WRC-23 Space Related agenda items After CPM23-2

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Space Related Agenda Items Part-II

- **Satellite Issues 1.16, 1.18, 1.19, 7 Topics A, C, D, G, I**
- Science issues 1.14
- Aeronautical and maritime issues 1.7, 1.11
- General issues 9.1 Topics d)

CHAPTER 4 – Satellite issues

- 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, 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);

- 1.18 : to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution 248 (WRC-19);

- 1.19 :to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution 174 (WRC-19);

Agenda Item 1.16

- *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, 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)**;*
- Resolution **173 (WRC-19)** – *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 earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service*
- There are several areas on which there is no consensus either on the text or how to proceed with the implementation of the draft new Resolution.

Agenda Item 1.16

- WRC-23 agenda item 1.16 considers the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by earth stations in motion communicating with non-geostationary (non-GSO) space stations in the fixed-satellite service (FSS). The studies under this agenda item considered two types of earth stations in motion (ESIMs): aeronautical and maritime only. Studies have been carried out on sharing and compatibility between ESIM and terrestrial as well as space services allocated in the frequency bands above. For this agenda item, two methods have been identified:
- – Method A proposes no changes to the RR and suppression of Resolution **173 (WRC-19)**.
- – Method B proposes to add a new footnote No. **5.A116** in RR Article **5** and a reference to a new WRC Resolution providing the conditions for the operation of ESIM and protection of the services to which the frequency bands are allocated, and consequential suppression of Resolution **173 (WRC-19)**. Wherever it was not possible to achieve consensus on specific topics within method B, options are included for each of them.

Agenda Item 1.16

- **Background**
- ESIMs under WRC-23 agenda item 1.16 are earth stations that communicate with non-geostationary-satellite orbit (non-GSO) space stations 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 ITU Radiocommunication Sector (ITU-R) has studied the main technical and operational requirements for earth stations on mobile platforms operating in non-GSO FSS systems in these frequency bands, see Report ITU-R S.2261 (09/2012). The Report describes how such earth stations operating in these frequency bands need to be designed and operated to meet the existing technical and/or operational requirements applicable to non-GSO FSS earth stations.
- Technical and regulatory provisions for the operation of the abovementioned ESIMs under WRC-23 AI 1.16 are limited to aeronautical and maritime ESIMs.
- ESIMs can be used to provide broadband communication services to users on mobile platforms.
- There are a number of differences between GSO satellite networks and non-GSO satellite systems, including the number, the altitude and the coverage of space stations. The impact of these differences and, in particular, the interference environment resulting from the operation of non-GSO aeronautical and maritime ESIMs, has been studied in order to develop technical, operational and regulatory provisions for their operations in the frequency bands subject to Resolution **173 (WRC-19)**.

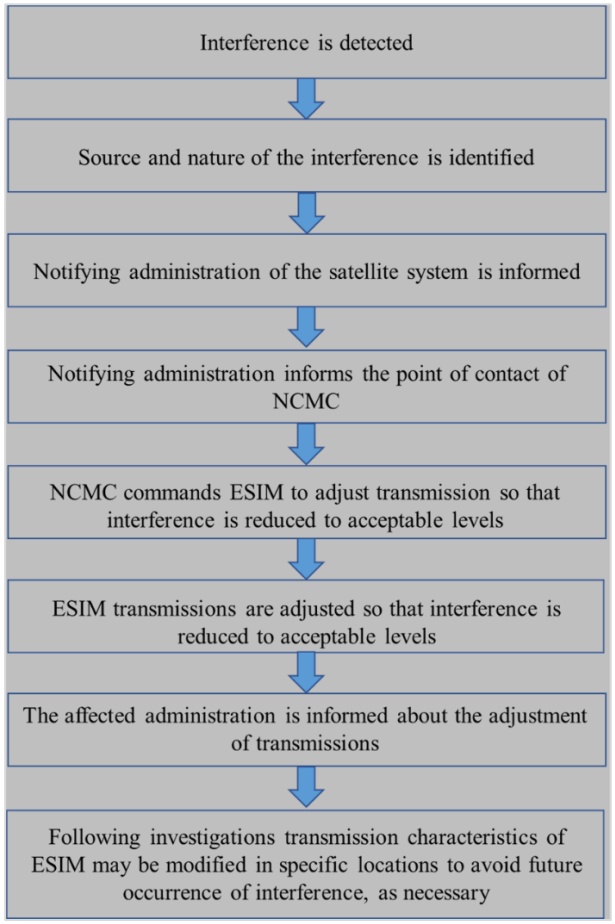
Agenda Item 1.16

- **Control and monitoring of ESIMs**
- The three elements consisting of interference management mechanism, switching facility for ON/OFF function and the functions of Network Control and Monitoring Center (NCMC) and their relations with each other are critical elements for the proper operation of ESIMs. Therefore, the text provided below requires careful consideration by administrations.
- The only administration that could notify ESIM is the same administration notifying the non-GSO satellite system with which ESIM communicates. Therefore, the notifying administration of the non-GSO satellite system is responsible for the compliance of ESIM with all relevant regulatory and administrative provisions including cases of interferences. The notifying administration of the non-GSO satellite system is also responsible for ensuring that ESIMs operate only in territories for which their operations are authorized by the administration having the jurisdiction on that territory.
- Upon receipt of an interference report from the affected administration, the notifying administration of the non-GSO satellite system responsible for the operation of ESIMs shall work with the NCMC to resolve the unacceptable interference.
- Should unacceptable interference occur to station(s) in the territory of an administration other than the notifying administration of the non-GSO satellite system under which the ESIMs operate.

