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| **The 3rd Meeting of the APT Conference Preparatory Group for WRC-23 (APG23-3)** | **APG23-3/OUT-29** |
| 8 – 13 November 2021, Virtual/Online Meeting | 13 November 2021 |

Working Party 4

**PRELIMINARY VIEWs on WRC-23 agenda item 1.16**

**Agenda Item 1.16:**

*to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution* ***173(WRC‑19)***

**1. Background**

In *resolves* 1.16of Resolution **811 (WRC-19)**, the 2019 World Radiocommunication Conference (WRC-19) resolved “to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7‑20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non‑geostationary fixed-satellite service earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173 (WRC-19)**” as part of the agenda for WRC-23.

The last two WRCs have adopted regulatory frameworks for the operations of GSO ESIM in Ka-band. WRC-15 adopted Resolution **156 (WRC-15),** allowing the use of ESIM communicating with GSO FSS networks in the 19.7-20.2 GHz and 29.5-30.0 GHz bands and WRC-19 adopted Resolution **169 (WRC-19),** allowing the use of ESIM communicating with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz. It is necessary to conduct relevant studies on the sharing situations between non-GSO ESIM and the incumbent services in the Ka band. The parameters of non-GSO ESIM and GSO ESIM have some similarities but also differences, which need to be paid attention to and considered in the follow-up studies under WRC‑23 agenda item 1.16.

WP4A is the responsible group, according to the CPM23-1 results (CA/215), to address the ITU-R preparatory work for WRC-23 and established Correspondence Group (CG) and Sub-Working Group (SWG), both chaired by Mr. Mario Neri, who was the chairman of AI 1.5(WRC-19). WP4A had 5 virtual meetings besides 5 virtual meetings of CG, and the SWG under WP4A developed the 4 documents below at the October/November meeting, which will be attached to the WP4A chairman’s report.

1. Terms of Reference for Working Party 4A Correspondence Group on WRC-23 agenda item 1.16 (4A/TEMP/164)
2. Work Plan for WRC-23 agenda item 1.16 (4A/TEMP/166)
3. Working Document towards draft CPM text and draft new Resolution for WRC-23 agenda item 1.16 (4A/TEMP/167)
4. Working Document on WRC-23 agenda item1.16 [NON-GSO\_ESIM] (4A/TEMP/168)

Because of the time constraint and the nature of virtual meetings, those documents other than ToR and Work Plan were still not fully discussed and agreed on. The membership is invited to provide its comments, suggestions, and amendments, preferably for discussion at Correspondence Group as advance information.

**2. Documents**

* Input Documents:

APG23-3/INP-10 (Australia)

APG23-3/INP-18 (Indonesia)

APG23-3/INP-22 (New Zealand)

APG23-3/INP-27 (Rev.1) (Korea (Republic of))

APG23-3/INP-31 (Japan)

APG23-3/INP-38 (Singapore (Republic of))

APG23-3/INP-44 (China (People’s Republic of))

* Information Documents:

APG23-3/INF-01 (WMO)

APG23-3/INF-05 (Rev.1) (Chairman, WP4 DG1.16)

APG23-3/INF-15 (ICAO)

APG23-3/INF-20 (CEPT)

APG23-3/INF-37 (ASMG)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Australia** - **Document APG23-3/INP-10**

* Australia supports the establishment of a harmonised regulatory framework and technical and operational measures that facilitate the use of non-geostationary (non-GSO) earth-stations in motion (ESIM) in the fixed-satellite service in the 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) frequency bands. Such use must ensure protection of services allocated in the bands and, as appropriate, in the adjacent bands. Australia is of the view that similar technical, operational and regulatory provisions as those applicable to GSO ESIM would also be applicable for non-GSO ESIM in these frequency bands. While an appropriate examination methodology may be established for any measures to be taken by the Bureau for non-GSO ESIM to comply with resolutions dealing with this Agenda Item, adequate transitional measures could be developed in case the methodology is not finalized by WRC-23.

**3.1.2 Indonesia (Republic of)** - **Document APG23-3/INP-18**

* Indonesia is of the view that the protection of current and planned stations of primary services allocated in the frequency band 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof, and in adjacent frequency bands, including passive services, should be ensured during sharing and compatibility studies of non-GSO FSS ESIMs planned for operation in those frequency bands.

**3.1.3 New Zealand** - **Document APG23-3/INP-22**

* New Zealand supports ITU-R studies with a view to enable and establish a harmonised framework to support non-GSO Earth stations in motion (ESIMs) in the 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) frequency bands. This framework may be similar to that for GSO ESIMs, as appropriate. Sharing and compatibility studies need to consider the protection of existing services while not imposing additional constraints.

