In case an allocation to FSS is adopted in these bands, the SRS forward and return inter-orbit links and down links notified before WRC-15 must receive co-equal status with FSS.

In addition, the band 13.4-13.75 GHz will be used by the ACES system under the standard frequency and time signal-satellite (Earth-to-space) service and its future operation needs to be ensured.

WMO (August 2015)

Document WRC-15-IRWSP-15/5 (26 August 2015)

WMO position relevant to the frequency band 10.6-10.7 GHz:

WMO opposes to any allocation to the FSS in the frequency band 10.6-10.7 GHz.

WMO Position relevant to the frequency band 13.25-13.75 GHz:

FSS (Earth-to-space) - WMO supports no change to the Radio Regulations in this frequency band (i.e. Method D1 (for 13.25-13.4 GHz) and E1 (for 13.4-13.75 GHz) in Draft CPM Report).

FSS (space-to-Earth) - WMO favours no change to the Radio Regulations in this frequency band. If an allocation to the FSS in the frequency band 13.25-13.75 GHz or a part of it is applied, the relevant protection of EESS sensors must be ensured by appropriate regulations based on the ITU-R study results.

## Regional organisations

ESA (September 2014)

Supports SFCG positions.

Eurocontrol (date of proposal)

EUMETNET (September 2014)

Supports WMO positions

EUMETSAT

Supports SFCG

CRAF (September 2015)

Doc. CPG15(15)INFO47

AI 1.6.1: As noted at 4.1/1.6.1/4.1 - 4.1/1.6.1/4.3 of the CPM text, compatibility with RAS is not achievable for the 10.6 GHz RAS bands for FSS operating in the space-earth direction, without at least 100 MHz separation between FSS and RAS allocations. No studies were performed regarding unwanted emissions into the 15.35 – 15.4 GHz RAS band.

CRAF approves Methods E2 and EE2 allocating the 13.4 – 13.75 GHz band to the FSS in the earth-space and space-earth directions, respectively.

CRAF strongly opposes method FF2 allocating the band 14.5 – 14.8 GHz in the space-earth direction, because no compatibility studies were conducted with regard to the secondary RAS allocation in the adjacent band at 14.47 – 14.5 GHz., that is also used for VLBI.

CRAF also strongly opposes method GG2 allocating the band 14.8-15.35 GHz in the space-earth direction, because this band is directly adjacent to the 15.35 – 15.4 GHz primary RAS allocation and because of the secondary SRS allocation in this band that is also used for VLBI.

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU (date of proposal)

GSMA (date of proposal)