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GLOBAL SATELLITE OPERATORS ASSOCIATION

GSOA WRC-23 POSITIONS

Global **Challenges** | Satellite **Answers**

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Contents

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Agenda Item 1.2

WRC-23 Agenda Item 1.2

Overview

To consider identification of IMT and possible allocations to the mobile service on a primary basis, in accordance with Resolution **245 (WRC-19)**, which sets out sharing and compatibility studies for the stated frequency bands:

- **> 3300-3400 MHz & 3600-3800 MHz (R2)**
- **> 3300-3400 MHz (amend footnote in R1)**
- **> 6425-7025 MHz (R1)**
- **> 7025-7125 MHz (globally)**
- **> 10000-10500 MHz (R2)**

GSOA Position

3600-3800 MHz (R2)	6425-7025 MHz (R1) 7025-7125 MHz (globally)	10-10.5 GHz (R2)
GSOA supports **No Change** to the ITU RR for 3600-3800 MHz in R2 but recognizes the various preferences for the use of 3600-3700 MHz in R2. GSOA is of the view that countries deciding to identify IMT up to 3700 MHz can include their names in footnote 5.434 instead of identifying the band regionally for IMT.	GSOA position is **No Change** to the ITU RR. Using 6425-7025 MHz in R1 and 7025-7075 MHz globally for IMT would lead to excessive interference making these bands unusable for FSS.	GSOA position is **No Change** to the ITU RR. If an IMT identification was considered in 10-10.5 GHz, the conditions to protect the EESS services globally should also include IMT unwanted/OOB emission limits to protect FSS above 10.7 GHz.

Background C-band downlink (3600-3800 MHz)

Countries in R2 rely heavily on C-band Fixed Satellite Services (FSS) to support critical services that cannot be provided as reliably or at all by other means, for multiple applications and industry verticals such as broadcasting, backhaul and trunking services for MNOs and Telcos. A high number of earth stations are deployed, including receive-only and bidirectional terminals, in business-to-consumer (B2C) scenarios.

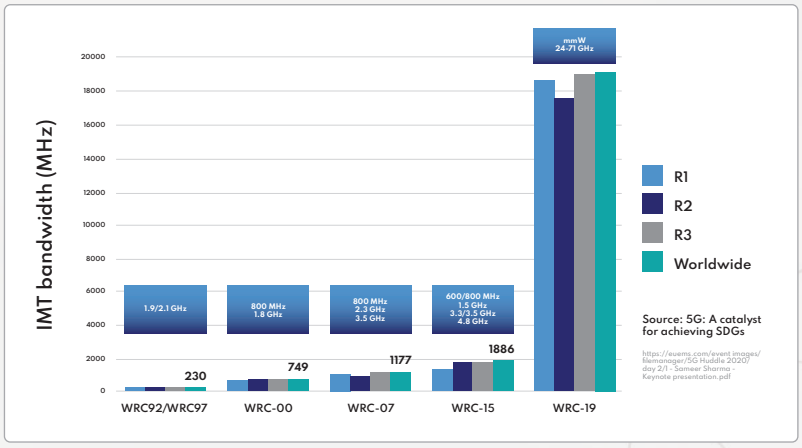
Satellite operators in R2 have long term plans and business interests for the use of 3600-3800 MHz (space-to-Earth) for both existing operations and future satellite systems. The band has unique characteristics such as wide coverage and resilience to rain fade. Higher frequency bands for FSS (such as Ku, Ka) are extensively used and face higher demand for existing and future geostationary satellite orbit (GSO) and non-geostationary satellite orbit (NGSO) systems, so they do not represent a suitable alternative.

ITU-R sharing studies between IMT and FSS earth stations (Report ITU-R S.2368) showed that:

- To meet the long-term interference criterion, the required separation distances are in the tens of km range
- To meet the short-term interference criterion, the required separation distances, including the effect of terrain, exceed 100 km
- When FSS earth stations are deployed in a ubiquitous manner or with no individual licensing, IMT and FSS sharing is not feasible in the same area (no minimum separation distance guaranteed)
- Deployment of IMT stations prevents future FSS earth stations from being deployed in the same area

Note that a total of ~1GHz of spectrum is already allocated and identified for IMT in the mid-band (2-3.6 GHz) in R2, without the need to add further pressure to the satellite ecosystem. Most R2 countries will continue operating FSS earth stations in the 3600-3800 MHz band. Seven R2 countries are already listed in footnote 5.434 that identifies 3600-3700 MHz for IMT.

Figure 1: Amount of spectrum available for IMT



Background C-band uplink (6425-7025 MHz and 7025-7075 MHz)

- Minimal potential for IMT operations while protecting FSS uplinks (indoor use only, 10-15 dBm EIRP limit necessary)
- Sharing studies between IMT and FSS in 5925-6425 MHz (CEPT/ECC Report 302) demonstrated that sharing with unlicensed Wi-Fi indoors is more feasible than sharing with IMT[1]
- ITU-R studies on 6425-7025 MHz, from GSOA and some administrations show excessive interference at the satellite. The studies that predict interference below the protection criterion are based on unrealistic or erroneous assumptions
- Some operators use 6425-6575 MHz for feeder uplinks to support all L-band MSS worldwide, necessary for operation of the Global Maritime Distress and Safety System (GMDSS), aviation safety services (AMS(R)S), and GNSS augmentation (SBAS)
- The issue goes beyond R1, even in the band 6425-7025 MHz, as satellites serving R2 and R3 have footprints overlapping with R1

Background C-band feeder links for NGSO MSS (6700-7075 MHz)

- 6700-7075 MHz is allocated to FSS globally (space-to-Earth) for NGSO feeder links for NGSO systems of the MSS
- Existing MSS systems have been using all or a portion of these allocations continuously since 1998
- Satellite operators have plans to deploy MEO satellite systems with more gateway earth stations planned
- 6700-7075 MHz is considered for the "IRIS2" satellite connectivity project of the European Union (EU)

Key Points

› In 6425-7075 MHz, studies conducted by GSOA and administrations show excessive interference to satellites, even with a very low IMT density. Any limit to protect satellite (e.g., 25 dB power reduction) would make IMT operations impractical. In other bands - e.g., 2655-2690 MHz - IMT already caused documented harmful interference to satellite receivers.

› In 10-10.5 GHz an IMT identification would generate excessive interference to the global EESS services in in 10-10.4 GHz (active) and in 10.6-10.7 GHz (passive). Although there is no FSS allocation in this band, FSS (space-to-Earth) is heavily used above 10.7 GHz. The conditions to protect EESS should also include IMT unwanted/OOB emission limits to protect FSS above 10.7 GHz. GSOA invites administrations to prioritise existing IMT identifications above 24 GHz to achieve the desired use cases (i.e., capacity hot-spots in urban scenarios).

› 14 countries in R1 already identified 3300-3400 MHz for IMT with great support for a regional harmonization (existing IAP in CITEL). Also, 7 countries in R2 already identified 3600-3700 MHz for IMT. Added to 3400-3600 MHz, this would support 300 MHz of contiguous bandwidth. This can be enough spectrum to satisfy IMT 5G needs. Taking this into account and the heterogeneous situation of Region 2 with respect to spectrum needs, GSOA opposes an IMT regional identification in 3400-3600 MHz. Any administration that requires additional IMT spectrum has the possibility to include its name in the existing footnote 5.434 and identify nationally 100 additional MHz in the 3600 – 3700 MHz.

1 Even though these two studies were done for the adjacent band, they are relevant to AI 1.2 since the technical characteristics assumed for IMT, FSS and Wi-Fi systems are applicable also in the band 6425-7 025 MHz.

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Agenda Item
1.3

WRC-23 Agenda Item 1.3

Overview

To consider a primary allocation of the band 3.6-3.8 GHz to the mobile service within Region 1 and take appropriate regulatory actions, in accordance with Resolution **246 (WRC-19)**, **with two key points:**

› **Conduct sharing and compatibility studies to ensure protection of primary services, and not impose undue constraints on existing services and their future development**

› **Only consider possible upgrade of the existing secondary Mobile Service allocation in 3.6-3.8 GHz (except aeronautical mobile) to primary in Region 1, excluding any IMT identification in Region 1 (R1)**

Background on C-band downlink (3.6-3.8 GHz in R1)

ITU-R sharing studies between Mobile Service (MS) systems and Fixed Satellite Service (FSS) earth stations (Report ITU-R S.2368) **have showed that:**

- The required separation distances are in the tens to over 100s of km to meet the long-term and short-term FSS protection criteria, respectively
- When FSS earth stations are deployed in a ubiquitous manner or with no individual licensing, MS and FSS sharing is not feasible in the same area (no minimum separation distance guaranteed)
- Deployment of MS stations prevents future FSS earth stations from being deployed in the same area

Note that a total of ~ 1GHz of spectrum is already allocated and identified to IMT in the mid-band (2GHz – 3.6GHz) in R1 without the need to further pressure the satellite ecosystem.