**3.1.4 Korea (Republic of)** - **Document APG23-3/INP-27 (Rev.1)**

* The Republic of Korea has preliminary views as follows:
  + appropriate examination method for aeronautical non-GSO ESIMs with respect to the conformity with the pfd limits should be developed in the ITU-R taking into account ensuring the protection of the terrestrial services;
  + the examination method mentioned above should be contained in the new Resolution on WRC-23 agenda item 1.16 for the Bureau to implement this Resolution effectively;
  + the ESIMs operating with non-GSO FSS system shall not cause unacceptable interference to and not impose constraints on the terrestrial services in those frequency bands and in adjacent frequency bands.

**3.1.5 Japan** - **Document APG23-3/INP-31**

* Japan supports ITU-R study activities to ensure protection of the existing services and not to impose constraints for future use, on FS, MS and other FSS systems.

**3.1.6 Singapore (Republic of)** - **Document APG23-3/INP-38**

* Singapore supports on-going studies to develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz, 18.8‑19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS ESIM, similar to that of GSO ESIM, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173 (WRC-19)**.
* Non-GSO ESIM operating in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (see No. **5.524**) shall not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations. Non-GSO ESIM operating in the frequency band 27.5-29.1 GHz shall comply with specific technical conditions subject to results of sharing studies in WP 4A so as not to cause unacceptable interference to terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations.
* For the protection of space services non-GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the non-GSO satellite system within which these ESIM communicate.
* For the protection of GSO FSS networks operating in the 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz and 29.5-30.0 GHz the relevant EPFD limits in Nos. **22.5C**, **22.5D** and **22.5F** shall apply. The methodology included in Recommendation ITU-R S.1503 for determination of compliance with EPFD limits in Article **22** is applicable to ESIMs communicating with non-GSO FSS systems.

**3.1.7 China (People’s Republic of)** - **Document APG23-3/INP-44**

* This administration is in favor of to conduct sharing and compatibility studies between earth stations in motion (ESIMs) planned for operation in non-GSO FSS in the frequency bands 17.7–18.6 GHz, 18.8–19.3 GHz and 19.7–20.2 GHz (space-to-Earth), and 27.5–29.1 GHz and 29.5–30 GHz (Earth-to-space) and the existing services, and to develop regulatory provisions and technical requirements for non-GSO ESIM while protecting the incumbent services in accordance with Resolution 173 (WRC-19).

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

* Regarding the protection of terrestrial services from aeronautical ESIMs a view was expressed that the aggregation of the interference from multiple aeronautical ESIM should be considered.
* APT Members recognized 29.5-30 GHz was allocated to terrestrial services on a secondary basis in 11 countries among APT Member states. A view was expressed that the protection of those services would be considered.

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

APT Members are of the view that on-going sharing and compatibility studies between earth stations in motion (ESIM) communicating with non-GSO FSS in the frequency bands 17.7–18.6 GHz, 18.8–19.3 GHz and 19.7–20.2 GHz (space-to-Earth), and 27.5–29.1 GHz and 29.5–30 GHz (Earth-to-space) and the existing services including passive services allocated in those frequency bands and the adjacent bands should be conducted to ensure the protection of existing services.

APT Members are also of the view that the operation of secondary services as allocated by previous WRCs and currently contained in the Radio Regulations shall/should not be adversely affected by the potential operation of ESIM being studied under this agenda item.

APT Members are also of the view that regulatory provision, and technical and operational measures with appropriate examination methodology by the Bureau for non-GSO ESIM should be established to ensure the protection of services to which the frequency bands are allocated and operated in accordance with the Radio Regulations. In the absence of such methodology necessary transitional measures should be developed and agreed by WRC-23.

APT Members are also of the view that for the protection of other space services, non-GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the non-GSO satellite system within which these ESIM communicate.

APT Members are also of the view that for the protection of GSO FSS networks operating in the 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz, and 29.5-30.0 GHz the relevant EPFD limits in Nos. **22.5C**, **22.5D** and **22.5F** shall apply.

APT Members are also of the view that the ESIMs operating with non-GSO FSS system shall not cause unacceptable interference to the terrestrial services in those frequency bands and in adjacent frequency bands and not adversely affect these terrestrial services.

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

Some APT Members are of the view that similar technical, operational, and regulatory provisions as those applicable to GSO ESIM would also be applicable for non-GSO ESIM in these frequency bands.

