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| **The 3rd Meeting of the APT Conference Preparatory Group for WRC-19 (APG19-3)** | **APG19-3/OUT-03** |
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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**

Resolution **159 (WRC‑15)** is entitled “Studies of technical, operational issues and regulatory provisions for non‑geostationary fixed-satellite services 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)”. The principal requirement is for the ITU-R 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. Not only are rain fade and gaseous absorption propagation effects more severe than in lower frequency bands, but effects such as cloud attenuation can also have a significant impact to the FSS intra‑service sharing environment in the 50/40 GHz frequency bands. Thus, higher margins of atmospheric fade can exist in evaluating sharing criteria between non-GSO and GSO systems in the 50/40 GHz frequency range. 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. Eight studies have been presented including discussions of the derivation of epfd masks and propagation considerations that must be taken into account for the development of appropriate regulatory provisions in the 50/40 GHz bands.

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 WP4A is undertaking development of a Recommendation with a methodology to derive the permissible level of interference into a wanted FSS network, whether the interference is caused by a GSO or by a non-GSO system. This permissible level from non-GSO systems, however, relates to the aggregate interference caused by all 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. ITU-R studies have shown that operation of next generation non-GSO systems can apply technical and operational mitigation techniques to help reduce potential interference to GSO networks.

Compatibility with EESS (Passive) and RAS

Resolution **159 (WRC-15)** calls for studies regarding protection of EESS (passive) systems in the frequency bands 36-37 GHz and 50.2-50.4 GHz from planned non-GSO systems, including the study of aggregate FSS interference effects from networks and systems operating or planning to operate in these bands. Current out of band limits for FSS earth stations operating in the channels adjacent to the 50.2-50.4GHz EESS (passive) band are specified in Resolution **750 (WRC-15).**

Resolution **159** **(WRC-15)** also calls for studies regarding the protection of Radio Astronomy systems from planned non-GSO systems. Studies have been carried out to assess the impact of a LEO and MEO non‑GSO system into RAS systems in the 42.5-43.5 GHz, 48.94-49.04 GHz, and 51.4-54.25 GHz frequency bands. The results of these studies indicate that coordination distances by non-GSO systems could be used to protect RAS systems from the operations of planned non-GSO systems.

Methods to satisfy the Agenda Item

Based on the work conducted to date, WP 4A has developed the draft CPM text for WRC-19 Agenda item 1.6 which can be found in Annex 31 to Document 4A/675.

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/675;
* Working document towards a 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 6 to Document 4A/675;
* 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 7 to Document 4A/675;
* 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 8 to Document 4A/675;
* 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 4 to Document 4A/675.

**2. Documents**

Input Documents:

APG19-3/INP-23(Rev 1) (KOR), INP-36 (NZL), INP-43 (AUS), INP-51 (J), INP‑67 (SNG), INP-84(Rev 1) (VTN), INP-88 (CHN)

Information Documents:

APG19-2/OUT-05 (Chairman, APG-19),

APG19-3/INF-06 (CEPT), INF-08(Rev 1) (CITEL)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Republic of Korea** - **Document APG19-3/INP-23(Rev 1)**

The Republic of Korea proposes modifications to the APT Preliminary View adopted as at the APG19-2 meeting as stated below:

“APT Members support 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.”

**3.1.2 New Zealand** - **Document APG19-3/INP-36**

New Zealand supports the ITU-R studies undertaken in accordance with Resolution **159 (WRC 15)**. As the frequency bands 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz are underutilised in New Zealand, we are open to consider a review of the regulatory framework to better facilitate co-frequency operation of GSO and non-GSO networks within these frequencies.

**3.1.3 Australia** - **Document APG19-3/INP-43**

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 is subject 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.

Furthermore, studies are needed to ensure protection of:

1. the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz from non-GSO FSS transmission, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the range 37.5-51.4 GHz possibly through a revision of Resolution **750 (Rev.WRC-15)**, and

2. the radio astronomy frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4‑54.25 GHz from non-GSO FSS transmissions, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the range 37.5-51.4 GHz.