Resolution 246 (WRC-19) recognizes that "for African countries, especially those in tropical areas, the operations of FSS systems (space-to-Earth) are more reliable for use in C-band frequencies (3400-4200 MHz), rather than in higher frequency bands".

In many R1 countries, e.g., in Africa, the reliance on C-band FSS services is profound and pervasive with thousands of earth stations, including for B2C services with a significant number of smaller, often self-installed, antennas located at consumer households. Protection of such a high number of earth stations would not allow for a widescale outdoor MS deployment.

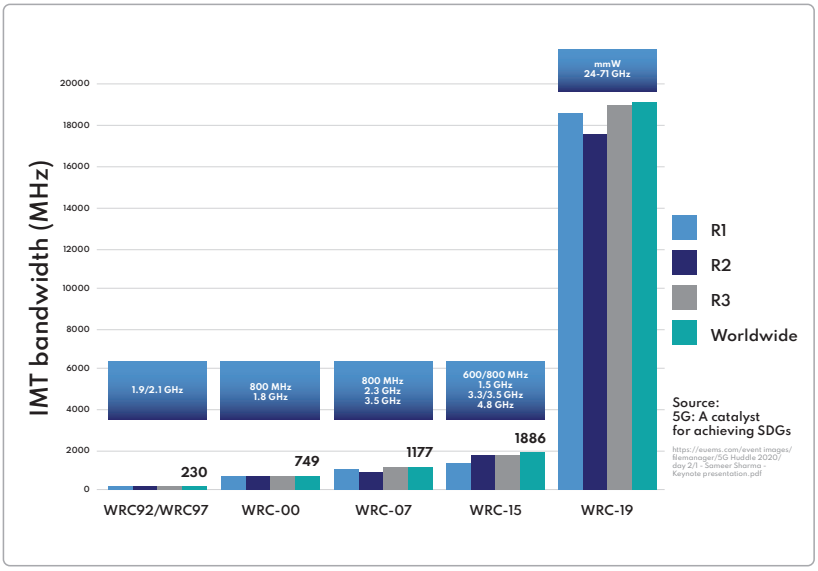

Figure 1: Amount of spectrum available for mobile services

Key Points

- There is enough harmonized mid-band spectrum available to MS including in C-band (3.3-3.6 GHz). According to an LS Telcom study[1], on average less than 50% of available spectrum <5GHz is licensed over Africa
- In Africa, the following mid-band spectrum is already harmonized and ready for MS: **1427–1518 MHz, 1710–1980 MHz, 2110–2170 MHz, 2300–2400 MHz, 2500–2690 MHz, 3300–3400 MHz, 3400–3600 MHz, 4800–4990 MHz.** These frequencies are part of 3GPP standards and have a mature MS device ecosystem

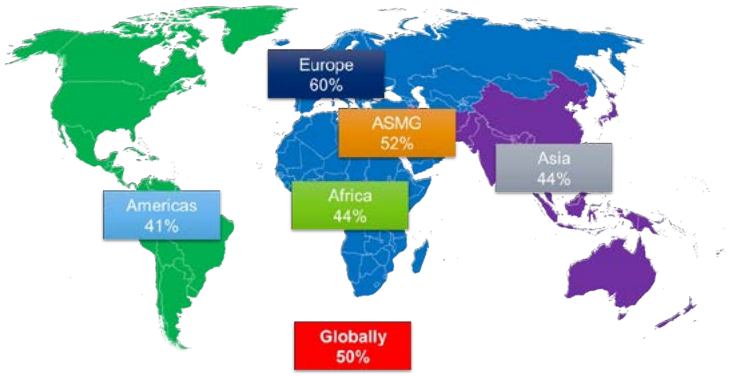

Figure 2: Percentage of spectrum available for IMT/MS which is licensed and in use

- Specifically in C-band, 3300–3400 MHz in combination with 3400–3600 MHz represent 300 MHz of harmonized spectrum for Africa. If 3600–3700 MHz is also added, this totals 400 MHz to be available for ATU, in line with CEPT and ASMG

Allocating the entire 3.6-3.8 GHz band for MS is not the norm, as numerous countries around the world are stopping below 3.6 GHz or 3.7 GHz.

In all countries deploying IMT or MS in C-band, FSS earth stations had to be removed to avoid constraining IMT or MS. This confirms ITU-R studies findings that IMT/MS and FSS sharing is not feasible. Migration of FSS leads to complexity for satellite operators to accommodate their existing customers operating in 3.6-3.8 GHz to the limited satellite capacity above 3.8 GHz. The choice of one administration can impact the capacity provision of a satellite operator over a whole region for additional users to migrate to 3.8-4.2 GHz. It is both a difficult and costly exercise that impacts consumers with potential service disruption and the need for regulators to support consequential ground works to facilitate the migration.

GSOA Position

- **MS should use available spectrum before seeking more spectrum that impacts existing services.**
- **Using 3.6-3.8 GHz in R1 for MS would lead to excessive interference making the band unusable for FSS.**
- **An IMT identification is not in the scope of the Agenda Item, nor in Resolution 246 (WRC- 19).**
- **No undue constraints should be imposed on the existing services and their future development.**

GSOA supports **No Change to ITU RR** for 3.6-3.8 GHz in R1 but recognizes the various preferences in R1. An upgrade of MS in 3.6-3.7 GHz could be a balance between MS and FSS use such as with Method E2. Methods which do not propose any conditions to protect existing services should also be opposed.

1 https://www.lstelcom.com/fileadmin/content/lst/marketing/media/2019_Study_LicensingUseofMobileSpectrum.pdf

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Agenda Item
1.8

WRC-23 Agenda Item 1.8: Use of FSS Networks by Unmanned Aircraft Systems for Control and non-Payload Communications

Overview

To consider, on the basis of ITU-R studies in accordance with Resolution 171 **(WRC-19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155 (Rev. WRC-19)** and **No. 5.484B** to accommodate the use of FSS networks by control and non-payload communications (CNPC) of unmanned aircraft systems (UAS). UAS comprise an unmanned aircraft (UA) with an Earth station on-board and an associated unmanned aircraft control station (UACS) connected via satellite links used to facilitate beyond line-of-sight (BLOS) control and non-payload communication (CNPC).

Background

UA CNPC links in segregated airspace have been operating for several years using FSS networks in the geostationary orbit under No. **4.4** of the Radio Regulations (non-interference, non-protection). UAS CNPC links have also been the subject of studies in ITU-R since 2007. WRC-15 agreed on Resolution **155 (Rev.WRC-19)** ("Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces"). Resolution **155 (Rev. WRC-19)** is a complex resolution, containing 19 resolves. This is further complicated in that UAS falls under the responsibility of two international organizations, ITU and ICAO. ICAO is responsible for the Standards and Recommended Practices (SARPS), which includes safety, while the ITU is responsible for the spectrum aspects. WRC-23 Agenda Item 1.8 links the two organizations via resolves 18 of Resolution **155 (Rev. WRC-19)** which calls for WRC-23 "to consider the progress made by ICAO in the process of preparation of SARPs for UAS CNPC links" and "to review this Resolution".

Key Points

The frequency bands under consideration are:

- **12.5 – 12.75 GHz (space-to-Earth)**
- **14 – 14.47 GHz (Earth-to-space)**
- **19.7 – 20.2 GHz (space-to-Earth)**
- **29.5 – 30.0 GHz (Earth-to-space)**

The concern is that because CNPC links have "safety of life" implications, CNPC links could be considered to have "super-primary" status within FSS applications and therefore constrain other FSS operations using the same frequency bands.

The safety aspects of UAS CNPC shall not have any impact on:

- Existing agreement between notifying administrations reached during FSS satellite coordination process
- Future coordination of FSS networks during the application of provisions of Articles 9 and 11 of the RR
- Existing terrestrial services and their current and expected applications; and
- Assignments which fall under RR 11.41

If the conditions for the safety operation of CNPC established by ICAO cannot be met by existing FSS links, while respecting the principles described above, then this link should not be used for UAS.

GSOA Position

It is noted that this complex Agenda Item was also discussed at WRC-12 and WRC-15, and that the consideration of this matter at WRC-19 resulted in Resolution 171 (WRC-19). However, after more than ten years of studies there are still several key problems that have not been resolved, including:

- The contradiction between the safety nature of the operation of UAS CNPC links and the non-safety status of the FSS.
- There is the uncertainty whether a UAS CNPC link operator could require a super primary status over regular FSS, either formally through ITU regulations, through ICAO regulations which are outside the control and authority of ITU or de facto, e.g., in bilateral coordination discussions.
- The FSS bands in question are among the most heavily congested frequency bands with a multitude of different types of FSS users, many operating without individual licensing and most networks with incomplete frequency coordination. As a result, interference is a regular occurrence, also into FSS networks that has completed all the frequency coordination.

