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| A picture containing text, clipart  Description automatically generated | ASIA-PACIFIC TELECOMMUNITY | **Document No:** |
| **The 5th Meeting of the APT Conference Preparatory****Group for WRC-23 (APG23-5)** | **APG23-5/OUT-29** |
| 20 – 25 February 2023, Busan, Republic of Korea | 25 February 2023 |

Working Party 4

**PRELIMINARY VIEWs on WRC-23 agenda item 1.17**

**Agenda Item 1.17:**

*to determine and carry out, on the basis of the ITU-R studies in accordance with Resolution 773 (WRC 19), the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate.*

**1. Background**

Under this agenda item, Resolution **773 (WRC-19)** invites the ITU-R:

* to develop the technical and operational characteristics of different types of space stations that plan satellite-to-satellite transmissions in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;
* to study the technical and operational characteristics, including spectrum requirements, off-axis e.i.r.p. values and out-of-band emission limits, for transmissions between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;
* to study sharing and compatibility between satellite-to-satellite links intending to operate between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz and current and planned stations in the FSS and other existing services allocated in the same frequency bands and adjacent frequency bands, including passive services, with a view to ensuring protection of the primary services referred to above;
* to develop, for different types of space stations, the technical conditions and regulatory provisions for satellite-to-satellite operations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or portions thereof, including new ISS allocations, as appropriate, taking into account the results of the studies above.

In accordance with the results of CPM23-1, the above studies are being conducted by ITU-R Working Party 4A (WP 4A) hybrid meeting in-person with remote participation from 14-22 September 2022 which the detailed activities are in the Chairman’s Report of ITU-R Working Party 4A (Document 4A/856).

* Working document on WRC-23 agenda item 1.17 ([Document 4A/856/Annex 15](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856%21N15%21MSW-E.docx))
* Annex 1 to Working document on WRC-23 agenda item 1.17 ([Document 4A/856/Annex 16](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856%21N16%21MSW-E.docx))
* Annex 2 to Working document on WRC-23 agenda item 1.17 ([Document 4A/856/Annex 17](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856%21N17%21MSW-E.docx))
* Annex 3 to Working document on WRC-23 agenda item 1.17 ([Document 4A/856/Annex 18](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856%21N18%21MSW-E.docx))
* Draft CPM text for WRC-23 agenda item 1.17 ([Document 4A/856/Annex 24](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856%21N24%21MSW-E.docx))

Six methods were proposed:

* **Method A:** No changes to the Radio Regulations and suppression of Resolution 773 (WRC-19).
* **Method B1:** allow satellite-to-satellite operation through a fixed-satellite service (space-to-space) allocation where such operations use the “within the cone” concept.
* **Method B2:** allow satellite-to-satellite operation through an inter-satellite service allocation where such operations use the “within the cone” concept.
* **Method B3:** allow satellite-to-satellite operation through a fixed-satellite service (space-to-space) allocation where such operations use the “expanded-cone” concept.
* **Method B4:** allow satellite-to-satellite operation through an inter-satellite service allocation where such operations use the “expanded-cone” concept.
* **Method B5:** This method would be identical to any of the above Methods B1 to B4 with the exclusion of the frequency band 11.7-12.7 GHz.
* Ongoing discussion in ITU-R WP 4A meetings:

All relevant information contained in these contributions were incorporated in the draft CPM text for WRC-23 AI 1.17. Most of the Methods proposed to be incorporated in the draft CPM text were relatively similar except for some points relative to:

* specific frequency bands to be considered,
* mechanisms to protect other non-GSO FSS, GSO FSS and EESS,
* necessity to implement an NCMC mechanism,
* selection of the concept of operation (i.e., “within the cone” or “expanded-cone”),
* selection of the sat-to-sat allocation (i.e., through an FSS (space-to-space) or ISS allocation).