Some APT Members are of the view that non-GSO ESIM operating in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz, and 19.7-20.2 GHz (see No. **5.524**) shall not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations. Non-GSO ESIM operating in the frequency band 27.5-29.1 GHz shall comply with specific technical conditions subject to results of sharing studies in WP 4A so as not to cause unacceptable interference to terrestrial services to which the frequency bands are allocated and operating in accordance with the Radio Regulations.

Some APT Members are of the view that the methodology included in Recommendation ITU-R S.1503 for determination of compliance with EPFD limits in Article **22** is applicable to ESIMs communicating with non-GSO FSS system.

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

* As the ITU-R studies progress, APT Members are encouraged to consider developing more specific views that could support the studies and discussions to create the draft CPM text and new resolution on this agenda item.
* APT Members are encouraged to follow the relevant WP4A meetings and submit contributions if necessary for consideration at the next APG meeting.

**7. Views from Other Organisations** (as provided in the information documents to

APG23-3)

**7.1 Regional Groups**

**7.1.1 ASMG** - **Document APG23-3/INF-37**

* Follow-up studies in the radio sector to ensure that the non-GSO ESIM shall not request any protection from existing and future services in these frequency bands and adjacent bands, with an emphasis on establishing strict procedures to ensure the protection of those existing and future services in these frequency bands and adjacent bands
* the non-GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the GSO satellite system with which these ESIM communicate
* Non-GSO ESIM operating in the frequency band (29.5-30) GHz shall not claim protection from terrestrial services in the footnote (5.542) of the Radio Regulations.
* Non-GSO ESIM operating in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz shall not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulation
* Develop a methodology to assist the BR to verify that the non-GSO ESIM under this resolution comply with the PFD limits under this agenda to ensure the protection of terrestrial services in the frequency bands (27.5- 29.1)GHz and (29.5-30)GHz
* Review the ITU-R Recommendation S.1503 to ensure that non-GSO ESIM under this agenda will comply with EPFD limits mentioned in the Article 22 of the radio regulations to ensure the protection of GSO satellite networks in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz,19.7-20.2 GHz,27.5-28.6 GHz and 29.5-30 GHz

**7.1.2 ATU**

*No information on AI1.16*

**7.1.3 CEPT** - **Document APG23-3/INF-20**

CEPT supports the development of a regulatory framework for the operation of ESIM communicating with non‐GSO satellite systems in the FSS in the frequency bands 17.7‐18.6 GHz, 18.8‐19.3 GHz and 19.7‐20.2 GHz (space‐to‐Earth) and 27.5‐29.1 GHz and 29.5‐30 GHz (Earth‐to‐space). The technical and operational requirements for the use of non‐GSO ESIM shall ensure the protection of GSO networks and other services operating in the same frequency bands and in adjacent bands.

CEPT is of the view that non‐GSO ESIM operating in the frequency bands 17.7‐18.6 GHz and 18.8‐19.3 GHz (space‐to‐Earth) shall not claim protection from terrestrial services having allocations in the same frequency bands and operating in accordance with the Radio Regulations.

CEPT supports the development of a methodology regarding examination by the Bureau of compliance with pfd limits by non‐GSO aeronautical ESIM or of adequate transitional measures in case WRC‐23 could not finalise the methodology. CEPT also supports that the progress on this WRC‐23 agenda item not be conditional on the development of the methodology for compliance with pdf limits as part of Resolution 169 (WRC‐19) for aeronautical GSO ESIM.

CEPT is of the view that the protection of GSO networks in the fixed‐satellite service operating in the frequency bands 17.8‐18.6 GHz, 19.7‐20.2 GHz, 27.5‐28.6 GHz and 29.5‐30 GHz from non‐GSO ESIM can be achieved by requiring that links involving non‐GSO ESIM comply with EPFD limits referred to in Nos. 22.5C, 22.5D and 22.5F and that the methodology included in Recommendation ITU‐R S.1503 for determination of compliance with epfd limits in Article 22 is applicable to ESIM communicating with non‐GSO FSS systems.

CEPT is of the view that to protect GSO networks – in those bands where epfd limits do not apply ‐ and non‐GSO systems in the FSS:

* + - non‐GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the non‐GSO satellite system with which the ESIM communicate
    - non‐GSO ESIM shall not cause more interference and shall not claim more protection than typical earth stations in this non‐GSO systems
    - the operation of non‐GSO ESIM shall comply with the coordination agreements obtained following the application of provisions under No 9.11A.

CEPT is of the view that sharing and compatibility studies between non‐GSO ESIM and fixed and mobile services allocated on a secondary basis in the 29.5‐30 GHz (see No 5.542) are outside the scope of this agenda item as per resolves 2 in Resolution 173 (WRC‐19).