GSOA has actively followed the work to revise Resolution 155 (Rev. WRC-19). GSOA notes evident risks that revisions of Resolution 155 (Rev. WRC-19) may result in unintended consequences potentially affecting regular FSS services, either through the ITU regulations or through the ICAO regulations which are outside the control and authority of ITU. Considering the lack of progress and convergence in the discussions during the WRC-23 study cycle, GSOA has come to the conclusion that UAS CNPC links with additional safety requirements are unsuitable to be implemented in the regular FSS bands and that RR 5.484B and Resolution 155 (Rev. WRC-19) should be suppressed.

GSOA recommends the following actions:

A review of the current conditions for use of FSS assignments, where this could allow for additional assignments to be available for UAS CNPC while meeting safety requirements, is required.

Being the safety status responsibility of ICAO, ITU RR 4.10 does not apply.

Interference environment for MSS Operations in 14-14.47 GHz, 19.7-20.2 GHz, and 29.5-30 GHz should not be further constrained by the operations of UAS CNPC in FSS.

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Agenda Item
1.15

WRC-23 Agenda Item 1.15

Overview

To consider the use of frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed satellite service globally, in accordance with Resolution 172 (WRC-19).

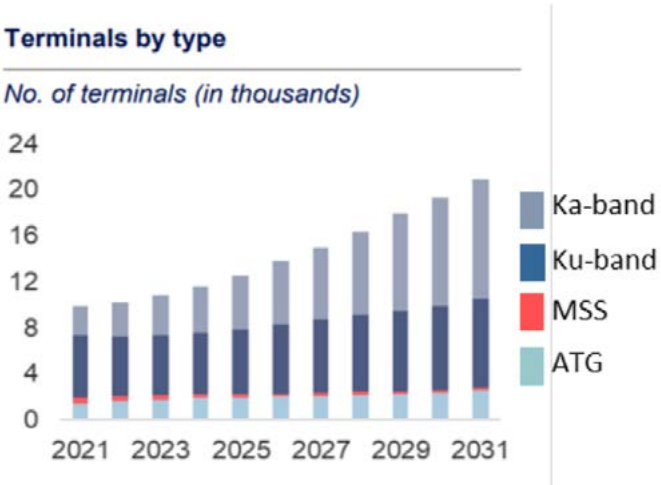
Allocation to services		
REGION 1	REGION 2	REGION 3
12.75-13.25 GHz	FIXED FIXED-SATELLITE (Earth-to-Space) 5.441 MOBILE Space research (deep space) (space-to-Earth)	

The frequency band 12.75-13.25 GHz is planned to be used globally in conjunction with the 14.0-14.5 GHz frequency band to provide additional uplink capacity in the Ku-band for in-flight and maritime connectivity.

A worldwide harmonized approach for A-ESIM and M-ESIM would benefit administrations, industries and consumers.

Background

IFC data consumption is on a steep rise and subscribers expect more value. In 2021, approximately 9,900 aircraft were actively providing IFC services through over 120 airlines. This number is expected to surpass 20,900 aircraft by 2031 representing 58% IFC penetration. The high demand for in-flight and maritime connectivity can be partially satisfied by additional capacity obtained by allowing operation of ESIM communicating with GSO space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space). This reflects that people are accustomed to being connected, even on the move, and their appetite for data is increasing.



People are accustomed to being connected, even on the move, and their appetite for data is increasing.

Key Points - Status of Agenda Item 1.15

Method A

No changes to the Radio Regulations and suppression of Resolution 172 (WRC-19).

Method B

Add a new footnote in RR Article 5 that refers to a new WRC Resolution with technical, operational and regulatory conditions for the operation of A-ESIM and M-ESIM communicating with GSO space stations in the fixed-satellite service in the frequency band 12.75 13.25 GHz (Earth-to-space) while ensuring protection of allocated services inter alia protection of terrestrial services with both a minimum distance from the low-water mark and maximum e.i.r.p. density towards the horizon for M-ESIM, and pfd mask for A-ESIM and consequential suppression of Resolution 172 (WRC-19).

- The draft new Resolution [A115] (WRC-23) contains technical, regulatory and operational conditions for operation of A-ESIM and M-ESIM.
- Regarding the protection of existing services, including the Appendix 30B Plan, the following measures are included in the Resolution:
  - Appendix 30B GSO networks (Annex 1): A regulatory procedure to be followed by administrations and the Radiocommunication Bureau, including examinations to protect the Plan.
  - Terrestrial services (Annex 2): A PFD mask at Earth's surface for A-ESIM and a minimum distance to the low-water mark and maximum e.i.r.p. density towards horizon for M-ESIM.
  - Non-GSO systems (Annex 3): Off-axis and on-axis e.i.r.p. limits for A-ESIM and M-ESIM.
  - The process and responsibility to resolve any possible interference issues resulting from operations of A-ESIM or M-ESIM.
- There are still areas in the draft new Resolution [A1.15] (WRC-23) which contain options and will need to be further discussed and resolved in WRC-23.

GSOA Position

- **Supports Method B:**
  Develop a technical and regulatory framework to ensure protection of existing services in the band and adjacent bands, as contained in the draft new Resolution [A1.15] (WRC-23) and its Annexes.
- **Supports resolving the remaining Open issues and finalizing the Draft New Resolution [A115] (WRC-23) in WRC-23.**

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Agenda Item
1.16

WRC-23 Agenda Item 1.16

Overview

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 NGSO FSS earth stations in motion ("NGSO ESIM"), while ensuring due protection of existing services in those frequency bands, in line with Resolution 173 (WRC-19).

- Technical and regulatory provisions for the operation of ESIM under this Agenda Item are limited to aeronautical (A-ESIM) and maritime ESIM (M-ESIM)
- ESIM using GSO networks ("GSO ESIM") in Ka-band have already been addressed by the ITU, with Resolution 156 (WRC-15) (19.7-20.2 / 29.5-30.0 GHz) & Resolution 169 (WRC-19) (17.7-19.7 / 27.5-29.5 GHz)
- A harmonized international framework for the use of NGSO ESIM, including ensuring the protection of existing services, is also required

Background

- There is a growing demand for in-flight and maritime connectivity worldwide
- Several NGSO constellations are being planned, in the process of being deployed or already operating in the Ka-band and are positioned to provide service via ESIM
- NGSO ESIM in the Ka-band will support the need for ubiquitous broadband connectivity to passengers/crew on aircraft and vessels
- NGSO ESIM have technical characteristics that are similar to GSO ESIM

Key Points - Status of Agenda Item 1.16

WP 4A has identified two methods to satisfy Agenda Item 1.16:

Method A

No change to the Radio Regulations and suppression of Resolution 173 (WRC-19)

Method B

Add a new footnote in RR Article 5 that refers to a new WRC Resolution with technical, operational and regulatory conditions for the operation of NGSO maritime and aeronautical ESIMs while ensuring protection of allocated services, and consequential suppression of Resolution **173 (WRC-19)**

- NGSO ESIM operating in 17.7-18.6, 18.8-19.3 GHz and 19.7-20.2 GHz (No. 5.524) shall not claim protection from terrestrial services
- For the protection of terrestrial services with secondary allocation in 29.5-30 GHz (No. 5.542), the same conditions as for NGSO ESIM in 27.5-29.1 GHz shall apply for administrations mentioned in No. 5.542
- Sharing and compatibility studies have shown that, due to the similarities between NGSO ESIM and GSO ESIM, the existing GSO framework for the protection of terrestrial services can be adopted for NGSO
- For the protection of space services, NGSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the NGSO system
- For the protection of GSO FSS networks, the relevant epfd limits in Article 22 shall apply. For the protection of the Earth exploration-satellite service (EESS passive) in 18.6-18.8 GHz, GSOA supports pfd limits from technical studies (Annex 3 of draft Resolution)
- The notifying administration is responsible for the ESIM operation, including resolving cases of interference

GSOA Position

- Support Method B
- Support finalizing a New Draft Resolution on this Agenda Item
- Support the development of a methodology (Annex 2 of new Resolution) for examination by the Bureau of compliance of NGSO Aero ESIM with pfd limits on the ground
- For protection of terrestrial services in the 27.5 – 29.1 GHz frequency band, the same technical conditions as applicable to GSO ESIM in Resolution 169 (WRC-19) should apply (same pfd limit on the ground for A-ESIM; same minimum distance from the coast and max EIRP spectral density towards the horizon for M-ESIM)
- Oppose to the publication of list of countries authorizing ESIM in their territory as a) it is difficult to implement b) it will not help identifying the ESIM potentially causing interference and c) it will impose an additional burden to the authorizing administration
- Oppose to unnecessary differentiations in the regulatory framework of NGSO ESIM compared to the one of GSO ESIM

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Agenda Item
1.18

WRC-23 Agenda Item 1.18

Overview

> "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)."

Considerations

- While there is a demand for new spectrum for narrowband emissions such as M2M and IoT, there is also an exponential increase for non-terrestrial network (NTN) Mobile Satellite Service (MSS) voice and data communications requiring wider band emissions.
- Agenda Item 1.18 limits spectrum access only to low power, low duty cycle MSS devices which precludes more robust existing MSS and future 5G NTN global capabilities and use cases.

