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| **The 4th Meeting of the APT Conference Preparatory****Group for WRC-19 (APG19-4)** | **APG19-4/OUT-01** |
| 7 – 12 January 2019, Busan, Republic of Korea | 12 January 2019 |

Working Party 3

**PRELIMINARY VIEWs on WRC-19 agenda item 1.6**

**Agenda Item 1.6:**

*“to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution* ***159 (WRC-15)****”*

**1. Background**

The principal requirement of this agenda item is to conduct “studies of technical and operational issues and regulatory provisions for the operation of non-GSO FSS satellite systems in the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2‑48.9 GHz (limited to feeder links only), 48.9-50.2 GHz and 50.4-51.4 GHz (all Earth-to-space), while ensuring protection of GSO satellite networks in the FSS, MSS and BSS, without limiting or unduly constraining the future development of GSO networks across those bands, and without modifying the provisions of Article **21**”. Protection of EESS (passive) and RAS is also required.

Sharing between Non-GSO and GSO systems

ITU-R studies have shown that in the 50/40 GHz frequency bands, propagation impairments such as rain, cloud and gaseous absorption exist that can substantially affect FSS satellite links. The studies demonstrate that these propagation impairments should be taken into account on both the wanted and interfering paths for sharing analyses in the 50/40 GHz band, noting there is a difference in the attenuation experienced by each path, but it has a limited impact on the total degradation of the link for some specific scenarios.

The objective is to identify means to enable use of these bands by non-GSO systems that will ensure appropriate protection of co-frequency GSO FSS networks, thereby significantly enhancing spectrum use.

Coordination between non-GSO FSS systems

In order to facilitate sharing between non-GSO FSS systems in the frequency bands covered by Resolution **159 (WRC‑15),** the ITU-R should develop a methodology to apply the relevant coordination procedure (No. **9.12)** to facilitate sharing amongst non-GSO FSS systems and to ensure a way to keep track of the aggregate interference from all operating non-GSO systems. ITU-R studies have shown that it may therefore be necessary to apportion this aggregate interference into single entry permissible levels to be met by non-GSO FSS systems, taking into account the mechanisms by which all the interference sources cumulate.

Further, there is a need to provide a regulatory mechanism that would ensure protection of GSO FSS from the maximum aggregate EPFD produced by multiple non-GSO FSS systems. ITU-R studies have indicated that one possible mechanism for meeting this objective, in addition to regulatory sharing mechanisms, is for provisions of coordination between non-GSO satellite systems.

Methods to satisfy the Agenda Item

Based on the work conducted to date, WP 4A has developed four Methods within the draft CPM text for WRC-19 Agenda item 1.6 which can be found in Document CPM19-2/1.

Relevant Reports/Recommendations

WP 4A, as the responsible group, has developed the following working documents:

* Preliminary draft new Recommendation ITU-R S.[50/40 GHZ FSS SHARING METHODOLOGY] “*Maximum permissible levels of interference in a satellite network (GSO and non-GSO) in the fixed-satellite service caused by other co-directional FSS networks operating in 50/40 GHz frequency band*”, as contained in Annex 1 to Document 4A/826;
* Preliminary draft new Report ITU-R S.[50/40 GSO-NGSO SHARING] “*Sharing between 50/40 GHz GSO FSS networks and non-GSO FSS systems*”, as contained in Annex 4 to Document 4A/826;
* Working document towards a preliminary draft new Report ITU-R S.[50/40 NGSO-NGSO SHARING] “*Study of mitigation techniques between non-GSO FSS systems in the bands 36-37 GHz and 50.2-50.4 GHz*”, as contained in Annex 10 to Document 4A/826;
* Working document towards a preliminary draft new Report ITU-R S.[50/40 GHz ADJACENT BAND STUDIES] “*Protection of EESS (passive) and RAS systems from non-GSO satellite systems operating in the 37.5-42.5 GHz, 47.2 50.2 GHz and 50.4-51.4 GHz frequency bands under WRC-19 agenda Item 1.6*”, as contained in Annex 11 to Document 4A/826;
* Working document towards a preliminary draft new Recommendation ITU-R S.[50/40 Reference Links] “*Satellite system characteristics to be considered in frequency sharing analyses within the fixed-satellite service in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz*”, as contained in Annex 5 to Document 4A/826.