**2. Documents**

Input Documents: APG23-5/[INP-11](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-11_Thailand-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_and_7.docx) (THA), [INP-17](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-17_Japan-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_1.18_1.19_and_7.docx) (J), [INP-24](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-24_Japan-WP4-Proposed_modification_to_the_Chapter_3_of_draft_CPM_Report.docx) (J)\*, [INP-29](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-29_India_WP4-Preliminary_Views_on_WRC_23_Agenda_Items_1.15_1.16_1.17_and_7.docx) (IND), [INP-35](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-35_Bangladesh_WP4-Preliminary_Views_on_WRC_23_Agenda_Items_1.15_1.16_1.17_1.18_and_1.19.docx) (BGD), [INP-39](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-39_Iran-WP4-Preliminary_Views_on_WRC_23_Agenda_Items_1.15_1.16_1.17_1.18_1.19_and_7.docx) (IRN), [INP-48](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-48_Singapore-WP4-Preliminary_Views_on_WRC_23_Agenda_Items_1.15_1.16_1.17_and_7.docx) (SNG), [INP-59](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-59_Australia-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_1.18_1.19_and_7.docx) (AUS), [INP-66](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-66_Rep_of_Korea-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_1.18_and_7.docx) (KOR), [INP-81](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-81_Indonesia-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_and_7.docx) (INS), [INP-83](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-83_Tonga-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.16_and_1.17.docx) (TON), [INP-91](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-91_China-WP4-Preliminary_Views_on_WRC-23_Agenda_Items_1.15_1.16_1.17_1.18_1.19_and_7.docx) (CHN)

*\*: Input documents related to the modification of Draft CPM report.*

Information Documents: APG23-5/[INF-01](https://www.apt.int/sites/default/files/2023/01/APG23-5-INF-01_WMO_Position_on_WRC-23_Agenda.docx) (WMO), [INF-36](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-36_Brief_on_AI1.17.docx) (Chairman, DG AI1.17), [INF-39](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-39_Status_of_CEPT_preparation_for_WRC-23_and_RA-23.pdf) (CEPT), [INF-43](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-43_CITEL_preparation_for_WRC-23.pdf) (CITEL)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Thailand (Kingdom of)**- **Document APG23-5/INP-11**

Thailand supports Method B1 in the current draft CPM text, in order to allow the use of satellite-to-satellite operations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz or portions thereof, in accordance with Resolution 773 (WRC-19).

Thailand is of the view that further ITU-R developments of, among other things, the regulatory provisions and appropriate technical conditions should ensure protection of the existing primary services, including their future developments, in those frequency bands and adjacent frequency bands.

**3.1.2 Japan - Document APG23-5/INP-17**

In order to protect and not to impose any additional constraints on future development of the Region 3 BSS in the band 11.7-12.2 GHz, Japan does not support the allocation to inter-satellite links in the band 11.7-12.2 GHz (support no change to Radio Regulations) in Region 3. In addition, Japan supports to limit the pfd value applied to the Region 2 inter-satellite links allocation in the band 11.7-12.2 GHz by -147 dB(W/(m2 ⋅ 27MHz)) at the Earth’s surface in Region 3.

Further, Japan supports ITU-R studies on the sharing and compatibility as well as to develop technical conditions and regulatory provisions for the use of satellite-to-satellite links operations in the 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz frequency bands in accordance with Resolution 773 (WRC-19), and such the use shall ensure protection of primary services allocated in the bands and in the adjacent bands.

Japan is also of the view that the technical conditions and regulatory provisions developed under WRC-23 Agenda item 1.17 shall ensure not causing unacceptable interference to the terrestrial services operating in the frequency band 27.5-29.5 GHz.

**3.1.3 India (Republic of) - Document APG23-5/INP-29**

India supports Method B5 in the draft CPM Text to enable the operation of satellite-to-satellite links and the development of regulatory framework and technical conditions to ensure protection of incumbent services in the relevant frequency bands and in the adjacent frequency bands without imposing any new constraints as currently provided in the RR in the frequency bands as under:

|  |  |  |  |
| --- | --- | --- | --- |
| F2 | F3 | F4 | F5 |
| 18.1-18.6, 18.8-19.3, 19.7-20.2 GHz (service provider-to-user) | 19.3-19.7 GHz (service provider-to-user) | 27.5-29.1, 29.5-30 GHz (user-to-service provider) | 29.1-29.5 GHz (user-to-service provider) |

India also proposes the following regulatory measures:

1. the protection of NGSO FSS using a set of hard limits and accordingly support option N2.
2. the protection of GSO FSS within the envelop of typical Earth Stations and accordingly support option G1.
3. the satellite-to-satellite operations use the “within the cone” concept.