Background

Resolution 248 (WRC-19) called for studies to be conducted relating to spectrum needs and potential new allocations for narrowband Mobile Satellite Service (MSS) in the band 2010-2025 MHz (Region 1) and bands 1695-1710 MHz, 3300-3315 MHz and 3385-3400 (Region 2).

This Agenda Item invited the ITU-R to consider studies relating to spectrum needs and potential new allocations for MSS for applications of low-data rate systems for the collection of data from, and management of, terrestrial devices in the MSS with the aim to consider possible new primary or secondary allocations, with the necessary technical limitations, taking into account the characteristics described in recognizing (c), to the MSS for non-GSO 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, while not imposing undue restrictions on their further development.

Studies and draft CPM methods

Work at ITU-R WP4C on AI 1.18 during this study cycle was characterized by a lack of agreement on the interpretation of Resolution 248 (WRC-19), the lack of agreed technical parameters, and the lack of any necessary sharing & compatibility studies.

Technical and operational characteristics in accordance with Resolution 248 (WRC-19), spectrum needs, associated sharing and compatibility studies were NOT AGREED NOR COMPLETED. Therefore, it is NOT POSSIBLE to determine how to ensure the protection of existing services (in-band & adjacent band) with

potential new allocations to the MSS in the frequency bands 1695-1710MHz, 3300-3315MHz & 3385-3400MHz in Region 2; and 2010-2025 MHz in Region 1.

While there is increased demand for new spectrum for narrowband emissions such as M2M and IoT, there is also an exponential increase for non-terrestrial network (NTN) MSS voice and data communications requiring wider band emissions. Accordingly, allocating dedicated spectrum solely for narrowband emissions such as M2M and IoT is not necessary and would be an inefficient use of spectrum since these services can be offered in existing and future conventional MSS allocations.

Global spectrum harmonization and common technical conditions, aligning with the existing Region 2 MSS allocation from 2010-2025 MHz, would maximize spectrum utility and potential use-cases and encourage the deployment of global systems in this spectrum and should be considered as part of a broader FAI on the study and allocation of conventional MSS.

WP4C finalized WRC-23 CPM text at its September 2022 meeting by establishing two No change approach methods as follows:

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 its Appendices thereof, except revision of **Resolution 248 (WRC-19)**

A new Method C was introduced at CPM23-2 for primary allocation to the mobile satellite service in the frequency band 2 010-2 025 MHz (Earth-to-space) in Region 1 that includes the following Alternatives and Options:

Alternative 1: Limited to MSS narrowband
Option 1: For all countries in Region 1 **Option 2:** For a list of countries in Region 1

Alternative 2: MSS allocation
Option 1: For all countries in Region 1 **Option 2:** For a list of countries in Region 1

GSOA Position

› **Supports Method A:**
- **No change** to the Radio Regulations and **Suppression** of **Resolution 248 (WRC-19)**

› **Rationale**

GSOA encourages to support Method A of CPM text, which supports a No Change position at WRC-23 for Agenda Item 1.18, and the Suppression of Resolution 248 (WRC-19) given the ambiguity in the Resolution 248 (WRC-19), the lack of agreed technical and operational characteristics of narrowband MSS, as well as the impossibility to perform sharing and compatibility studies with existing primary services and studies on the spectrum needs to ensure the protection of existing services (in-band and adjacent band) with potential new allocations to the MSS in the frequency bands under study.

GSOA view on Method C: there have been no studies performed to justify an allocation of spectrum at the WRC-23. This would set a bad precedent for future spectrum allocations to move forward without agreed technical and operational characteristics of spectrum and where there have been no studies performed to ensure protection of incumbent services. In addition, GSOA does not support allocations limited to certain applications.

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Agenda Item
1.19

WRC-23 Agenda Item 1.19

Overview

To consider a new primary FSS allocation 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 (Resolution 174 WRC-19).

Background

- The band 17.3-17.7 GHz is allocated to BSS feeder links (Earth-to-space) and subject to Appendix 30A
- The band 17.3-17.7 GHz is also allocated to BSS (space-to-Earth) in non-planned bands
- The proposed new FSS Downlink (DL) allocation in 17.3 – 17.7 GHz is contiguous to the existing global FSS Ka-band allocation in the 17.7 – 21.2 GHz band used widely for many kinds of services
- The new FSS DL allocation is considering GSO and NGSO systems based on the Article 22 framework
- In Region 1 the band is already allocated to the FSS (space-to-Earth) and coexists with BSS feeder links (Earth-to-space) that are subject to Appendix 30A
- The frequency range is allocated on a primary basis to satellite services only. It is not shared with terrestrial services as other ranges of the Ka-band

GSOA Position

- GSOA supports the development of a regulatory framework to allocate the 17.3 – 17.7 GHz band to the FSS (space-to-Earth) in Region 2, while ensuring the protection of BSS feeder links (Earth-to-space) subject to Appendix 30A and BSS (space-to-Earth)
- Expanding the FSS allocation by 400 MHz would add contiguous spectrum in Region 2 for gateways and user terminals alike, responding to the growing demand for broadband satellite service throughout in Americas
- The new allocation would provide satellite operators with the flexibility to satisfy BSS or FSS service demand in the same frequency band indistinctly and in many cases without the necessity to use exclusive payloads depending on the service
- Supports Method D of the CPM text. For the modification of RR No. 5.516A and the new footnote 22.5F.Y, GSOA supports the first alternative of CPM text for each footnote

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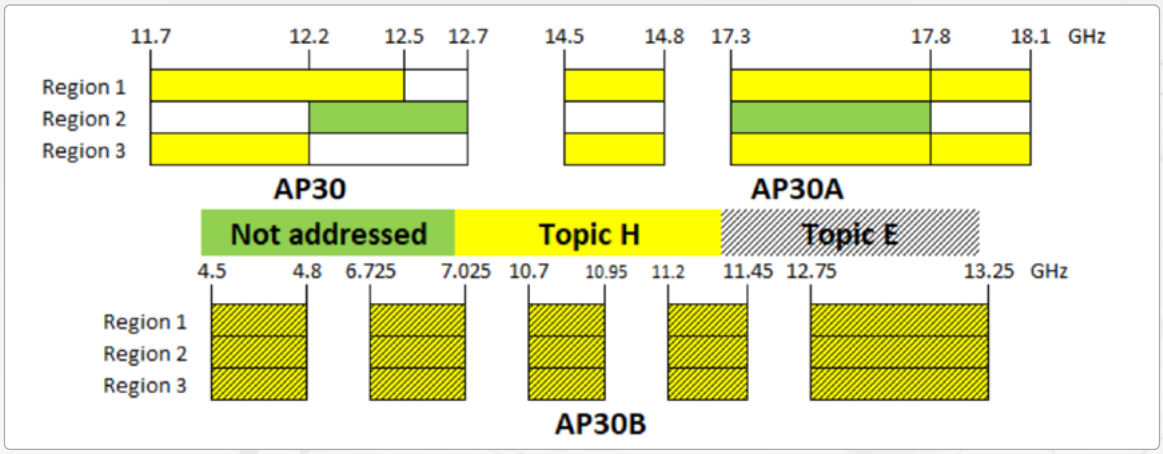
Agenda Item
7 Topics E&H

WRC-23 Agenda Item 7: Planned Bands Topics E & H

Overview

To facilitate the use of the AP30, AP30A & AP30B frequency bands.



Topic E: Improved procedures for new ITU Member States

› GSOA supports improving procedures for new ITU Member States.

› Coordination can address encountered problems on a case-by-case basis and is therefore pleased to note the initiated coordination efforts being made supported by the Radiocommunication Bureau.

› GSOA is very concerned by Methods which do not take into account operational or soon to be operational satellite networks which would be obliged to stop its operation without any possibility of discussions as soon as a new ITU Member State decides to request an allotment in an orbital position close to the satellite already in operation, **Hence, GSOA finds the implementation of method E3 unreasonable and cannot support it.**

Method E1: No changes to the Radio Regulations.

Method E2: To grant new ITU Member States the same privileges as those granted to administrations having no assignments in the AP30B List, or under coordination, as adopted in Resolution 170 (WRC-19).

Method E3: To modify Article 7 procedure of AP30B so that ITU Member States could obtain national allotment by reconsidering the priority between Article 7 requests and application of Article 6 for additional systems.

GSOA Position: GSOA supports modified Method E2 as agreed in CPG meeting in September 2023.

› **Support developing specific measures for new ITU Member States by further involving Radiocommunications Bureau support, limited coordination activities for New Member States while granting some certainties for operational or nearly operational satellite networks.**

Topic H: Enhanced protection of Plan networks

› Implicit agreement (Methods H1

GSOA fully understand that the protection of the Plan is crucial and supports developing specific measures to address this concern while also addressing the potential problem related to no reply to coordination requests from additional uses/systems which is not addressed in Method H1B.

› EPM degradation tolerance (Methods H2)

GSOA recalls that the increase in the EPM degradation tolerance from 0.25 to 0.45 dB adopted by WRC-2000 was linked with approved additional modifications as adoption of more robust digital modulation for the Plan.