**2. Documents**

Input Documents:

APG19-4/INP-17 (AUS), INP-24 (NZL), INP-39 (VTN), INP-61 (J), INP-77 (KOR), INP-92 (SNG), INP-98 (CHN)

Information Documents:

APG19-3/OUT-03 (Chairman, APG-19), APG19-4/INF-02 (WMO), INF-22 (CITEL), INF-23 (CEPT), INF-24 (RCC), INF-27 (NPL)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Australia** - **Document APG19-4/INP-17**

Australia supports establishment of regulatory and procedural conditions to accommodate non-GSO FSS satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**. This issubject to protection to GSO satellite networks in FSS, MSS and BSS, and also to stations of other existing services in the same and adjacent frequency bands.

In relation to the protection of GSO networks, Australia notes the results of the ITU-R studies, in particular the conclusion that implementation of epfd limits may result in spectrum inefficiencies, and that regulation aimed at limiting the aggregate impact from NGSO systems to a maximum allowable capacity and availability loss might be a better approach for achieving the required protection of GSO networks. Further studies may be required to determine an optimum outcome based on the capacity and availability loss approach.

In relation to the protection of EESS (Passive) in the adjacent band, Australia notes the conclusion of the ITU-R studies indicating that the current limits in Resolution **750 (Rev.WRC-15)** are insufficient, and supports a strengthening of those limits but only to the extent deemed essential for protection of the Passive Service. In relation to the protection of RAS Australia notes the information now contained in a Draft New Report R S.[50/40 GHz ADJACENT BAND STUDIES].

Australia does not support the modification of Article **21** in relation to this agenda item.

**3.1.2 New Zealand** - **Document APG19-4/INP-24**

New Zealand supports the conclusions of ITU-R studies in reviewing Article **22** to better facilitate co-frequency operation of GSO and non-GSO networks within the frequency bands 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz. The methods are similar, however New Zealand supports Method A as it includes a proposal for monitoring and protecting GSO networks from the aggregate effects of non-GSO systems.

**3.1.3 Viet Nam** - **Document APG19-4/INP-39**

Taking the spectrum needs into account for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, Viet Nam does not support the consideration of the bands considered under AI 1.6 for non-GSO FSS satellite systems.

* Considering the result of sharing study between non-GSO systems and GSO networks, Viet Nam is of the view that: support having the method No change to Radio Regulations.

**3.1.4 Japan** - **Document APG19-4/INP-61**

Japan is of the view that appropriate protection of the existing services is necessary.

**3.1.5 Republic of Korea** - **Document APG19-4/INP-77**

Noting many similarities identified in the proposed Methods in the Draft CPM text, the Republic of Korea has a view that it is required to consider more carefully about advantages and disadvantages for dealing with GSO reference links, which Methods A and B address in a different way, used for the procedure to ensure that aggregate limits for non-GSO FSS systems will not be exceeded.

The Republic of Korea also has a view that it is not appropriate to modify the unwanted emission limits for GSO earth station, since Resolution **159 (WRC-15)** clearly calls for studies of technical, operational issues and regulatory provisions for non-GSO FSS system, and therefore modifying the limits for GSO earth station is not within the scope of WRC-19 agenda item 1.6.

The Republic of Korea considers that further review is required for the proposed unwanted emission limits for the FSS in Resolution **750 (Rev.WRC-15)**.

**3.1.6 Singapore** - **Document APG19-4/INP-92**

Singapore supports studies under WRC-19 Agenda Item 1.6 with a view to develop a regulatory framework and technical conditions for non-GSO satellite systems in the existing FSS allocations in the 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) frequency bands under the terms of Resolution **159 (WRC-15)**. Singapore is of the view that Method A with the following modifications to the Radio Regulations could be supported.

With regard to the modification of unwanted emission limits for the FSS in Resolution **750 (Rev.WRC-15)** to protect EESS (passive) systems operating in the band 50.2-50.4 GHz from harmful interference from non-GSO FSS systems operating in the adjacent frequency bands, the unwanted emission limits of −13 and −23 dBW/200 MHz (depending on antenna diameter) for non-GSO FSS systems should be introduced, as proposed in Option 4. However, there should not be any modification to the limits for GSO networks in Resolution **750 (Rev.WRC-15)** since this is outside the scope of agenda item 1.6. On this point, Option 2 is supported for the GSO satellite networks.