**3.1.4 Bangladesh (People's Republic of) - Document APG23-5/INP-35**

In order to protect and not to impose any additional constraints on future development of the BSS in the band 11.7-12.2 GHz in Region 3, Bangladesh administration supports method A of the draft CPM report to WRC-2023 i.e., no change to the radio regulations.

**3.1.5 Iran (Islamic Republic of) - Document APG23-5/INP-39**

The Islamic Republic of Iran is of the view that there are many ambiguous and non-addressed issues some of which are as follows:

* There is no coordination procedure to protect other services, in particular FSS services which are Core Frequency band providing backhaul infrastructure telecommunication /ICT services to many countries, where the inter satellite systems are composed of GSO and NGSO link. This issue is also reflected in the RRB Rules of Procedure. See [([Document 4A/691/Annex 30](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0691%21N20%21MSW-E.docx))](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0691%21N30%21MSW-E.docx).
* Reference to undefined terms such as "lower altitude" and "higher altitude".
* Using the new phrases "service provider space stations" and "user space stations".
* Serious concerns expressed by some administrations regarding the use of "extended cone" concept and its potential difficulties including unacceptable interference to other FSS use which would be created from the use of such concept.
* Use of frequency band 11.7-12.2 GHz which is the band used in regions 1& 3 for broadcasting satellite service. See further explanation below.
* Ambitious traffic which gives rise to larger spectrum needs which goes far bound several WRC periods, up to 2040. See further explanation below¨.
* High degree of complexity in the proposed draft CPM Report which require careful consideration, examination, verification and validation which was impossible to carryout due to the time constrains, complexity of the issue, multiple agenda items in ITU-R Study groups which made it impossible for many delegates to carry out the above-mentions issues.
* There are inappropriate regulatory texts in the proposed draft Resolutions.
* There are extensive modifications to Appendix 4 which is not only time consuming but requires a lot of works for the Bureau.
* There are various PFD values to be respected which require methodology to implement as well as actions by the Bureau to examine their conformity with the proposed limit.
* There are many other inconsistencies, shortcoming, ambiguities in the draft which have not been carefully addressed nor duly verified.

The Islamic Republic of Iran is of the view that Method A is an appropriate method for this agenda item due to the fact the studies carried out so far are not complete and there are many non-clarities.

This administration also supports the transfer of this agenda item to the next WRC in order to provide an opportunity for further study on the outstanding issues.

Based on the past practices aimed at avoiding adverse impact on the Space Plan bands of Appendix 30, this administration is of the strong view that the bands of Appendix 30 shall be excluded from the frequency bands proposed for the operation of inter-satellite links. Therefore, should the ambiguous and missing points yet to be addressed are resolved this administration may consider method B5 in which method B1 to be used with the exclude of frequency band 11.7-12.7GHz.

This administration is of the view that spectrum estimation up to the year 2040 is very ambitious, due to the non-clarities and non-completed sharing conditions, Therefore, it is proposed to estimate the spectrum needs until 2030 at most. If the need is not met in 2030, the situation may be reviewed.

However, after some arrangements in Method B5, using Method B1, and clear regulatory procedure that by this option Intersatellite service shall in no way produce an unacceptable interference to nor claiming protection from FSS as well as not creation and restriction of the current and future use of FSS nor adversely affecting that service and removing other obstacles mentioned above, this Administration may consider a possible way forward to meet the reasonable and factual spectrum needs of intersatellite service either at WRC-23 or at later stage.