Agenda Item 1.16

- View 1 was expressed that the notifying administration of the non-GSO satellite system with which the ESIMs communicate gathers all information about an interference case from the affected administration and resolves the case of interference. The affected administration is invited to provide any available information to the best of its abilities without any additional burden.
- View 2 was expressed that the course of action of how to address an interference case should be described more in detail. The steps explained in a text needs to be carefully examined, verified and validated to ensure that its application would contribute to the resolution of interference, taking into account that there is no time element associated with the steps.

Agenda Item 1.16, Interference



Agenda Item 1.16

- **Services with allocations in these bands**

Frequency range (GHz)	Non-GSO ESIMs direction of transmission	Service allocation		Existing provisions in the RR relevant to sharing between non-GSO FSS and other allocated services (for information purposes)
		Terrestrial services	Space services	
17.7-17.8	space-to-Earth	FIXED		Article **21**
		MOBILE		Article **21**
			GSO FSS (space-to-Earth)	No. **22.2**
			GSO FSS (Earth-to-space)	No. **22.2**
			BSS	No. **22.2**
			Non-GSO FSS (space-to-Earth)	No. **9.12**
17.8-18.4	space-to-Earth	FIXED		Article **21**
		MOBILE		Article **21**
			GSO FSS (space-to-Earth)	Nos. **22.5C** and **22.5CA**
			GSO FSS (Earth-to-space)	Applicable parts of Nos. **22.2** and **22.5F**
			Non-GSO FSS (space-to-Earth)	No. **9.12**
			Meteorological-satellite service	No. **5.519**
18.4-18.6	space-to-Earth	FIXED		Article **21**
		MOBILE		Article **21**
			GSO FSS (space-to-Earth)	Article **22**, No. **22.2**
			Non-GSO FSS (space-to-Earth)	No. **9.12**

Agenda Item 1.16

- WRC-23 agenda item 1.16 considers the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by earth stations in motion communicating with non-geostationary (non-GSO) space stations in the fixed-satellite service (FSS). The studies under this agenda item considered two types of earth stations in motion (ESIMs): aeronautical and maritime only. Studies have been carried out on sharing and compatibility between ESIM and terrestrial as well as space services allocated in the frequency bands above. For this agenda item, two methods have been identified:
- – Method A proposes no changes to the RR and suppression of Resolution **173 (WRC-19)**.
- – Method B proposes to add a new footnote No. **5.A116** in RR Article **5** and a reference to a new WRC Resolution providing the conditions for the operation of ESIM and protection of the services to which the frequency bands are allocated, and consequential suppression of Resolution **173 (WRC-19)**. Wherever it was not possible to achieve consensus on specific topics within method B, options are included for each of them.

Agenda item 1.18

- *1.18 to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution **248 (WRC-19)**;*
- Resolution **248 (WRC-19)** – *Studies relating to spectrum needs and potential new allocations to the mobile-satellite service in the frequency bands 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz for future development of narrowband mobile-satellite systems*
- NOTE – Due to a divergence of views in several areas including methods, no consensus was reached and therefore, the entirety of the text below could not be agreed to by CPM23-2.
- Moreover, Method B below does not invoke a new agenda item under agenda item 10 of WRC-23 since such item is outside the mandate of the CPM, taking into account that Resolution **804 (Rev.WRC-19)** provides course of actions under which new agenda items could be proposed to WRCs.
- NOTE – The narrowband MSS parameters were not agreed to by the responsible group for the MSS under WRC-23 agenda item 1.18 partly due to ambiguities in Resolution **248 (WRC-19)**. As a result, appropriate sharing and compatibility studies between narrowband MSS and incumbent services could not be taken into account in this agenda item. Consequently, the compatibility of narrowband MSS systems and the protection of incumbent services, both in-band and adjacent band, could not be determined or ensured.

Agenda item 1.18

- **Summary**
- Resolution **248 (WRC-19)**, WRC-23 agenda item 1.18 invites ITU-R to conduct "studies relating to spectrum needs and potential new allocations to the mobile-satellite service in the frequency bands 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz for future development of narrowband mobile-satellite systems" while ensuring the protection of existing primary services in those frequency bands and adjacent frequency bands. Such studies are limited to MSS non-geostationary satellites operating low data-rate systems,
- There are three methods to satisfy WRC-23 agenda item 1.18:
  - Method A: No change to the Radio Regulations and suppression of Resolution **248 (WRC-19)**;
  - Method B: No change to any Articles of the Radio Regulations and the Appendices thereof, except revision of Resolution **248 (WRC-19)**.
  - Method C: To allocate the frequency band 2 010-2 025 MHz to the mobile-satellite service (Earth-to-space) on a primary basis and suppression of Resolution **248 (WRC-19)**.

Alternative 1, Option 1: MSS narrowband use for all countries in Region 1;
Option 2: MSS narrowband use for a list of countries in Region 1.
Alternative 2, Option 1: MSS allocation for all countries in Region 1;
Option 2: MSS allocation for a list of countries in Region 1.