GSOA considers that modification of the EPM degradation tolerance to go back to the value pre-WRC-2000 is not feasible.

› Implicit agreement

Method H1A: No changes to the Radio Regulations Method H1B: Remove implicit agreement.

Method H1C: New mechanism similar as the AI 7 Topic I mechanism to replace implicit agreement whereby the administration of the additional use/system is allowed to operate (with commitment to respect certain conditions) until the BIU of the national assignment/allotment of the other administration.

GSOA Position: Supports Methods H1A & H2A

› **GSOA could also consider supporting Method H1C in the CPM Report as an alternative, which is similar to the new type of agreement as suggested in Topic I (below) that could potentially replace the implicit agreements regulations.**

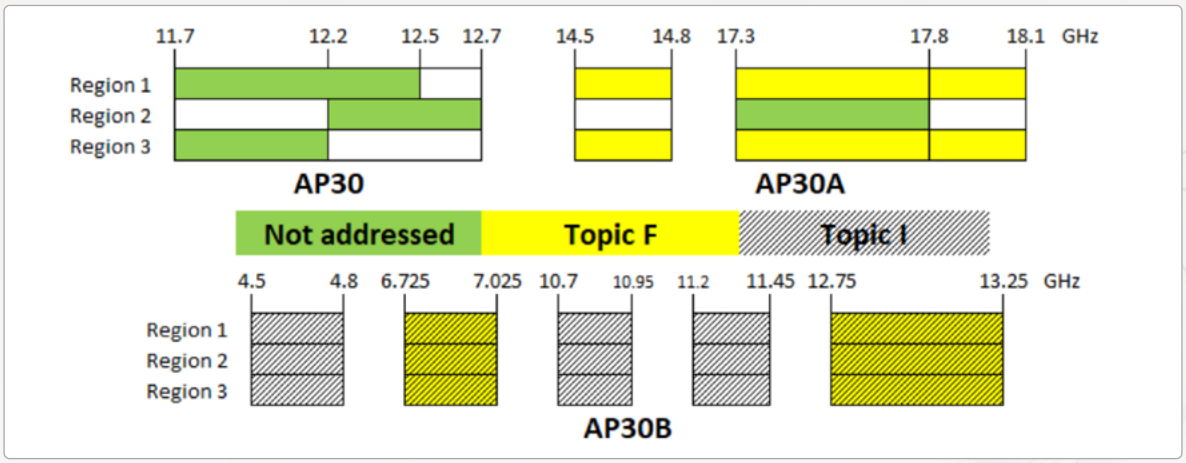
› **Method H1B only addresses part of the implicit agreement problem - i.e., the protection of Plan networks but not the potential problem related to no reply from the Plan administration to coordination requests.**

Agenda Item 7 Topics F&I

WRC-23 Agenda Item 7: Planned Bands Topics F & I

Overview

To limit the impact and facilitate the use of the AP30, AP30A & AP30B frequency bands by national or regional space systems..



Topic F: Mechanism to prevent one admin with global coverage network to create obstacle to another admin intending to deploy a national network

- GSOA supports developing specific measures to avoid creating obstacles to establish space systems over national territories without creating uncertainties for operational networks or national networks.
- Bilateral coordination and/or national licensing conditions solutions can address encountered problems on a case-by-case basis.
- The operational area of a satellite is covered by the relative satellite antenna gain of -3 dB and can be drastically impacted by any transmission within the relative satellite gain up to -20 dB.
- Relative satellite gains between -3 dB and -20 dB could not just be considered as "high receiving sensitivity area" which create obstacles to establish space systems over national territories, but also as consequence of physics' laws for a transmit antenna.

Method F1: No changes to the Radio Regulations.

Method F2: To request notifying an administration with a network with high receiving sensitivity (relative satellite antenna gain of at least -20 dB) over a territory of another administration to accept uplink interference coming from the territory of the other administration, and removing the right to claim protection from harmful interference from the territory of an administration that has not agreed to be included in service area.

Method F3: To request a notifying administration of a satellite network having relative satellite antenna gain derived from the minimum ellipse required to cover the service area of equal to or less than −20 dB over the territory of another administration, to accept uplink interference coming from the territory of the other administration.

GSOA Position:

- **GSOA does not support Methods F2 or F4 which are not technically feasible to implement.**
- **As a high percentage of coordination agreements are concluded under Res 559, GSOA supports Method F1.**
- **GSOA could support Method F3 as an alternative, which proposes a technically workable solution addressing challenging coordination cases, i.e., global coverage in uplink and regional coverage in downlink.**

Topic I: Special agreements to restore adequate protection for national allotment subject to agreement under § 6.15

- GSOA supports developing specific measures to restore adequate overall aggregate carrier-to-interference levels without changing the orbital position of the national allotment.
- GSOA supports specific measures on a voluntary basis.

Method I1: No changes to the Radio Regulations.

Method I2: Define a new type of agreement where the administration of the national allotment allows the assignment to operate until the bringing into use of its national allotment, without considering mutual interference. This would come with a commitment from the administration responsible for the assignment to protect the national allotment at that time.

GSOA Position: Supports Method I2

- **GSOA encourages relevant administrations to make their utmost efforts to sign such new agreements with national allotment to restore their protection.**

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Agenda Item
9.1 Topic c)

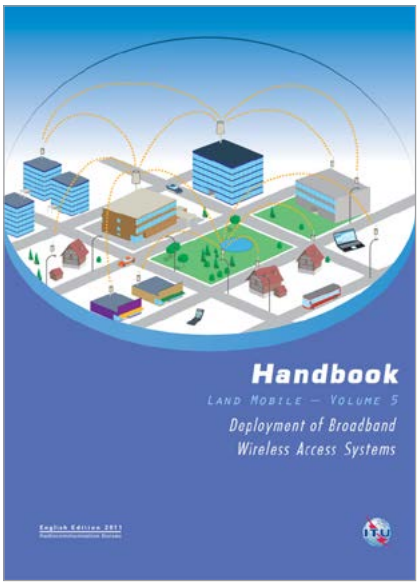
WRC-23 Agenda Item 9.1 Topic c)

Overview

To study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis, in accordance with Resolution 175 (WRC-19).

Background

- This topic was proposed as an Agenda Item to WRC-19 through a multi-country proposal on fixed wireless broadband applications in the bands allocated to the fixed service (FS) that could use IMT technology.
- Considering the amount of spectrum already available for FS, no regulatory activity is necessary under this topic to satisfy even the most critical demands of access, core and transport connectivity. It should be noted that frequency bands up to 86 GHz are already used by FS, including FWA.
- Spectrum sharing is generally difficult or impossible between satellite earth stations and IMT mobile systems, but is more feasible with fixed systems. Any change in use of a band from fixed to mobile could harm spectrum sharing.
- There was a discussion regarding the use of the terms "IMT Technology" and "IMT System" within Resolution 175. It was clarified that this topic concerned the fixed wireless applications that use IMT-technologies in the frequency bands allocated to the fixed service on a primary basis.
- In the latest meetings of WP 5A and WP 5C, most Administrations did not support Alternative 1.
- The current preliminary views of **APT, ATU, CEPT, CITEL** and **RCC** support no change to the Radio Regulations under Agenda Item 9.1 Topic c), except for suppression of Resolution 175 (WRC-19).



Key Points - Status of Agenda Item 9.1 Topic c)

The draft CPM text presents two Approaches to address this Agenda Item 9.1 Topic c).

Approach 1

Developing new ITU-R Recommendation(s), Report(s) and Handbook(s) through submission of contribution to the subsequent relevant ITU-R meetings in that regard.

Approach 2

Revising the existing ITU-R Recommendation(s), Report(s) and Handbook(s) through submission of contribution to relevant ITU-R subsequent meetings

The CPM report also presents two Alternatives to address the issue of a response to the objectives of Resolution 175 (WRC-19).

Alternative 1

Considers that Resolution 175 (WRC-19) needs to be revised, or be replaced with a draft new WRC Resolution, to continue conducting the studies requested by WRC-23 Agenda Item 9.1 Topic c).

Alternative 2

There is no need to have any draft new or revised Resolution on this matter in the draft CPM text and doing so would be outside the scope of the Resolution 175 (WRC-19) resolves and consequently is not compliant with Resolution ITU-R 2-8, Annex 1 (Working methods), § A1.2.8.