**3.1.4 Japan** - **Document APG19-3/INP-51**

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

**3.1.5 Singapore** - **Document APG19-3/INP-67**

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)**. Provided that adequate epfd limits are developed to protect the GSO networks, Singapore supports Method C which includes the following modifications to the Radio Regulations:

* Modify RR No. **5.484A** to include 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)* bands in order to address the coordination between non-GSO FSS systems under RR No. **9.12**.
* Modify Article **22** to include epfd limits for the Earth-to-space and space-to-Earth directions, in order to protect GSO FSS satellite networks from non-GSO FSS systems operating in the subject frequency ranges
* Modify Resolution **750 (Rev.WRC-15)** to include unwanted emission power limits in order to protect EESS and SRS systems from non-GSO FSS systems

*Note: This contribution does not take into account the WP 4A meeting that took place in February 2018. Note that Method C is now known as Method B.*

**3.1.6 Viet Nam** - **Document APG19-3/INP-84(Rev.1)**

Considering no technical measures and regulatory framework for sharing between non-GSO systems and GSO networks, Viet Nam is of the view that:

* The technical, operational conditions and regulatory provisions for non-geostationary fixed-satellite services 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) shall ensure the protection of GSO satellite networks in the FSS, MSS and BSS, without limiting or unduly constraining the future development of GSO networks.
* Taking into account studies regarding the 37.5-43.5GHz band carried out under
WRC-19 AI 1.13

**3.1.7 China** - **Document APG19-3/INP-88**

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；

– China supports to study a methodology of the aggregate epfd limits to ensure the operations with the multiple non-GSO FSS/non-GSO FSS systems.

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

As part of the general discussion, it was noted that APT Members support further studies on technical and operational issues, as well as the development of regulatory provisions.

It was noted that this agenda item has been identified by CPM19-1 as having overlapping bands of interest with AI 1.13. In discussion it was pointed out that the APG Steering Committee discussed the general issue and observed that there were no contributions on overlap bands relating to any agenda items. It was also noted that AI 1.6 relates to regulatory framework issues only. No allocation is being sought as part of this agenda item and accordingly, sharing and compatibility with the existing satellite allocations needs to be demonstrated by TG 5/1

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

APT Members support 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.

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

No other views.

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

The draft CPM methods to address this agenda item should be ready for consideration by the APG19-4 meeting. APT Members are encouraged to assess the proposed draft CPM methods with a view to developing specific APT Preliminary Views.

Views relating to the overlap of frequency bands of interest with AI 1.13 should be presented in a contribution where there are specific concerns that need to be addressed.

**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 APG19-3/INF-06**

CEPT considers that studies for the development of regulatory provisions and technical and operational conditions shall ensure protection for GSO satellite networks and stations of other existing services including passive services in the adjacent frequency bands. To ensure the protection of the EESS (passive) and RAS CEPT supports to study the effects of aggregate FSS interference from GSO satellite networks and NGSO systems operating in the relevant bands.

CEPT considers that the criteria based on a new ITU-R Recommendation under development shall be used while developing the aggregate epfd limits for protection of GSO networks. CEPT supports a methodology of interference assessment that takes into account the correlation between a fading event attenuating both the wanted signal and interfering signals in the frequency bands 40/50 GHz.

CEPT supports further studies on the methodology of interference assessment applicable to frequency bands above 30 GHz.

**7.1.4 CITEL** - **Document APG19-3/INF-08(Rev 1)**

Preliminary views from a few countries support studies. One country is of the view that no regulatory measures are required to protect EESS (passive) systems in the 36-37 GHz band but mitigation techniques and/or regulatory measures may be required in the band 50.2-50.4 GHz; NGSO FSS systems should be subject to coordination under No. **9.12**

**7.1.5 RCC** - **Document APG19-2/INF-01**

The RCC Administrations consider that studies on technical and operational issues and regulatory provisions in order 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 to GSO satellite networks in FSS, MSS and BSS, and also to stations of other existing services in the same and adjacent frequency bands.

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

The RCC Administrations consider that when conducting studies, protection shall be ensured to EESS (passive) in the frequency bands 36-37 GHz, 47.5-48.5 GHz and 50.2-50.4 GHz, and also to the radio astronomy service in the frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4-54.25 GHz from non-GSO FSS transmissions.

The RCC Administrations find it reasonable to study the impact of aggregate interference from GSO FSS networks and non-GSO FSS systems operated or planned to be operated 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) with the purpose of possible revision of Resolution**750 (Rev. WRC-15)** "Compatibility between the Earth exploration-satellite service (passive) and relevant active services".

The RCC Administrations consider it reasonable to study modification of interference assessment methodology specified in the Recommendation ITU-R S.1323 (Methodology A) with the purpose to broaden applicability of this recommendation in the frequency bands above 30 GHz.

**7.2 International Organisations**

**7.2.1 IARU**

No position expressed

**7.2.2 ICAO**

No position expressed

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