Agenda item 1.18

- Non-geostationary orbit satellites narrowband MSS systems are designed with a view to providing means to transfer data collected from user terminals deployed over a geographic area.
- WRC-23 agenda item 1.18 invited ITU-R to conduct studies relating to spectrum needs and potential new allocations to the MSS for applications of low data rate systems for the collection of data from, and management of, terrestrial devices in the MSS; the aim was to consider possible **new primary or secondary allocations**, with the necessary technical limitations, taking into account the characteristics described in *recognizing c)* of Resolution **248 (WRC-19)**,
- MSS for non-geostationary orbit satellites, based on the findings of the sharing and compatibility studies, while ensuring the protection of existing primary services in these frequency bands and adjacent bands as well as not imposing undue restrictions on their further development.
- Discussions in the responsible group on Resolution **248 (WRC-19)** have shown the language of the Resolution is ambiguous and unclear regarding the appropriate technical and operational characteristics of narrowband MSS that should be used in the sharing and compatibility studies and studies on spectrum needs.
- Given the ambiguity of Resolution **248 (WRC-19)** and subsequent lack of agreed technical and operational characteristics of narrowband MSS by the responsible group, sharing and compatibility studies with existing primary services and studies on the spectrum needs could not be concluded to determine the suitability of new allocations to the MSS for low data rate/narrowband applications.
- Any potential new allocations to the MSS for future development of narrowband mobile-satellite systems is not possible under agenda item 1.18.

Agenda item 1.18

- **Summary and analysis of the results of ITU-R studies**
- The responsible group for WRC-23 agenda item 1.18 considered and discussed the technical and operational parameters as proposed by multiple input documents with the aim of providing the required parameters for narrowband mobile-satellite systems to conduct the mandatory sharing and compatibility studies with the current services in the frequency bands 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz and its adjacent bands.
- However, due to the difficulties and ambiguities of Resolution **248 (WRC-19)**, amongst other things, the responsible group was unable to achieve agreement on the interpretation of Resolution **248 (WRC-19)** and the technical parameters of narrowband MSS. Accordingly, the responsible group was unable to progress, finalize or fully discuss the sharing and compatibility studies with existing primary services to determine the suitability and spectrum needs of new allocations to the MSS for applications of low data rate systems under WRC-23 agenda item 1.18. Some preliminary sharing and compatibility studies were submitted during the study cycle, however none were fully discussed and/or liaised with the contributing working groups.

Agenda item 1.18

- **Methods to satisfy the agenda item**
- There are three methods to satisfy WRC-23 agenda item 1.18:
  - Method A: No change to the Radio Regulations and suppression of Resolution **248 (WRC-19)**;
  - Method B: No change to any Articles of the Radio Regulations and the Appendices thereof, except revision of Resolution **248 (WRC-19)**.
  - Method C: To allocate the frequency band 2 010-2 025 MHz to the mobile-satellite service (Earth-to-space) on a primary basis and suppression of Resolution **248 (WRC-19)**.

    Alternative 1, Option 1: MSS narrowband use for all countries in Region 1;
    Option 2: MSS narrowband use for a list of countries in Region 1.

    Alternative 2, Option 1: MSS allocation for all countries in Region 1;
    Option 2: MSS allocation for a list of countries in Region 1.

Agenda item 1.19

- *1.19 to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution **174 (WRC-19)**.*
- Resolution **174 (WRC-19)** – *Primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2*

17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation	**17.3-17.7** FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation	**17.3-17.7** FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation
5.514	5.514 5.515	5.514

Agenda item 1.19

- **Summary**
- WRC-23 agenda item 1.19 considers a new primary allocation to the fixed-satellite service (FSS) in the space-to-Earth direction pursuant to Resolution **174 (WRC-19)**.
- Analyses the results of the studies:
  - in the frequency band 17.3-17.7 GHz;
  - in the adjacent frequency band 17.2-17.3 GHz;
  - in the adjacent frequency band 17.7-17.8 GHz.

  Four methods to satisfy the agenda item:
  - Method A proposes no change to the RR and suppression of Resolution **174 (WRC-19)**;
  - Method B proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction This method contains two alternatives for several items to provide a wide range of options. The selection of Alternative 1 for all the items extends provisions used in Region 1 to Region 2, as well as the addition of other provisions, while the selection of Alternative 2 for all items results in more conservative conditions with the objective to provide further protection of the BSS feeder link AP30A receiving space station and GSO FSS systems;
  - Method C proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction, limiting the FSS operation to geostationary satellites; and
  - Method D proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction, extending the regulatory provisions used in Region 1 to Region 2, as well as the addition of other provisions.

- The various studies were submitted, examined and agreed by consensus in ITU-R.

Agenda item 1.19

- **Background**
- In the 2019 World Radiocommunication Conference, Resolution **174 (WRC-19)** was established to consider a new primary allocation to the FSS in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, which is already allocated to the broadcasting-satellite service (BSS) on primary status.
- An FSS (space-to-Earth) emission is similar to a BSS (space-to-Earth) emission. Both consist of a space station transmitting a signal towards the Earth that will be received by fixed earth station terminals. In principle, the interference scenario with respect to other services should not be different; however, with this new allocation, the flexibility in possible uses of the band would be increased.
- In Region 1, the frequency band is already allocated to the FSS, a new allocation in Region 2 progresses the principle of Regional harmonization, which allows for synchronization of frequency bands across both Regions. The consideration of Recommendation ITU-R BO.1834 and Recommendation ITU-R BO.1835, which address compatibility and sharing between the BSS networks using the Region 2 BSS allocation in the frequency band 17.3-17.8 GHz and feeder links of BSS networks using the worldwide FSS (Earth-to-space) allocation in the frequency band 17.3-17.8 GHz, is well suited for addressing an approach to study the proposed FSS (space-to-Earth) allocation with existing feeder links of BSS networks using the frequency band 17.3-17.8 GHz.
- For the coordination between new FSS GSO (space-to-Earth) frequency assignments with respect to BSS frequency assignments and between new FSS GSO (space-to-Earth) frequency assignments, no modification to Radio Regulations would be required, since RR No. 9.7 already covers the coordination process and RR Appendix 5, Table 5-1 already contemplates a coordination trigger (8° of orbital arc).