CEPT supports the protection of EESS (passive) sensors in the frequency band 18.6‐18.8 GHz, and compatibility studies with related non‐GSO systems to define necessary protection measures. In particular, CEPT is of the view that enabling the operations of non‐GSO ESIM should not result in an increase of the interference to EESS (passive) sensors operating in the 18.6‐18.8 GHz band. Any measure on non‐GSO space stations communicating with aeronautical ESIM and maritime ESIM that may be needed to limit the interference to EESS (passive) sensors operating in the 18.6‐18.8 GHz band shall be applicable only to those non‐GSO systems notified/brought into use after the last day of WRC‐23.

**7.1.4 CITEL** - **Document**

Some administrations support studies on the technical and operational characteristics of ESIMs and sharing and compatibility studies to develop technical and regulatory provisions for the operation of ESIM with non-GSO FSS systems in accordance with Resolution 173 (WRC-19) with a view to ensuring the protection of and not impose additional constraints on existing services, including terrestrial services and GSO FSS, in those frequency bands and in adjacent bands, including passive services.

Some administrations support studies on the technical and operational characteristics of ESIMs and sharing and compatibility studies to develop technical and regulatory provisions for the operation of ESIM with non-GSO FSS systems in accordance with Resolution 173 (WRC-19) with a view to ensuring the protection of and not impose additional constraints on existing services, including terrestrial services and GSO FSS, in those frequency bands and in adjacent bands, including passive services.

An administration is of the view that the studies conducted in preparation of WRC-15 and WRC-19 to support the deployment of GSO ESIM in the Ka-band have many similarities with those being carried out under Resolution 173 (WRC-19). This administration is of the view that there is no potential for interference in bands in the bands where non-GSO ESIM would only receive. In the bands 27.5-29.1 GHz and 29.5- 30.0 GHz, this administration is of the view that WRC-23 should aim to establish the same technical, operational and regulatory provisions as those applicable to GSO ESIM, such as remaining within the technical and coordination envelope, complying with relevant epfd, pfd, distance and EIRP spectral density limits as appropriate, to the extent possible and pending the results of the studies.

**7.1.5 RCC** - **Document**

The RCC Administrations are in favor of the development of regulatory provisions and technical requirements for earth stations in motion (aeronautical and maritime ESIMs) planned for operation in non-GSO FSS systems in the frequency bands 17.7–18.6/18.8–19.3/19.7–20.2 GHz (space-to-Earth) and 27.5–29.1/29.5–30 GHz (Earth-to-space), or parts thereof in order to ensure protection of, and not impose additional constraints on, satellite GSO networks and other services, including terrestrial services, in those frequency bands and in adjacent bands, including passive services. To accomplish this, ITU-R should develop appropriate methodologies and procedures stipulated in *considering further* of Resolution **173** (WRC-19).

The RCC Administrations consider that non-GSO ESIMs operating in the frequency bands 17.7–18.6/18.8–19.3 GHz (space-to-Earth) shall not claim protection from terrestrial services currently allocated in the same frequency bands and operating according to the Radio Regulations.

The RCC Administrations consider that ESIMs could be used in non-GSO FSS systems, only if the following conditions are met:

* the technical and operational measures and the possible regulatory changes to be established based on the results of ITU-R studies shall not affect the relevant RR provisions related to the protection of GSO networks from non-GSO FSS systems;
* ESIMs should be operated in non-GSO FSS systems within the envelope of the characteristics and within coordination constraints of typical earth stations of the non-GSO FSS systems initially published and included in the BR IFIC;
* ESIMs in non-GSO FSS systems should not be used for safety-of-life applications;
* when operating ESIMs in non-GSO FSS systems, measures shall be envisaged excluding unauthorized use of ESIMs in the territory of states that have not granted relevant authorizations (licenses).

**7.2 International Organisations**

**7.2.1 IARU** - **Document**

*No information on AI1.16*

**7.2.2 ICAO** - **Document APG23-3/INF-15**

To ensure that any radio regulatory action taken as a result of this agenda item:

* do not adversely affect the provision of UAS CNPC under Resolution 155 (Rev. WRC-19);
* make a clear regulatory distinction between satellite networks or satellite network resources providing UAS CNPC and those providing non-safety ESIMs applications;
* do not set a precedent that could adversely affect the provision of aeronautical safety-of-life services.

**7.2.3 WMO** - **Document APG23-3/INF-01**

WMO supports studies, as necessary, to ensure non-GSO FSS ESIM deployment will protect the co-frequency band MetSat allocation and that the operation of non-GSO FSS ESIM in the frequency bands adjacent to 18.6-18.8 GHz will not result in increased adjacent band interference to EESS (passive) operations.