Such consideration would be conditioned that at the time of notification of the assignments relating to intersatellite service to the Bureau under Article 11 of the Radio Regulations comply with the proposed resolves to be included in the draft Resolution as follows:

*“In order to implement the objectives included in the footnote 5.487 as well as other obligations mentioned above, the notifying administration of the inter-satellite system at the time of notification under Article 11 of Radio Regulation, submitting Appendix 4 information to ITU shall also provide a firm commitment that in the case of unacceptable interference undertake to immediately cease emission or reduce the interference to an acceptable level and that the inter-satellite system is capable to make this commitment immediately”*

**3.1.6 Singapore (Republic of) - Document APG23-5/INP-48**

On the basis that some APT members have raised concerns in the last APG on the protection of BSS in Region 3 for the frequency bands 11.7-12.2 GHz and in consideration that there is still a need for further discussion on some key issues highlighted above in CPM23-2, Singapore is of the following view:

* Supports Methods B1 or B2 for the development of a regulatory framework for the operation of satellite-to-satellite links in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;
* Need to ensure protection of incumbent services as currently provided in the Radio Regulations in the relevant and adjacent frequency bands without imposing new constraints to incumbent services to protect satellite-to-satellite links from interference;
* Supports Option N2 where hard limits are used for protection of non-GSO FSS systems, subject to an agreement on the eirp spectral density limits; and
* Preference for Option G1 where non-GSO user space stations operate within the envelope of typical earth stations associated with the satellite network with which they communicate.

**3.1.7 Australia - Document APG23-5/INP-59**

Australia supports the development of technical conditions and regulatory provisions that establish a harmonised framework which facilitates the use of satellite-to-satellite operations in the 11.7- 12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz frequency bands. Such use shall protect and impose no additional regulatory or technical constraints on services to which the frequency band is currently allocated on a primary basis in accordance with Resolution 773 (WRC-19).

Regulatory recognition of satellite-to-satellite operations under this agenda item should be conditional on these operations being contained within the cone of coverage towards earth of the FSS GSO/non-GSO service provider space station and further restricted to ensure that in the FSS (Es) allocated portions of the band transmissions from a user space station to a service provider space station only occurs when the users apogee is lower than the service providers minimum operational altitude, and that for the FSS (s-E) portions of the band transmissions from a service provider space station to a user space station only occurs when the user space station apogee is lower than the service providers station minimum operational altitude.

Australia is of the view that further work is required for the development of a practical regulatory regime to facilitate the introduction of space-to-space operations that would ensure that no unacceptable interference is caused to other space services, while at the same time providing reasonable scope to implement viable links between both GSO and non-GSO service provider space stations and associated user non-GSO space stations.

Australia could support changes to the Table of Frequency Allocations to include space-to-space operation under the FSS allocation associated with appropriate regulatory measures (including further consideration of the applicability of limits as contained in Table 22-2) within a draft new Resolution.

**3.1.8 Korea (Republic of) - Document APG23-5/INP-66**

As the Republic of Korea supports the technical conditions and regulatory provisions for inter-satellite links in the bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or portions thereof within the FSS allocations with an additional indicator “space-to-space” limited to the links operating in the same direction of transmission as provided in the current FSS allocations for “within the cone of coverage” concept of operation, Method B5 associated with B1 in the draft CPM Report can be supported.

The Republic of Korea is also of the view that the transmitting non-GSO FSS space stations in the bands 27.5-29.1 GHz and 29.1-29.5 GHz shall not cause unacceptable interference to the terrestrial services operating in the frequency band 27.5-29.5 GHz. Therefore, the Republic of Korea supports Option 2 for the maximum power flux-density (pfd) limit in the band 27.5-29.5 GHz as provided in the draft CPM Report (see Annex 2 to Draft New Resolution [A117-B1]).

*Option 2*

*pfd(θ) = −136.2 (dB(W/(m2 1 MHz))) for 0°≤ θ ≤ 0.01°*

*pfd(θ) = −132.4 + 1.9∙logθ (dB(W/(m2 1 MHz))) for 0.01°< θ ≤ 0.3°*

*pfd(θ) = −127.7 + 11∙logθ (dB(W/(m2 1 MHz))) for 0.3°< θ ≤ 1°*

*pfd(θ) = −127.7 + 18∙logθ (dB(W/(m2 1 MHz))) for 1°< θ ≤ 2°*

*pfd(θ) = −129.4 + 23.7∙logθ (dB(W/(m2 1 MHz))) for 2°< θ ≤ 8°*

*pfd(θ) = −108 (dB(W/(m2∙1 MHz))) for 8°< θ ≤ 90.0°*

*where θ is the angle of arrival of the radio-frequency wave (degrees above the horizon).*

It should be noted that Resolution **169 (WRC-19)** in its Annex 3 provides the maximum pfd mask to protect the same terrestrial services in the same frequency band as those considered under this agenda item and in order to ensure the same protection of terrestrial services, the same pfd mask needs to be applied.