Agenda item 1.19

- **4/1.19/3 Summary and analysis of the results of ITU-R studies**
- Two orbital scenarios for FSS operations were considered in the studies conducted under agenda item 1.19. The studies consisted in analysing both FSS GSO and FSS non-GSO downlink operations with respect to sharing and compatibility with incumbent services in the frequency band 17.3-17.7 GHz and sharing and compatibility with primary services in the adjacent frequency bands 17.2-17.3 GHz and 17.7-17.8 GHz. Nominal parameters were identified to address all services within the frequency band 17.3-17.7 GHz and for the adjacent frequency bands, the contributing working parties liaised characteristics and protection criteria to be considered in the studies when applicable. FSS parameters varied depending on studies, i.e. non-GSO system parameters may differ from study to study based on representative systems under development. In some instances, no studies were performed even when an allocation may exist as no characteristics or protection criteria were liaised by the contributing working party.

Agenda item 1.19

Four methods to satisfy the agenda item:

– Method A proposes no change to the RR and suppression of Resolution **174 (WRC-19)**;

– Method B proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction This method contains two alternatives for several items to provide a wide range of options. The selection of Alternative 1 for all the items extends provisions used in Region 1 to Region 2, as well as the addition of other provisions, while the selection of Alternative 2 for all items results in more conservative conditions with the objective to provide further protection of the BSS feeder link AP30A receiving space station and GSO FSS systems;

– Method C proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction, limiting the FSS operation to geostationary satellites; and

– Method D proposes modifications to the RR in order to allocate the frequency band 17.3-17.7 GHz in Region 2 to the FSS in the space-to-Earth direction, extending the regulatory provisions used in Region 1 to Region 2, as well as the addition of other provisions.

CHAPTER 4 – Satellite issues

7	to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution 86 (Rev.WRC-07), in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;	

Agenda Item 7, **Topic A**

- **Topic A – Tolerances for certain orbital characteristics of non-GSO space stations of the FSS, BSS or MSS**
- Topic A for WRC-23 agenda item 7 considers the adoption of possible tolerances for certain orbital characteristics of non-GSO space stations of the fixed-satellite, mobile-satellite or broadcasting-satellite services to account for potential differences between values recorded in the Master International Frequency Register (MIFR) for the specified orbital characteristics of non-GSO space stations operating on notified frequency assignments and those representative of the actual deployment of these non-GSO space stations. Any tolerances should provide the necessary flexibility to accommodate normal operations of non-GSO systems and allow operational coexistence between systems filed at same or close orbital positions. Optimization of initial orbital parameters of a system submitted at the coordination stage under RR Article **9** compared to the operational orbital parameters, is not addressed under this topic but under RR Article **11** through the notified orbital parameters recorded in the MIFR.

Agenda Item 7, **Topic A – Tolerances for certain orbital characteristics of non-GSO space stations of the FSS, BSS or MSS**

- Method A1: No change to the Radio Regulations;
- • Method A2: A draft new WRC-23 Resolution on the implementation of tolerances for certain orbital characteristics of satellites of non-GSO FSS, BSS or MSS systems to be referred to in RR Nos. 11.44C.1, 11.49.2 and 11.51;
    - – Two options are proposed under this method for the Resolution:
    - ▪ Option A proposes to apply these tolerances, including temporary variation, for satellites of all non-GSO FSS, BSS or MSS systems (either with an eccentricity < 0.5/TBD or more broadly), or to non-GSO FSS, BSS or MSS systems subject to Resolution **35 (WRC-19)** (either with an eccentricity < 0.5/TBD or more broadly);
    - ▪ In Option B, the orbital elements are updated at the notification stage to reflect the final design. Therefore, Option B proposes to apply two sets of tolerances for satellites of certain non-GSO FSS, BSS or MSS systems with regard to changes between coordination and notification filings, as well tolerances, including temporary variation, between notification filings and deployed characteristics;
- • Method A3: Modify RR Appendix 4 to add data items related to the planned tolerances for each of the four orbital characteristics for non-GSO systems subject to RR No. 11.44C and refer to these new data items in the relevant provisions of RR Article 11 and in Resolution 35 (WRC-19);
- • Method A4: New footnotes in RR Article 11 pointing to a draft new WRC-23 Resolution, applicable to non-GSO FSS, BSS or MSS systems subject to Resolution 35 (WRC-19), other than certain highly-inclined satellites, calling for periodic reporting on the altitude and inclination of deployed satellites and providing provisions – including BR examination in some cases – for ensuring that deviations, excluding temporary deviations, do not increase interference or require additional protection.

Agenda Item 7, **Topic C**

- Topic C – Protection of geostationary-satellite networks in the mobile-satellite service operating in the 7/8 GHz and 20/30 GHz bands from emissions of non-geostationary-satellite systems operating in the same frequency bands and identical directions
- Topic C under WRC-23 agenda item (AI) 7 was established to verify the effectiveness of the regulatory protection of the geostationary-satellite orbit (GSO) mobile-satellite service (MSS) from interference caused by non-GSO systems, and to identify possible inconsistencies in the provisions of the Radio Regulations (RR) applicable to the frequency bands:
  - 7 250-7 750 MHz (space-to-Earth);
  - 7 900-8 025 MHz (Earth-to-space);
  - 20.2-21.2 GHz (space-to-Earth); and
  - 30-31 GHz (Earth-to-space).

In response to this Topic, three methods are outlined in sections 4/7/3.4 and 4/7/3.5.