GSOA Position

- **Support Approach 2 to address the issue for the use of IMT technology in the frequency bands allocated to the FS on a primary basis by updating existing ITU-R Recommendations/ Reports/Handbooks.**
- **Support Alternative 2 to address the issue of a response to the objectives of Resolution 175 (WRC-19), reflecting the fact that there is no need to have any draft new or revised Resolution.**
- **There is no need to develop new regulatory provisions in the Radio Regulations and thus Agenda Item 9.1 Topic c) should not lead to any changes to the Radio Regulations.**
- **The suppression of Resolution 175 (WRC-19).**


Rep. ITU-R F.2058 1

REPORT ITU-R F.2058

Design techniques applicable to broadband fixed wireless access systems conveying Internet protocol packets or asynchronous transfer mode cells

(2006)

TABLE OF CONTENTS

Page

1 Introduction ... 2
2 Types of FWA systems conveying IP packets or ATM cells in terms of radio channel utilization ... 2
3 Scope ... 3
4 References ... 3
5 Abbreviations ... 5
6 Technical characteristics addressed ... 8
6.1 Modulation and multiple access method ... 8
6.2 CoS and QoS ... 9
6.3 Transfer delay characteristics ... 9
6.4 VoIP technique ... 10
6.5 Efficient spectrum utilization technique ... 10
6.6 Error correction techniques in an ATM-based FWA system ... 10
ANNEX 1 – Mechanism to ensure QoS or CoS in the broadband FWA systems ... 11
ANNEX 2 – Example calculations of average access protocol delay and delay variation of CSMA/CA-based FWA ... 29
ANNEX 3 – Example calculations of additional waiting time in multiple VoIP flow situations for TDMA-based FWA ... 34
ANNEX 4 – Example calculations of QoS class 0 network delay ... 39
ANNEX 5 – Technical characteristics of broadband FWA systems to support VoIP technique ... 43
ANNEX 6 – Techniques to improve spectrum utilization efficiency ... 50
ANNEX 7 – Error correction techniques in an ATM-based FWA system ... 53

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Agenda Item 9.1 Topic c)

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Agenda Item 9
RR 21.5

WRC-23 Agenda Item 9 RR 21.5

Overview

This issue was defined at WRC-19, in document 550:

"ITU R is invited to study, as a matter of urgency, the applicability of the limit specified in No. 21.5 of the Radio Regulations to IMT stations, that use an antenna that consists of an array of active elements, with a view to recommend ways for its possible replacement or revision for such stations, as well as any necessary updates to Table 21-2 related to terrestrial and space services sharing frequency bands. Furthermore, the ITU-R is invited to study, as a matter of urgency, verification of No. 21.5 regarding the notification of IMT stations that use an antenna that consists of an array of active elements, as appropriate."

This issue should be addressed at WRC-23 on the basis of the Director's Report (WRC-23 Agenda Item 9).

The purpose of the power limits in RR 21.5 is to cap the aggregate interference generated by fixed and mobile stations (including IMT) into satellite receivers in space. The limit applies to certain frequency bands, listed in ITU RR Table 21-2, allocated to the fixed or mobile services and shared on a primary basis with allocations to satellite uplink services (Earth-to-space). If the limit is not respected, excessive interference could prevent the operation of satellites.

Background

Provision 21.5 of the ITU RR is as follows:

> **The power delivered by a transmitter to the antenna of a station in the fixed or mobile services shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz, or +10 dBW in frequency bands above 10 GHz, except as cited in No. 21.5A.** (WRC-2000)

The studies conducted by the ITU-R before WRC-19 indicated that the aggregate interference from IMT systems using the 26 GHz and other mmWave bands would not exceed the satellite protection requirements. However, the IMT community is seeking to deploy base stations with higher power than assumed in those ITU-R studies. As IMT systems in these bands start to be deployed, their characteristics have to be properly controlled to ensure that satellite systems remain protected.

There are no other provisions in ITU RR that would adequately protect satellite receivers from aggregate interference from IMT systems. The EIRP limit in RR 21.3 is 55 dBW, which does not adequately protect satellite receivers[1].

The recent introduction of Advanced Antenna Systems (AAS) into 5G mobile systems introduces ambiguity in how to interpret the "power delivered by a transmitter to the antenna of a station" when applying RR 21.5. AAS antennas use an array of radiating elements sending the same signal from each element, but adjusted in phase and sometimes in power, to create a narrow beam that is steered towards the user equipment. Some argue that each radiating element is one "antenna", so the RR 21.5 limit would apply to each radiating element separately. Others argue that the RR 21.5 limit applies to the antenna as a whole, and the "Total Radiated Power" (TRP)[2] is an effective parameter equivalent to the "power delivered by the transmitter to the antenna."

1 The typical EIRP of a VSAT earth station is around 50 dBW. The IMT interfering power just compliant with RR 21.3 would therefore be 5 dB greater than such a VSAT signal. Other VSATs in LEO FSS systems operate with EIRP lower than 50 dBW, hence IMT would interfere with satellites even more.

2 The TRP is defined as the integral of the power transmitted from all antenna elements in different directions over the entire radiation sphere. The parameter is already used in the ITU RR to apply a limit on IMT base station unwanted emissions, in Resolution 750 (Rev.WRC-19).

One example illustrates the potential impact of the first interpretation, i.e., the limit applies to each radiating element. The ITU-R studies for 26 GHz assumed that IMT base stations have a radiated power per antenna element of -23 dBW (7 dBm). Compared with the RR 21.5 limit of +10 dBW, IMT could thus operate with increased power by 33 dB in apparent compliance with RR 21.5. This huge increase in IMT base station power - by a factor of 2,000 times more - would cause severe harmful interference to satellite receivers using the same band.

The second interpretation, based on the use of TRP and same limit of +10 dBW, would provide just adequate protection to satellite uplinks in the 26 GHz band, and even give margin for the mobile industry to design new, higher power antennas.

The same problem occurs in any frequency band where AAS antennas are envisaged. AAS antennas can be used in any band allocated to the mobile service, whether the band is identified for IMT in ITU RR or not. The use of AAS antennas has also been proposed for fixed service systems. Hence the RR 21.5 power limit should apply to the TRP of AAS antennas in all frequency bands in ITU RR Table 21-2.

The current RR 21.5 limit applies to the power of the emission, irrespective of the signal bandwidth. Yet, the power spectral density is the relevant parameter to measure interference to satellites. If the bandwidth of an IMT base station is halved (while making no other changes), the power spectral density doubles, increasing the interference impact. Hence it is necessary to properly take account of the bandwidths of the IMT signals using AAS antennas.

Key Points

- The ITU RR frequently need to be adjusted to keep up to date with new technologies. The introduction of IMT AAS antennas has created an ambiguity that needs to be urgently addressed. Applying to all fixed and mobile systems, including IMT stations, RR 21.5 has to achieve its objective: to limit the interference to satellite uplinks.
- Different interpretations of RR 21.5 could lead to very large increases in interference into satellite receivers, which may, in the long term, threaten the existence of satellite systems in some frequency bands.
- A solution is available, based on the use of the TRP parameter, that would provide just adequate protection to satellite uplinks, without undue constraints on current or new IMT system deployment.

GSOA Position

GSOA recommends the following actions:

1. **The definition of the "power delivered by the transmitter to the antenna" for AAS antennas should be clarified in ITU RR, through additions to RR Article 21. This should apply to all fixed and mobile services, including IMT stations, and in all the frequency bands included in Table 21-2.**
2. **ITU RR Table 21-2 should be updated with the addition of satellite uplink bands that are shared on a primary basis with the fixed or mobile services, including the following ones:**
   - FSS allocations in 24.65-25.25 GHz (Region 1), 24.75-25.25 GHz (Region 2), 42.5-43.5 GHz, 47.2-50.2 GHz, 50.4-51.4 GHz and 81-86 GHz.
   - MSS allocations in 43.5-47 GHz, 66-71 GHz, and 81-84 GHz.
3. **The TRP parameter should also be used for these additional bands. The limit in RR 21.5 (currently +10 dBW) needs to be reviewed to ensure that it continues to provide adequate protection to satellite uplinks.**

The actions in item 1 could occur during WRC-23. The actions in items 2 and 3 can occur after WRC-23, based on a new Agenda Item for a future WRC.

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Agenda Item 9
RR 21.16.6

WRC-23 Agenda Item 9.2 RR 21.16.6

Overview

This issue was identified in the Director's report to WRC-19. The Report recognized that studies performed before WRC-2000 have not addressed cases of non-GSO satellite systems having more than 1000 satellites and that the Conference may wish to invite the ITU-R to study the appropriateness of the equations contained in No. **21.16.6** for non-GSO satellite systems having more than 1 000 satellites. WRC-19 decided the matter as follows as indicated in Document CMR19/569, the Minutes of the eighth Plenary meeting.

This issue should be addressed at WRC-23 on the basis of the Director's Report (WRC-23 Agenda Item 9).

Background

Article **21** of the Radio Regulations contain power flux-density (PFD) limits at the Earth's surface produced by a space station for the protection of terrestrial services from space services. The tables in Article **21** contain these limits that apply under assumed free-space propagation conditions and apply to emissions by a space station of the service indicated. For the frequency band 17.7-19.3 GHz, Article **21** contains a function X in No. **21.16.6**, to define the scaling function of the total number, N, of satellites in the non-GSO satellite constellations.