**3.1.9 Indonesia (Republic of) - Document APG23-5/INP-81**

Indonesia supports NOC for new allocation to inter-satellite system in the bands subject to this agenda item, with the main reasons as follows.

* The Ku-Band frequency spectrum in the range of 11.7 - 12.7 GHz is still used for fixed satellite service.
* The multifunctional Ka-Band satellite services will occupy the 18.1-18.6 GHz, 18.8-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) bands.

**3.1.10 Tonga (Kingdom of) - Document APG23-5/INP-83**

With the understanding that there is still a need for further discussion on some of the issues, Tonga supports:

* Method B for the development of a regulatory framework for the operation of satellite-to-satellite links in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz
* that the same level of protection to incumbent services as currently provided in the Radio Regulations in the relevant and adjacent frequency bands should be ensured without imposing new constraints to incumbent services
* “within the cone” operation for the inter-satellite links
* Option N2 for protection of non-GSO FSS systems, where hard limits are used, subject to an agreement on the values for the limits
* Option G1 where non-GSO user space stations operate within the envelope of typical earth stations associated with the satellite network with which they communicate. For NGSO-to-NGSO satellite-to- satellite links there are already fixed epfd (Art 22.2) limits in part of the band to protect GSO networks. For NGSO-to-NGSO satellite-to- satellite links in the rest of the band and for NGSO-to-GSO satellite-to-satellite links a possible additional solution is a BR check for compliance of operation of the NGSO user space under the envelope of the service provider earth stations.
* The development of provisions to ensure EESS (passive) protection in the 18.6-18.8 GHz frequency band (EESS1). These provisions should however not apply for non-GSO systems using orbits with an apogee less than 2000 km that employ frequency reuse schemes of at least three colours provisions. Studies have showed that no specific limit would be required in this case.
* The use of the mask in Annex 3 of Resolution **169** that is associated with ESIM at altitudes above 3 Km, for the protection of terrestrial services in the 27.5-29.5 GHz, with the atmospheric attenuation taken into account when assessing compliance. The maximum pfd produced at the surface of the Earth by emissions from a non-GSO space station shall not exceed.

*pfd(δ) = −124.7 (dB(W/(m2×14 MHz))) for 0° ≤ δ ≤ 0.01°*

*pfd(δ) = −120.9+ 1.9∙log δ (dB(W/(m2×14 MHz))) for 0.01° < δ ≤ 0.3°*

*pfd(δ) = −116.2 + 11∙log δ (dB(W/(m2×14 MHz))) for 0.3° < δ ≤ 1°*

*pfd(δ) = −116.2 + 18 log δ (dB(W/(m2×14 MHz))) for 1° < δ ≤ 2°*

*pfd(δ) = −117.9 + 23.7∙log δ (dB(W/(m2×14 MHz))) for 2° < δ ≤ 8°*

*pfd(δ) = −96.5 (dB(W/(m2×14 MHz))) for 8° < δ ≤ 90.0°*

where *δ* is the angle of arrival of the radio-frequency wave (degrees above the horizon) in accordance with Resolution **169**.

**3.1.11 China (People’s Republic of) - Document APG23-5/INP-91**

China supports the development of a regulatory framework to enable the operation of satellite-to-satellite links within the fixed-satellite service (FSS) allocation in the 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz bands, or parts thereof, while ensuring protection of existing primary services in the same frequency bands and adjacent bands.

China is the view of that satellite-to-satellite link transmissions should comply with the same directionality indicators as in the existing FSS allocations (Earth-to-space = from user space station to service provider space station, space-to-Earth = from service provider space station to user space station).

China concerns the use of the “expanded cone” concept and actual and/or potential difficulty/problem, including unacceptable interference to other FSS use, which may arrive of the use of such concept.