These methods consist of:

- Method C1 for no change to the Radio Regulations.
- Method C2 for a new provision in RR Article **22** extending the application of the concept of provisions of RR No. **22.2** for the protection of GSO satellite networks operating in the mobile-satellite service in the frequency bands under consideration in this topic.
- Method C3 for the modification of RR No. **5.461** and the additions of two new footnotes in RR Article **5** extending the application of the concept of provisions of RR No. **22.2** for the protection of GSO satellite networks operating in the mobile-satellite service in the frequency bands under consideration in this topic.

5.461 *Additional allocation:* the bands 7 250-7 375 MHz (space-to-Earth) and 7 900-8 025 MHz (Earth-to-space) are also allocated to the mobile-satellite service on a primary basis, subject to agreement obtained under No. **9.21**.

Agenda Item 7, **Topic D**

- Topic D – Topics for which consensus was achieved in ITU-R
- Topic D is a collection of three different topics that are viewed as being straightforward and for which consensus was achieved within ITU-R when presented. The topics address matters such as resolving inconsistencies in regulatory provisions or formalizing certain existing practices.
- Consensus was achieved, only a single method has been developed to address each topic.
- **Topic D1 - Modifications to Appendix 1 to Annex 4 of RR Appendix 30B**
- **Topic D2 – New RR Appendix 4 parameters for Recommendation ITU-R S.1503 updates**
- **Topic D3 - BR Reminders for BIU and BBIU**

Agenda Item 7, **Topic G**

- Topic G – Revisions to Resolution 770 (WRC-19) to allow its implementation
- Resolution **770 (WRC-19)** provides a methodology to determine conformity of non-GSO satellite systems with single-entry interference thresholds in RR Article **22** to ensure the protection of the GSO fixed-satellite service (FSS) and broadcasting-satellite service (BSS) 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.
- The objective of this topic is to propose corrections to Resolution **770 (WRC-19)**.

  - In addition to Method G1 proposing no change to Resolution **770 (WRC-19)**, editorial and regulatory modifications are proposed in Methods G2 and G3.
  - Both methods contain the same elements. While Method G2 proposes that the modifications are included in a revision of Resolution **770 (WRC-19**),
  - Method G3 proposes to remove Annex 2 from Resolution **770 (WRC-19)** and move it to a new ITU-R Recommendation which would be incorporated by reference in a revision of Resolution **770 (WRC-19**) and in the RR provisions referring to this Resolution.

Agenda Item 7, **Topic I**

- Topic I – Special agreements under RR Appendix 30B
- Following application of § 6.15 of RR Appendix **30B**, some national allotments currently possess low overall aggregate carrier-to-interference levels, lower than 21 dB.
- To restore adequate overall aggregate carrier-to-interference levels without changing the orbital position of the national allotment, a proposed method is considered under this Topic.
- The method consists of defining a new type of agreement between notifying administrations of a national allotment and of an assignment, respectively.
- Under such an agreement, the administration of the national allotment allows the assignment to operate until the bringing into use of its assignment stemming from the national allotment, at which time the administration of the assignment commits to respect the section 2.2 of Annex 4 pfd levels over the territory of the national allotment.
- Given that the national allotment and the allowed assignments will not simultaneously use the same frequency over the same area, mutual interference is not considered.

Space Related Agenda Items Part-II

- Satellite Issues 1.16, 1.18, 1.19, 7 Topics A, C, D, G, I
- **Science issues 1.14**
- Aeronautical and maritime issues 1.7, 1.11
- General issues 9.1 Topics d)

CHAPTER 3 – Science issues

1.14 to review and consider possible adjustments of the existing frequency allocations or possible new primary frequency allocations to the Earth exploration-satellite service (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with Resolution 662 (WRC-19);

Agenda Item 1.14

- EESS (passive) microwave sensing mainly includes Ice Cloud Measurements and atmosphere gases measurement. The Ice Cloud Imager (ICI) instrument which is a conical scanning millimetre/sub-millimetre wave radiometer, performs measurements of cloud ice water paths and cirrus clouds operating in two symmetric spectral bands of 239.2-242.2 GHz and 244.2-247.2 GHz. The Microwave Limb Sounder (MLS) instrument continuously observes thermal emission from utilizing spectrometers of numerous channels within the frequency band 231.5-252 GHz to measure the chemical processes and compounds within Earth's atmosphere.

Agenda Item 1.14

- **Background**
- Per Resolution **662 (WRC-19)**, WRC-23 agenda item 1.14 calls for WRC-23 to "Review of frequency allocations for the Earth exploration-satellite service (passive) in the frequency range 231.5-252 GHz and consideration of possible adjustment according to observation requirements of passive microwave sensors" without unduly constraining the other primary services currently allocated in this frequency range.
- The ability of EESS (passive) microwave remote sensing instruments to measure ice clouds depends on the specific microwave frequencies. The frequency band 231.5-252 GHz provides the optimal sensitivity to ice particles. The frequency band around 243.2 GHz (2 × 3 000 MHz bandwidth (BW) in the bands 239.2-242.2 GHz and 244.2-247.2 GHz) is being considered for future ICI EESS (passive) sensors. ICI data will enhance the ability of Numerical Weather Prediction (NWP) centres to initialize global and regional models with information on ice clouds, which is not well represented in the weather and climate models today. In addition, various portions of the frequency range 231.5-252 GHz play an important role in the measurement of chemical processes and compounds within Earth's atmosphere, such as nitric acid, ozone, sulphur dioxide, and isotopic oxygen.