17.7 - 19.3 GHz 7, 8	Fixed-satellite (space-to-Earth) Meteorological-satellite (space-to-Earth)	0°-5°	5°-25°	25°-90°	1 MHz
		−115 − X 13	−115 − X + ((10 + X)/20) (− 5) 13	−105 13	

13 **21.16.6** The function X is defined as a function of the number, N, of satellites in the non-geostationary satellite constellation in the fixed-satellite service, as follows:

$X = 0$ dB for $N \leq 50$

$X = \frac{5}{119}(N-50)$ dB for $50 < N \leq 228$

$X = \frac{1}{69}(N+402)$ dB for $N > 228$

In essence, the applications of these equations for satellite constellations of more than 1000 satellites presume that satellites that are not even in view of terrestrial stations are contributing to interference. In fact, any constellation size greater than 1,853 satellites will produce an X-factor that equates to a greater number of simultaneously transmitting satellites than the total number of satellites in the constellation. Consequently, applying this equation to satellite constellations of multiple thousands of satellites leads to overly conservative PFD values and constraining limitations on non-GSO systems to meet the limits.

After performing comprehensive studies, WP4A concluded that the equation in RR **21.16.6** is not appropriate for large non-GSO systems employing more than 1000 space stations. Furthermore, WP 4A sharing studies have confirmed that the solution X=10log10(Nv), where Nv is the maximum number of visible satellites, is an appropriate way forward to revise the equation in No. **21.16.6** at WRC-23 for large non-GSO systems (N>1000).

Key Points

- WRC-19 decided:
  - To call for studies by ITU-R of the appropriateness of the equations contained in RR **21.16.6** for large non-GSO satellite systems; and,
  - to issue qualified favorable findings under RR 9.35/11.31 when examining compliance of non-GSO FSS satellite systems with RR Article **21** pfd limits, while the matter is under consideration by WP 4A;
- WP4A confirmed the equation in RR **21.16.6** is not appropriate for large non-GSO systems employing more than 1000 space stations. Additionally, WP 4A established that the solution X=Max (20.3, 10log10(Nv)), where Nv is the maximum number of visible satellites could be used to revise the error in RR **21.16.6**.

GSOA Position

GSOA recommends the following actions:

- GSOA supports the results of WP4A studies that shown the equation in RR **21.16.6** is not appropriate for large non-GSO systems employing more than 1000 space stations.
- GSOA suggest the WRC to consider and approve the solution provided by WP4A to address the error in RR **21.16.6**.
- Should no solution be found prior to the end of WRC-23, GSOA supports that the qualified favourable finding should be extended.

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Agenda Item
10 NGSO ESIM

WRC-23 Agenda Item 10:
12.75-13.25 GHz for NGSO ESIM

Overview

Some ITU-R regional organizations are currently considering Agenda Item 10 proposals to allow operation of A-ESIM and M-ESIM communicating with non-GSO in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space).

Background

ESIM contribute to the United Nations Sustainable Development Goal 9 on industry, innovation, and infrastructure by connecting vessels, aircraft and land vehicles and ensuring their safety and security and that of their passengers, cargo, and systems. The ITU-R has addressed aeronautical and maritime earth stations in motion (ESIM) operating with GSO FSS satellites at several previous WRCs, which have adopted technical and regulatory regimes to allow such operations. In the Radio Regulations, Resolution 902 (WRC-03), and relevant parts of Resolutions 156 (WRC-15) and 169 (WRC-19) define technical and regulatory rules to allow GSO FSS networks to communicate with ESIM to provide broadband communications.

In this WRC Cycle there are already studies under Agenda Item 1.15 which show that it is possible to determine a set of technical, operational and regulatory conditions to allow operation of ESIMs communicating with GSO in the band 12.75-13.25 GHz while protecting existing services. With the growth of NGSO satellite constellations, extending the use of this band to NGSO to provide A-ESIM and M-ESIM applications while ensuring protection of existing services is logical and further promotes efficient use of the same spectrum.

Key Points

- In our increasingly connected world, the expectation of being "always on" is no longer bound by geography or location. Whether on land, at sea or in the air, companies continue to rely on satellite connectivity services and solutions to keep their operations in motion, continuously connected everywhere.
- Enhancements in antenna and terminal technology have enabled the usage of these frequency bands by both GSO FSS networks and non-GSO FSS systems. Non-GSO satellite constellations enable the provision of broadband connectivity for a variety of enhanced applications. More of such non- GSO systems are planned to be deployed to meet the increasing consumer demand for access to broadband connectivity, regardless of location.
- Studies done in ITU-R in this study cycle, under WRC- 23 Agenda Item 1.16, indicate that GSO FSS networks and non-GSO systems are able to share a frequency band to provide connectivity for ESIM.

GSOA Position

- **Support inclusion of this preliminary Agenda Item in the WRC-27 agenda to allow operation of A-ESIM and M-ESIM communicating with non-GSO in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) in order to respond to the increase in the required capacity for in-flight and maritime connectivity.**

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Agenda Item
10 Ku band

WRC-23 Agenda Item 10: 13.75-14 GHz band

Overview

Some ITU-R regional organizations are currently considering Agenda Item 10 proposals to review the usage and sharing conditions of the band 13.75-14 GHz to enable efficient use of the band by uplink FSS earth stations, including FSS earth stations using smaller antenna sizes.

Background

In Ku-band, there is only 500 MHz of spectrum available for return links in 14.00-14.5 GHz for use by smaller satellite terminals. This is not sufficient spectrum to support rapidly growing demand for ubiquitous satellite services deploying smaller FSS antennas, including ESIM connectivity, which has placed tremendous strain on the available spectrum for satellite services in Ku-band. There has been a big increase in number of operational satellite networks and use of orbit and spectrum resources over the last decades and corresponding increased development of a variety of applications and satellite user equipment, while customers are increasingly requiring higher data transmission rates, smaller user terminals, and increasingly flexible products.

Footnotes **5.502** and **5.503** pose limitations on the minimum size of the earth station antenna (1.2m for GSO and 4.5m for n-GSO) and on the maximum power flux density that a terminal can transmit towards the sea, which invalidate the use of this band by FSS return links. In addition to the fact that satellite technology has changed tremendously since these conditions were developed 20 years ago, there may also have been a change in other services sharing the band, their applications and co-existence conditions.

Key Points

- There is a pressing and growing need for Ku-band spectrum to be available to meet the increasing demand for connectivity, particularly for the use of smaller user terminals, including ubiquitously deployed very small aperture terminals (VSATs). Emergence of high throughput satellites (HTS) and NGSO satellites capable of providing large throughputs and broadband connections has significantly increased the use of smaller user terminals that more broadly meet customer needs, e.g., Electronically Steered Array.
- As shown in the table below, in all three ITU-R Regions there is a significant mismatch between the uplink and downlink non-planned spectrum in the 10-15 GHz range that can operationally be used to provide services for smaller antennas, e.g., HTS or broadband user terminals, VSATs, satellite news gathering, etc.

REGIONS	Downlink (MHz)	Uplink (MHz)
Region 1	750 (1000[1])	500
Region 2	1000	500
Region 3	1050	500

Table 1: Amount of uplink and downlink non-planned spectrum in the 10-15 GHz range available for smaller user terminals.

GSOA Position

- GSOA supports review of the usage and sharing conditions of the band 13.75-14 GHz as an Agenda Item for WRC-27.
- Allowing smaller use terminals to operate in the 13.75-14 GHz band would enable more efficient use of the band, alleviate the congestion in the existing uplink Ku-band and balance the mismatch between available uplink and downlink spectrum resources for FSS.

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Agenda Item
10 Q/V bands

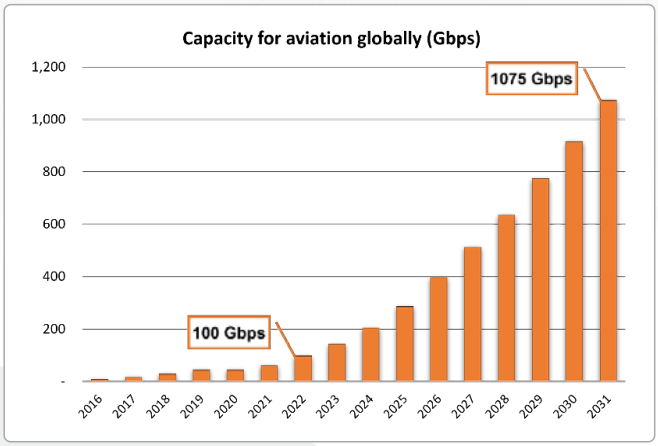
WRC-23 Agenda Item 10: NGSO ESIM in Q/V bands

Overview

Resolution 176 (WRC-19) calls for studies on the use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service. This is one of the preliminary Agenda Items for WRC-27 in Resolution **812 (WRC-19)**.