**3.1.7 China** - **Document APG19-4/INP-98**

China's preliminary views are as follows:

– China supports current ITU-R studies of technical and operational issues and regulatory provisions for the operation of non-GSO FSS satellite systems in the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space);

– GSO satellite networks in the FSS, MSS and BSS should be protected, without limiting or unduly constraining the future development of GSO networks across those bands, and without modifying the provisions of RR Article 21;

– China supports to study the effects of aggregate FSS interference from non-GSO systems operating in the relevant bands, to ensure the protection of the EESS (passive) and RAS.

**3.1.8 Nepal** - **Document APG19-4/INF-27**

Nepal supports further studies on technical and operational issues, and regulatory provisions of non-GSO FSS satellite systems in the frequency bands 37.5- 39.5 GHz (space-to-Earth), 39.5 - 42.5 GHz (space-to-Earth), 47.2 -50.2 GHz (Earth-to-space) and 50.4 - 51.4 GHz (Earth-to-space) while ensuring protection to GSO satellite networks in FSS, MSS and BSS, and other existing services in the same bands as well as protection of the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz and the radio astronomy in the frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4-54.25 GHz.

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

No additional issues raised during the meeting.

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

APT Members support the establishment of regulatory and procedural conditions for non-GSO FSS satellite systems in the frequency bands 37.5- 39.5 GHz (space-to-Earth), 39.5 - 42.5 GHz (space-to-Earth), 47.2 - 50.2 GHz (Earth-to-space) and 50.4 - 51.4 GHz (Earth-to-space) while ensuring protection to GSO satellite networks in FSS, MSS and BSS, and other existing primary services in the same bands as well as protection of the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz and the radio astronomy in the frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4-54.25 GHz.

APT Members in general support Method A[[1]](#footnote-1) of the draft CPM Report.

No APT Members support Methods B[[2]](#footnote-2) or C[[3]](#footnote-3) of the draft CPM Report.

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

Some APT Members support a possible revision of Method A or Method D[[4]](#footnote-4) of the draft CPM Report.

Some APT Members oppose Method D of the Draft CPM Report on the basis that any modification to the limits for GSO networks in Resolution **750 (Rev.WRC-15)** is outside the scope of the agenda item.

Some APT Members support No Change for this agenda item.

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

The CPM methods to address this agenda item will be available for consideration by the APG19‑5 meeting. APT Members are encouraged to assess the CPM methods with a view to finalising the APT position.

APT Members are encouraged to review the necessity of the proposed unwanted emission limits for the FSS in Res.750 (rev.WRC-15).

**7. Views from Other Organisations**

**7.1 Regional Groups**

**7.1.1 ASMG** - **Document APG19-2/INF-01**

Protect the fixed-satellite service systems in GSO either by adequate epfd levels or any other methodologies or according to wave propagation models in the frequency bands above 30 GHz.

Consult the satellite operators of the team to determine the epfd value that ensures the protection of the satellite networks in the geostationary orbital positions and the opinion for the proposed mechanism.

**7.1.2 ATU**

No position expressed.

**7.1.3 CEPT** - **Document APG19-4/INF-23**

CEPT supports the development of regulatory provisions, technical and operational conditions that would enable spectrally efficient operation of non-GSO FSS satellite systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) while ensuring protection for GSO satellite networks and stations of other existing services including passive services in the adjacent frequency bands.

CEPT considers that the limits currently in Resolution **750 (Rev. WRC-15)** are not sufficient for the protection of EESS (passive) in the adjacent frequency band 50.2-50.4 GHz from operation of non-GSO FSS satellite systems in the frequency bands under consideration in accordance with Resolution 159 (WRC-15). Appropriate unwanted emission limits for the protection of EESS (passive) are [-61.9] dBW/200 MHz for non-GSO user terminals and [-63] dBW/200 MHz for non-GSO gateways. CEPT is of the view that the effects of aggregate FSS interference from GSO satellite networks and non-GSO systems operating in the relevant bands should be taken into account to ensure the protection of the EESS (passive). CEPT considers that the unwanted emission limits for GSO FSS are not sufficient for the protection of EESS (passive) and should also be revised under WRC-19 AI 1.6. An appropriate unwanted emission limit is [-65.9] dBW/200 MHz for GSO CEPT supports the development of the new Recommendation ITU-R S. [50/40 GHz Sharing Methodology] which describes in particular the methodology to calculate the maximum permissible level of interference from non-GSO satellite systems specified as single entry and aggregate limits for:

a) increase in unavailability time allowance for degradation of GSO networks short term performance objectives;

b) a maximum reduction of the average throughput or spectral efficiency for GSO networks using Adaptive Coding Modulation. CEPT supports that this methodology takes into account the correlation between a fading event attenuating both the wanted signal and interfering signals in the frequency bands 40/50 GHz.