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- Compatibility studies show that, in the frequency bands 239.2-242.2 GHz and 244.2-247.2 GHz, the sharing between the conical scanning passive sensors (like ICI) and systems of the fixed service (FS)/mobile service (MS) is not feasible. Studies also show that limb sounding passive sensors are compatible with systems of the FS/MS in the whole frequency range 231.5-252 GHz. Further, the sharing between the fixed-satellite service (FSS) (GSO, space-to-Earth) and EESS (passive) is feasible within the whole frequency range 232-240 GHz.

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- Three methods are proposed:

– Method A: Addition of new primary allocations to the EESS (passive) in the frequency bands 239.2-242.2 GHz and 244.2-247.2 GHz, and implementation of power limits on the FS and MS in the frequency band 239.2-241 GHz;

– Method B: Addition of new primary allocations to the EESS (passive) in the frequency bands 239.2-242.2 GHz and 244.2-247.2 GHz, switch of the current FS and MS allocations in the frequency band 239.2-241 GHz to the frequency band 235-238 GHz and limitation of the EESS (passive) allocation in the 235-238 GHz to limb-sounding operations;

– Method C: No change.

Space Related Agenda Items Part-II

- Satellite Issues 1.16, 1.18, 1.19, 7 Topics A, C, D, G, I
- Science issues 1.14
- **Aeronautical and maritime issues 1.7, 1.11**
- General issues 9.1 Topics d)

Agenda item 1.7

- *to consider a new aeronautical mobile-satellite (R) service allocation in accordance with Resolution **428 (WRC-19)** for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the aeronautical mobile (R) service, in the aeronautical radionavigation service, and in adjacent frequency bands;*
- Resolution **428 (WRC-19)** – *Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions*

Agenda item 1.7

- **Background**
- The level of aircraft traffic in oceanic and remote areas remains limited due to the difficulty of providing and maintaining suitable terrestrial communication, navigation and surveillance means, which results in applying a large separation distance between aircraft.
- Progress has been made over the last years in the areas of navigation and surveillance, with the existing availability of global navigation satellite systems and reception by satellite of automatic dependent surveillance-broadcast signals in the frequency band 1 087.7-1 092.3 MHz.
- WRC-23 agenda item 1.7 deals with a possible new allocation to the AMS(R)S within the frequency band 117.975-137 MHz, to relay standard VHF communications operating under the AM(R)S, and to complement terrestrial infrastructures over oceanic and remote areas. This would not require modification to aircraft equipment, as the space segment would be able to receive and transmit to standard VHF radios already installed on board aircraft.
- The systems operating under an allocation either in-band or adjacent band were identified and sharing and compatibility studies were carried out to determine the operating conditions for systems intended to operate under a new AMS(R)S allocation. This is to ensure the protection of these in-band and adjacent band systems from possible interference resulting from the introduction of a new AMS(R)S system in this frequency band, and also to ensure that AMS(R)S protection will not constrain planned usage of those systems as mandated by Resolution **428 (WRC-19)**.
- Additionally, some studies were conducted to estimate interference from adjacent band services above 137 MHz into the receiving space stations in the AMS(R)S in the frequency band 117.975-137 MHz and leading to different conclusions reflected in different sub-methods B in order to avoid additional constraint of the planned usage of adjacent band services.

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- To address this agenda item, ITU-R has undertaken studies, pursuant to Resolution **428 (WRC-19)**, on a possible new aeronautical mobile-satellite (Route) service (AMS(R)S) allocation to accommodate the relay of VHF communications, towards the development of an ITU-R Report (see section 2/1.7/3).
- Five methods are considered to address this agenda item:
- – Method A: NOC.
- – Method B: This method, which provides general common elements required to be complemented with Methods B1, B2, B3 or B4, proposes to add a new allocation to the AMS(R)S in the frequency band 117.975-137 MHz, or part thereof, limited to non-geostationary-satellite systems and to internationally standardized aeronautical systems. This method is not an independent and standalone method as such and thus should be considered together with Methods B1, B2, B3 or B4.
    - Method B1 is containing the elements of Method B, and proposes a new allocation in the range 117.975-137 MHz with the addition of a power flux-density (pfd) limit, on AMS(R)S space stations unwanted emissions falling above 137 MHz, in order to ensure protection of adjacent band services above 137 MHz. Method B1 also proposes coordination for coexistence between AMS(R)S and other primary in-band services according to RR No. **9.11A** with a coordination threshold proposed in Annex 1 of RR Appendix **5**.
    - Method B2 is containing the elements of Method B, and proposes that systems operating under an allocation to the AMS(R)S be subject to the application of regulatory and technical measures to ensure compatibility with existing systems operating under an allocation to a different service in co-frequency bands and in the adjacent bands.
    - Method B3 is containing the elements of Method B, and proposes the specific range 117.975-136.8 MHz for the new AMS(R)S allocation, with the application of RR No. **9.11A** coordination procedure and of a new Resolution providing additional elements on the AMS(R)S regulatory framework.
    - Method B4 is containing the elements of Method B, and proposes to add an AMS(R)S allocation in the frequency band 117.975-136 MHz. Furthermore, RR No. **9.11A** applies to protect and not adversely affecting assignments to stations of the aeronautical mobile (R) service in frequency range 117.975-137 MHz. Its use shall be limited to systems that operate and are planned in accordance with recognized international aeronautical standards.