Based on that, this administration supports the Method B1 of agenda item 1.17 in the draft CPM text.

**3.2 Summary of issues raised during the meeting**

The issues raised during the meeting are summarized in the table below:

| **No.** | **Items** | **Views** | **Reference** |
| --- | --- | --- | --- |
|  | NOC | * No coordination procedure to protect other services, in particular FSS, where the inter-satellite systems are composed of GSO and NGSO link. This issue is also reflected in the RRB Rules of Procedure. See [([Document 4A/691/Annex 30](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0691%21N20%21MSW-E.docx))](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0691%21N30%21MSW-E.docx).
* To protect and not to impose any additional constraints on future development of the Region 3 BSS, the band 11.7-12.2 GHz should be excluded for this agenda item in Region 3.
* potential difficulties including unacceptable interference to other FSS use caused by the use of “expanded cone” concept.
* The technical conditions and regulatory provisions developed under this Agenda item shall ensure not causing unacceptable interference to the terrestrial services operating in the frequency band 27.5-29.5 GHz.
* The operation of the inter-satellite system using the FSS allocation could be under No. 4.4 of Radio Regulation, and further study on this issue could be continued in the study period of next WRC.
 | INP-35INP-39INP-81 |
|  | allow satellite-to-satellite operation through a fixed-satellite service (space-to-space) allocation | * satellite-to-satellite link transmissions should comply with the same directionality indicators as in the existing FSS allocations.
* Method B1 is proposed.
 | INP-11INP-17INP-29INP-48INP-59INP-66 INP-83INP-91 |
|  | The expanded cone | * the inter-satellite operations should use the “within the cone” concept.
* potential difficulty with “the expanded cone” concept.
 | INP-83INP-91INP-66 |
|  | Not causing unacceptable interference and not claiming protection to other space services | * Option N2 is considered to protect NGSO FSS: using a set of hard limit.
* Option G1 is considered to protect GSO FSS: with in the envelop of typical Earth Stations.
* For NGSO-to-NGSO satellite-to- satellite links in the rest of the band and for NGSO-to-GSO satellite-to-satellite links a possible additional solution is a BR check for compliance of operation of the NGSO user space under the envelope of the service provider earth stations.
 | INP-17INP-29INP-59INP-83INP-48 |
|  | The exclusion of 11.7-12.2 GHz in Region 3 | * There is no methodology to protect BSS services in the Ku band.
* To protect and not to impose any additional constraints on future development of the Region 3 BSS in the band 11.7-12.2 GHz.
* Method B5 is proposed.
* limit the pfd value applied to the Region 2 inter-satellite links allocation in the band 11.7-12.2 GHz by -147 dB(W/(m2⋅27MHz)) at the Earth’s surface in Region 3.
 | INP-35INP-39INP-66INP-17INP-83 |
|  | The protection of terrestrial services in frequency band 27.5-29.5 GHz | * The operation of the inter-satellite system shall not cause unacceptable interference to the terrestrial services operating in the frequency band 27.5-29.5 GHz.
* Option 2 is considered for the maximum power flux-density (pfd) limit in the band 27.5-29.5 GHz as provided in the draft CPM Report (see Annex 2 to Draft New Resolution [A117-B1])
* the pfd limit in Annex 3 of Resolution 169 can be applied to protection of the terrestrial services
 | INP-17INP-66INP-83 |

All the above issues need to be reflected in an appropriate manner in the corresponding Resolutions of this agenda item.

**4. APT Preliminary View(s)**

APT Members are the view of that satellite-to-satellite link transmissions should comply with the same directionality indicators as in the existing FSS allocations (Earth-to-space = from user space station to service provider space station, space-to-Earth = from service provider space station to user space station).

APT Members are the view of that the use of these bands for satellite-to-satellite links needs to protect the FSS in these bands, taking into account that the parts of these frequency bands studied under the agenda item are the core FSS bands which are used for telecommunication infrastructure in many countries.

APT Members are also the view of that significant additional work is required to develop a practical regulatory regime that will enable viable space-to-space operations (between both GSO and non-GSO service provider space stations and associated user non-GSO space stations) while at the same time ensuring that the space-to-space operation shall not cause unacceptable interference to other space services and nor claim protection from FSS.