In addition, CEPT supports that the conformity with these single-entry limits be evaluated using the calculation procedures in the new Recommendation ITU-R S.[50/40 GHz Sharing Methodology] and using the statistics of degradations due to the non-GSO system interference and fading issued from the latest versions of Recommendations ITU-R S.1503 and P.618, respectively.

CEPT also supports the development the new Recommendation ITU-R S. [50/40 GHz Reference links] which contains characteristics of representative FSS GSO reference links.

**7.1.4 CITEL** - **Document APG19-4/INF-22**

Proposals based on Methods A, C and D are under consideration.

**7.1.5 RCC** - **Document APG19-4/INF-24**

The RCC Administrations consider that regulatory provisions to ensure operation of non-GSO FSS satellite systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 47.2-48.9 GHz (limited to feeder links), 48.9-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) shall ensure protection for GSO satellite networks in FSS, MSS and BSS, and also for stations of other existing services in the same and adjacent frequency bands.

The RCC Administrations consider that technical conditions and regulatory provisions shall be adopted to ensure sharing of the considered frequency bands between different non-GSO FSS systems.

The RCC Administrations support the revision of Resolution 750 (WRC-15) and establishment of appropriate unwanted emission limits for non-GSO FSS earth stations operated in the frequency bands 49.7-50.2 GHz and 50.4-50.9 GHz to protect EESS (passive) in the frequency band 50.2-50.4 GHz taking into account aggregate interference effect caused by existing radio services’ systems in adjacent frequency bands. The RCC Administrations consider that Article 22 of the Radio Regulations shall establish the limitations for non-GSO FSS systems in order to ensure proper protection of GSO FSS and BSS systems in the frequency bands concerned. To identify the limits mentioned the RCC Administrations support the development of new Recommendation ITUR S.[Methodology to assess FSS compatibility in the 50/40 GHz bands] for establishment of the appropriate protection criteria and maximum permissible levels of interferences from non-GSO FSS systems to GSO FSS networks in 40/50 GHz bands as well as new Recommendation ITU-R on characteristics of GSO FSS and BSS reference links in 50/40 GHz bands.

**7.2 International Organisations**

**7.2.1 ICAO**

No position expressed.

**7.2.2 WMO**

WMO supports revision of Resolution 750 for FSS satellite systems in the 47.2-50.2 GHz and 50.4-51.4 GHz frequency ranges to ensure the protection of EESS (passive) in the band 50.2-50.4 GHz.

Furthermore WMO supports revision of Resolution 750 for FSS satellite systems in the 37.5-50.2 GHz frequency range to ensure the protection of EESS (Earth-to-space) in the band 40-40.5 GHz and EESS (passive) in the bands 36-37 GHz, if studies conclude that this would be necessary.

WMO would appreciate the development of a solution to ensure the continued operation of the ground-based radiometers in the 50.4-51.4 GHz frequency band.

**7.2.3 IARU**

No position expressed.

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1. Method A presents a regulatory and technical implementation to modify RR Article **22** to include a regulatory framework to enable non-GSO systems based upon a maximum allowable per cent increase in GSO unavailability specified in the short-term and long-term performance objectives of the GSO links. [↑](#footnote-ref-1)
2. Method B presents a regulatory and technical implementation to modify RR Article **22** to include a regulatory framework to enable non-GSO systems based upon a maximum allowable per cent increase in GSO unavailability based on the time allowance for *C/N* specified in the short-term performance objectives of the GSO links. [↑](#footnote-ref-2)
3. Method C presents a regulatory and technical implementation to modify RR Article **22** to include a regulatory framework to enable non-GSO systems based upon a maximum allowable per cent increase in GSO unavailability. Development of a draft new Resolution relating to the operation and planning of NGSO systems has not yet been completed. [↑](#footnote-ref-3)
4. Method D is identical with Method A with the exception of modifications to Resolution **750 (Rev.WRC-15)**. [↑](#footnote-ref-4)