Agenda item 1.11

- *to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution **361 (Rev.WRC-19)**;*
- Resolution **361 (Rev.WRC-19)** – *Consideration of possible regulatory actions to support modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation*

Agenda item 1.11

- to consider possible regulatory actions in support of the modernization of the global maritime distress and safety system (GMDSS) which has just been finalized by the International Maritime Organization (IMO).
- the following measures have been proposed in a unique method:
- – The deletion of narrow-band direct-printing (NBDP) for distress and safety communications from GMDSS in RR Appendices **15** and **17** for MF and HF in all bands.
- – Introduction of a new automatic connection system (ACS) which will be proposed to be implemented on the frequencies which had previously been used by NBDP for GMDSS in all MF and HF bands in RR Article **5** and Appendix **17** by a footnote.
- – Introduction of the NAVDAT frequencies in MF and HF in RR Appendix **15** and modification of the relevant provisions in RR Articles **5**, **32**, **33** and **52**. Those frequencies have been already introduced by WRC-19 in RR Appendix **17**, the difference is that now NAVDAT is part of the GMDSS.
- – To implement automatic identification system search and rescue transmitter (AIS SART) as locating equipment for which frequencies are protected by reference in RR Appendix **15**. Taking into account studies performed within ITU-R, especially in Recommendation ITU-R M.1371, it is proposed to amend RR No. **31.7** that survival craft stations may carry this equipment as an alternative to the RADAR-SART to be in line with SOLAS Chapter IV.
- In this method regarding the frequency band 1 645.5-1 646.5 MHz which is no longer used by the satellite emergency position indicating radio beacons (EPIRBs) no consensus has been reached for the regulatory action proposed to WRC-23:
- Some administrations are of the view that modification to RR No. **5.375** and Table 15-2 of RR Appendix **15** are required.
- Some other administrations are of the view that minor modification to RR No. **5.375** and Table 15-2 of RR Appendix **15** are required.
- Some further administrations are of the view that any modifications to the Radio Regulations at this stage are premature and hence no change is proposed.

5.375 The use of the band 1 645.5-1 646.5 MHz by the mobile-satellite service (Earth-to-space) and for inter-satellite links is limited to distress and safety communications (see Article **31**).

Agenda item 1.11

- **Global maritime distress and safety system modernization**
- The modernization of GMDSS, for which the work is undertaken by the IMO was not finalized at the time of WRC-19. That Conference has solely been able to take some preliminary decisions regarding NAVDAT in the MF and HF bands.
- In 2022, IMO has adopted amendments to the 1974 Safety of Life at Sea (SOLAS) Convention Chapters III and IV, together with related and consequential amendments to existing instruments other than SOLAS. These amendments will enter into force in 2024 and concluded the IMO work on modernization of the GMDSS.
- One of the changes to the SOLAS Convention is the removal of non-406 MHz satellite EPIRBs, leaving only satellite EPIRBs operating on 406 MHz. Consequently, satellite EPIRBs operating on 1.6 GHz (1 645.5-1 646.5 MHz) and EPIRBs using VHF digital selective calling (DSC) operating at 156.525 MHz no longer form a part of the GMDSS.
- Given the removal of 1.6 GHz EPIRBs by the IMO, and noting that the use of the 1.6 GHz EPIRB has already ceased operation.
  - some administrations are of the view that WRC-23 may consider possible changes to the RR related to use of the frequency band 1 645.5-1 646.5 MHz (Earth-to-space) for EPIRBs under issue A of AI 1.11.
  - some other administrations are of the view that modifications to the RR in relation to this frequency range is outside the scope of this agenda item.

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- **E-navigation**
- E-navigation is a concept under study at IMO. The definition of e-navigation is given by IMO:
- "E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment."
- As shipping moves into the digital world, e-navigation is expected to provide digital communications and digital information for the benefit of maritime safety, security and protection of the marine environment, reducing the administrative burden and increasing the efficiency of maritime trade and transport.
- Among the objectives of e-navigation, quoting the strategy implementation plan of the IMO, there are the improvements of communications in general, the standardization and automation of ship's reporting and the integration and presentation of available information in graphical displays received via communication equipment.
- Communication is a key element for e-navigation. Future communication systems should be digital and could include VDES and in the future NAVDAT and be developed to facilitate wide information management solutions.
- **Additional satellite systems into the global maritime distress and safety system**
- Two satellite systems have been providing safety communication in the GMDSS. The introduction of an additional GSO MSS system for GMDSS may require new or modified regulatory provisions, based on the results of the ITU-R studies.