APT Members are of the view that currently there is no coordination procedure to protect other services, in particular FSS, from inter-satellite link, composed of GSO and non-GSO links. See Rules of Procedure in this regard.

APT Members support satellite-to-satellite transmissions “within the cone of coverage” concept of operations.

With respect to the studies carried out under this agenda, as contained in the report of CPM23-2, APT members support the exclusion of 11.7-12.2 GHz in Region 3 for this agenda item.

APT Members are of the view that the technical conditions and regulatory provisions developed under WRC-23 agenda item 1.17 shall ensure not causing unacceptable interference and nor claim protection from the terrestrial services operating in the frequency band 27.5-29.5 GHz.

APT Members are the view of that the notifying administration of satellite-to-satellite transmissions when submitting Appendix **4** data elements to the Bureau shall also send a firm commitment undertaking that in case of any interference to FSS or terrestrial services, shall immediately cease emission or reduce it to the acceptable level to the interfered assignments.

**5. Other View(s) from APT Members**

Some APT Members support method A (NOC) for this agenda at this point of time.

Some other APT Members support Method B presented in the Draft CPM text for this agenda.

Some APT Members are considering Option N2 where hard limits are used for protection of non-GSO FSS systems, subject to an agreement on the eirp spectral density limits; and Option G1 where non-GSO user space stations operate within the envelope of characteristics and coordination agreement of typical earth stations associated with the satellite network with which they communicate.

Some APT Members also support to limit the pfd value applied to the Region 2 inter-satellite links allocation in the band 11.7-12.2 GHz by -147 dB(W/(m2⋅27MHz)) at the Earth’s surface in Region 3.

Some APT Members are of the view that considering Annex 3 to Resolution **169 (WRC-19)** proving the maximum pfd limit at the surface of the Earth to protect the terrestrial services in the frequency band 27.5-29.5 GHz, in order to ensure the protection of same terrestrial services operating in the same frequency band considered under this agenda item, the same pfd mask as in the Annex should be applied.

**6. Issues for Consideration at Next APG Meeting**

APT Members are invited to submit their contributions, including the identification of their preferred Methods to the next APG meeting, taking into account the results of ITU-R studies and outcome of the CPM23-2, in order to develop the draft PACP on WRC-23 agenda item 1.17.