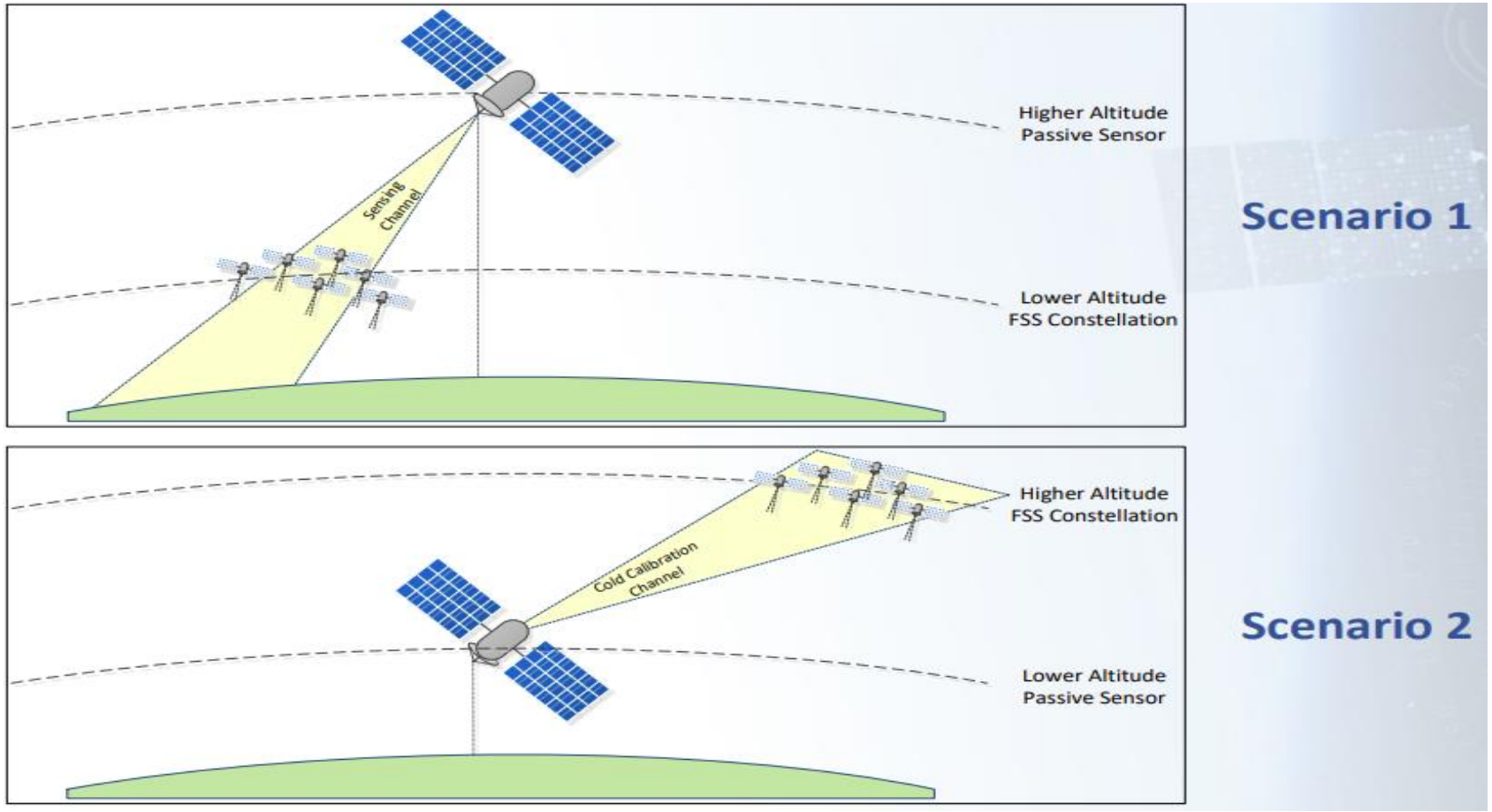
Space Related Agenda Items Part-II

- Satellite Issues 1.16, 1.18, 1.19, 7 Topics A, C, D, G, I
- Science issues 1.14
- Aeronautical and maritime issues 1.7, 1.11
- **General issues 9.1 Topics d)**

Agenda item 9.1(9.1-d)

- Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations
- **Summary of the results of ITU-R studies**
- Under WRC-23 agenda item 9.1, topic d), which is a continuation of study matters that began but were not fully resolved under WRC-19 agenda item 1.6, there are two potential interference scenarios that were studied, while taking into account the fixed-satellite service (FSS) characteristics provided by the relevant ITU-R contributing group and the Earth exploration-satellite service (EESS) (passive) characteristics:
  - interference into the sensing channel of EESS (passive) from non-geostationary-satellite orbit (non-GSO) FSS constellations operating in the frequency band 37.5-38 GHz at a lower altitude than EESS (passive) sensors;
  - interference into the cold calibration channel of EESS (passive) from non-GSO FSS constellations operating in the frequency band 37.5-38 GHz at a higher altitude than EESS (passive) sensors.

Agenda item 9.1(9.1-d)



Agenda item 9.1(9.1-d)

- With regard to the first scenario, the results of one study considering two different non-GSO FSS systems indicate that an unwanted emission power density limit of −31 dBW/100 MHz in the frequency band 36-37 GHz would be needed. This would be applicable to non-GSO FSS constellations operating at altitudes below 970 km (maximum altitude of EESS (passive) sensors in this frequency band). The results of another study considering one non-GSO FSS system show that there is a minimum positive margin of 10-15 dB to the EESS (passive) protection criteria. Both studies consider a side lobe level of 0 dBi, no additional satellite body blockage loss, and no apportionment of the EESS (passive) protection criterion. When considering an additional attenuation provided by the FSS satellite body of more than 18 dB, all studies conclude that no specific unwanted emission limit would be needed to cover this scenario.
- With regard to the second scenario, the results of two studies considering three different non-GSO FSS systems indicate that an unwanted emission power density limit of −31 dBW/100 MHz in the frequency band 36-37 GHz would be needed, without apportionment of the EESS (passive) protection criterion. This would be applicable to non-GSO FSS constellations operating at altitudes above 407 km (minimum altitude of EESS (passive) sensors in this frequency band) and below 2 000 km (limited to LEO constellations). Another study that considers a different set of operational FSS characteristics has shown that there is a minimum margin of approximately 7 dB to the EESS (passive) protection criteria when only assessing interference from the particular constellation considered, and this study concludes that no specific unwanted emission limit would be needed to cover this scenario.
- In addition, Administrative Circular CA/251 (Results of CPM23-1) stipulates that “WRC-19 invites ITU-R to conduct further study of this topic and develop Recommendations and/or Reports, as appropriate, and report back to WRC-23 to take action, if necessary”.
- Administrative Circular CA/251 also stipulates that “WRC-19 agreed that modifications to Resolution **750 (Rev.WRC-19)** should not be considered under these studies since the frequency band 36-37 GHz is not referenced in No. **5.340**”.

THANK YOU FOR YOUR ATTENTION

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