**7. Views from Other Organisations**

**7.1 Regional Groups**

**7.1.1 CEPT - Document APG23-5/INF-39**

* CEPT supports the development of a regulatory framework to enable the operation of satellite-to-satellite links in the 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz bands while ensuring protection of existing services in the same frequency bands and adjacent bands.
* CEPT supports that the introduction of satellite-to-satellite transmissions must ensure the same level of protection for GSOs and non-GSOs as currently provided in the RR and must not impose new constraints on GSOs and non-GSOs to protect satellite-to-satellite links from interference.
* CEPT supports that the introduction of satellite-to-satellite transmissions must ensure the same level of protection for terrestrial services as currently provided in the RR and must not impose new constraints on terrestrial services to protect satellite-to-satellite links from interference.
* CEPT does not oppose the deletion of the 11.7-12.7 GHz frequency bands from the consideration under this agenda item.
* CEPT is considering whether to address this agenda item through either an FSS (space-to-space) or an ISS allocation. The hard limits or coordination procedures to protect terrestrial services and/or other satellite networks/systems will not be tied to the type of allocation.
* CEPT supports the completion of the studies in order to be able to address the operations under the “expanded cone” concept of operations.
* CEPT supports the development of an envelope provisions where no additional coordination would be required for the user and service provider space stations if sat-to-sat emissions fall within in the envelope of the operational characteristics of the service provider. Additional coordination or measures may be required for the user space stations
* outside the cone of coverage for the protection of GSO.
* For the protection of GSO systems in the bands where epfd limits are in place, the CEPT is considering alternative provisions depending on whether the transmission is from non-GSO to non-GSO or from non-GSO to GSO.
* For the protection of non-GSO systems, the CEPT is considering the development of hard limits.
* CEPT proposes that space stations that plan satellite-to-satellite transmissions should be governed by the following preliminary guiding principles:
* Satellite-to-satellite link transmissions will comply with the same directionality indicators as in the existing FSS allocations (Earth-to-space = from user space station to service provider space station, space-to-Earth = from service provider space station to user space station);
* Non-GSO user space stations will operate in a manner that should resemble typical Earth stations of the FSS service provider system;
* The equivalent power flux-density, epfd↑, produced at any point in the geostationary-satellite orbit by emissions from all combined operations of space-to-space and typical Earth station transmissions shall not exceed the limits given in Table 22-2;
* The equivalent power flux-density, epfd↓, at any point on the Earth’s surface visible from the transmitting satellite system, produced by emissions from all the space stations of the non-geostationary-satellite system shall not exceed the limits given in Tables 22-1A to 22-1E, where applicable;
* The higher altitude to lower altitude link transmissions in 18.1-18.6 GHz and 18.8 20.2 GHz from the GSO or non-GSO FSS service provider space station to the non-GSO user space station would be identical in technical characteristic to the transmissions from GSO or non-GSO service providers to any ground-based user in the service provider’s network;
* Enabling the operation of satellite-to-satellite links should not result in an increase of the interference to EESS (passive) sensors operating in the 18.6-18.8 GHz band. CEPT supports the development of measures to ensure EESS (passive) protection in the 18.6-18.8 GHz frequency band. Any provision on non-GSO service provider space stations providing satellite-to-satellite links that may be needed to limit the interference to EESS (passive) sensors operating in the 18.6-18.8 GHz shall be applicable only to those non-GSO service provider systems notified/brought into use after the last day of WRC-23.

**7.1.2 CITEL - Document APG23-5/INF-43**

* An Administration proposes to allow satellite-to-satellite operations through an inter-satellite service (ISS) allocation where such operations would use the “within the cone” concept, once this administration is of the view that an inter-satellite allocation would be the most straightforward approach to allow for satellite-to-satellite operations. The proposal is aligned with method B2 from draft CPM text but exclude the Ku band frequencies given limited discussions and studies at Working Party 4A, and also excludes the MSS bands 29.1-29.5GHz, since the administration is still considering the appropriate provisions to be associated with the inclusion of a new ISS allocation in these MSS bands.

**7.1.3 RCC - Document APG23-5/INF-45**

* The use of inter-satellite links in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz, and 27.5-30 GHz in current concepts it does not meet the definition of the FSS and imposes additional constraints on the use of the existing and future systems/networks of FSS, inter alia, over the national territories.
* Spectrum requirements should be justified, conditions for the use of intersatellite links in the above-mentioned frequency bands should ensure the protection of existing primary services that have allocations in the same or neighboring frequency bands and no additional constraints should be impose on the use of existing and future stations of these services.
* Supports the development of technical and operational conditions, as well as regulatory provisions, including new allocations to inter-satellite service, for the operation of inter-satellite links in the frequency bands 11.7−12.7 GHz, 18.1−18.6 GHz, 18.8−20.2 GHz and 27.5−30 GHz or parts thereof.

**7.1.4 ASMG**

None

**7.1.5 ATU**

None

**7.2 International Organisations**

**7.2.1 WMO- Document APG23-5/INF-01**

* WMO supports the development of technical conditions and regulatory provisions for satellite-to-satellite operations in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or portions thereof, as appropriate. Specifically, WMO supports the implementation of regulatory provisions which would ensure that the operation of satellite-to-satellite link transmissions will not lead to an increase interference to MetSat in the bands 18-18.3 GHz (ITU Region 2) or 18.1-18.4 GHz (ITU Regions 1 and 3), or to EESS (passive) in the band 18.6-18.8 GHz. In particular, WMO supports that an appropriate out-of-band pfd limit at the Earth’s surface is applied to ensure protection of the EESS (passive) in the band 18.6-18.8 GHz. Current studies show that a value of -126.4 dBW/m2/200 MHz might be suitable.

**7.2.2 IMO**

None.

**7.2.3 ICAO**

None.

**7.2.4 IARU**

None.

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