Background

People are accustomed to being connected, even on the move, and their appetite for data is increasing. As an example, capacity demand for aviation is predicted to grow tenfold in the next eight years, reaching 1075 Gbps globally by 2031 representing 58% IFC penetration.[1]



Source: Prospects for In-Flight Entertainment and Connectivity, Euroconsult 2022

The ITU-R has addressed ESIM in Ku- and Ka-bands at several previous WRCs, which have adopted technical and regulatory regimes to allow such operations. Meanwhile advances in satellite manufacturing and earth station technology have made ESIM more widespread and more practical. Consequently, the utilization of Ku- and Ka-band frequency spectrum for providing ESIM connectivity is growing exponentially to meet user demands, which may lead to scarcity in spectral resources in these bands. On the other hand, the rapidly increasing use of non-geostationary satellite orbits (non-GSO), such as medium Earth orbits (MEO) and low Earth orbits (LEO), represents an important innovation in satellite technology enabled by enhanced satellite design, manufacturing and launch service capabilities.

The passengers' ever-increasing hunger for bandwidth, combined with immense potential to obtain utmost operational proficiency with IFC use will lead to steep increase in the required capacity.

Key Points

- While Resolution 176 (WRC-19) was developed for GSO only, enhancements in antenna and terminal technology have enabled the usage of these frequency bands by both GSO FSS networks and non-GSO FSS systems. Non-GSO satellite constellations in these frequency bands enable the provision of broadband connectivity for a variety of enhanced applications. More of such non-GSO systems are planned to be deployed to meet the increasing consumer demand for access to broadband connectivity, regardless of location.
- Studies done in ITU-R in this study cycle, under WRC-23 Agenda Item 1.16, indicate that GSO FSS networks and non-GSO systems are able to share a frequency band to provide connectivity for ESIM. Technical and operational issues, along with regulatory provisions for the operation of non-GSO FSS satellite systems in Q and V frequency bands have been addressed in WRC-19 with the new Resolutions 769 (WRC-19) and 770 (WRC-19) and provisions 22.5L and 22.5M of Article 22 of the Radio Regulations.

GSOA Position

- **Support inclusion of this preliminary Agenda Item in the WRC-27 agenda in order to respond to steep increase in the required capacity for in-flight and maritime connectivity.**
- **Support studies under Resolution 176 (WRC-19) with an extended scope covering both GSO FSS networks and non-GSO FSS systems (LEO, MEO).**

1 https://gsoasatellite.com/reports_and_studies/communications-on-the-move-satellite-connectivity-for-fast-agile-secure-access/

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Agenda Item
10 V band

WRC-23 Agenda Item 10:
NGSO Gateway Use in 51.4 - 52.4 GHz FSS (Earth-to-space)

Overview

ITU-R regional organizations are currently considering the Agenda Item 10 proposal for Studies relating to the use of the 51.4 – 52.4 GHz band by gateway earth stations transmitting to non-geostationary FSS satellite orbit systems (Earth-to-space). This will enable efficient use of spectrum that would allow FSS to meet the ever-increasing demand for this service that presently exists.

Background

Today, NGSO satellite systems provide a wide range of broadband services in the FSS to a rapidly growing customer base, with more systems to come. Advances in satellite technologies are allowing a variety of new services including innovative broadband, video and mobile services covering all corners of the globe.

The technological progress in radio communication enables the satellite industry to offer much more capacity today (in addition to the increasing number of satellite systems being put into service). The satellite industry takes this development into account by using the most spectrum efficient technologies, including advances in spotbeam technologies and frequency re-use. However, even with this efficiency, demand for FSS outpaces the spectrum available for this service today.

The need for additional FSS spectrum in the 50 GHz range for non-GSO FSS gateway uplinks was established in partial response to Agenda Item 9.1.9 for WRC-19 in Report ITU-R S.2461. These studies included the need for spectrum for both non-GSO systems and GSO FSS networks. Spectrum for GSO networks was allocated by WRC-19 to GSO feeder links, but not for non-GSO This proposal invites the ITU-R to consider expanding the use of the FSS (Earth-to-space) band at 51.4-52.4 GHz to address the spectrum needs of non-GSO FSS systems in accordance with Report ITU-R S.2461.

Key Points

- WRC-19, pursuant to Resolution 162 (WRC-15), allocated the frequency band 51.4-52.4 GHz to the FSS (Earth-to-space) on a primary basis, and also adopted No. 5.555C which limited the use of the FSS allocation to geostationary satellite networks.
- High-speed broadband: This allocation would provide spectrum for non-GSO FSS systems to enable additional broadband connectivity.
- The presence of Q/V band satellite gateways can stimulate innovation and development in the local economy. This can lead to the creation of new products, services, and industries, which can drive economic growth and create new job opportunities.

  This can provide opportunities for education, commerce, and communication, and can enable businesses to compete on a global scale.
- Enhanced disaster response: Q/V band satellite gateways can provide a reliable means of communication during natural disasters or other emergencies when traditional communication infrastructure is damaged or unavailable. This can facilitate more effective disaster response efforts and can help to save lives and property, as well as to support the distribution of vital supplies and resources.

GSOA Position

GSOA supports the inclusion of the Agenda Item 10 proposal for Studies relating to the use of the 51.4 –52.4 GHz band by gateway earth stations transmitting to non-geostationary orbit FSS satellite systems (Earth-to-space).

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Agenda Item
10 MSS

WRC-23 Agenda Item 10:
New Spectrum allocations to the Mobile-Satellite Service

Overview

There is increasing demand for new harmonized spectrum for Mobile Satellite Service (MSS) to satisfy the demand of a wide variety of applications covering both narrowband emissions such as IoT/M2M, and wider band emissions such as non-terrestrial network (NTN) MSS voice and data communications that can accommodate Direct-to-device and new 3GPP NTN standard needs.

Background

WRC-23 Agenda Item 1.18 failed to provide 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 due to the lack of agreement on the interpretation of Resolution 248 (WRC-19) and the pre-requisite to make this spectrum available for the exclusive use of low duty cycle narrowband applications.

Key Points

› Create a new Agenda Item to considerate potential allocations to the MSS in the bands 2 010-2 025 MHz (E-s), 2 120-2 160 MHz (s-E) and 2 160-2 170 MHz (s-E) in Regions 1 and 3 (already allocated to the MSS in Region 2), and 2 200-2 215 MHz (s-E) globally, with the aim to conduct sharing and compatibility studies that ensure the protection of incumbent services (in band and adjacent).

GSOA Position

› **GSOA supports studies on 2 010-2 025 MHz, 2 120-2 160 MHz, 2 160-2 170 MHz and 2 200-2 215 MHz for a potential allocation to the conventional MSS.**

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Agenda Item
10 IMT

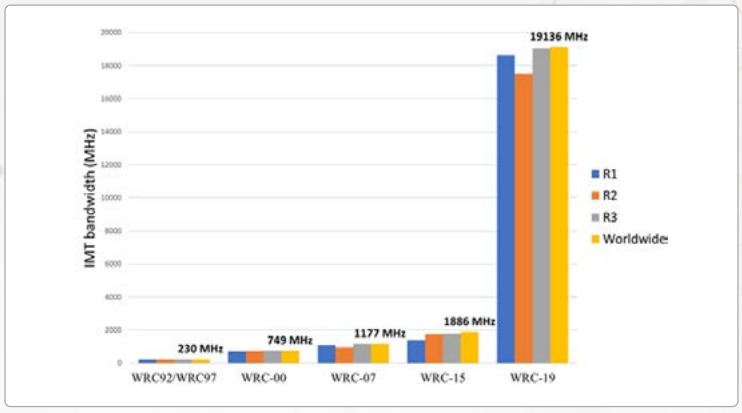
WRC-23 Agenda Item 10:
Studies on IMT identification in 7-24 GHz for 6G

Overview

Some ITU-R regional organizations have received and are considering proposals for possible future IMT identification in the 7-24 GHz frequency range towards WRC-27. The following facts regarding the need to conduct ITU-R studies for such potential future IMT spectrum identification should be duly noted.

Background

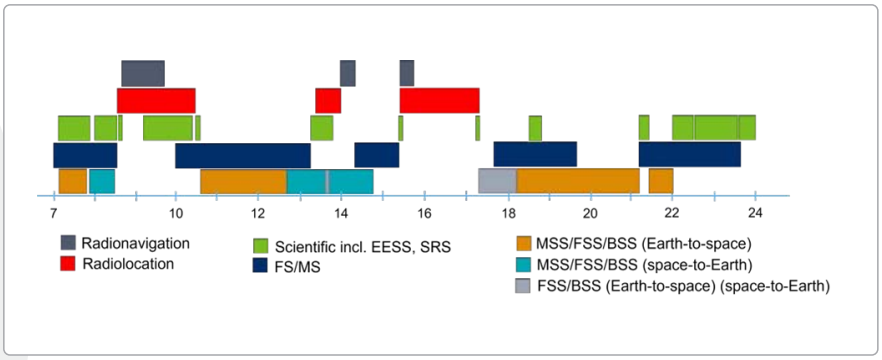
- The chart indicates the total significant amount of spectrum identified for IMT at various WRCs and it is important to avoid spectrum warehousing since spectrum is a finite resource which needs to be used efficiently and effectively.
- WRC-19 identified a total of 17.25 GHz bandwidth for IMT above 24 GHz and only a handful of countries have used it for 5G as of today. Korea, who had initially planned to deploy in the mmW band has now cancelled the licenses in 28GHz.



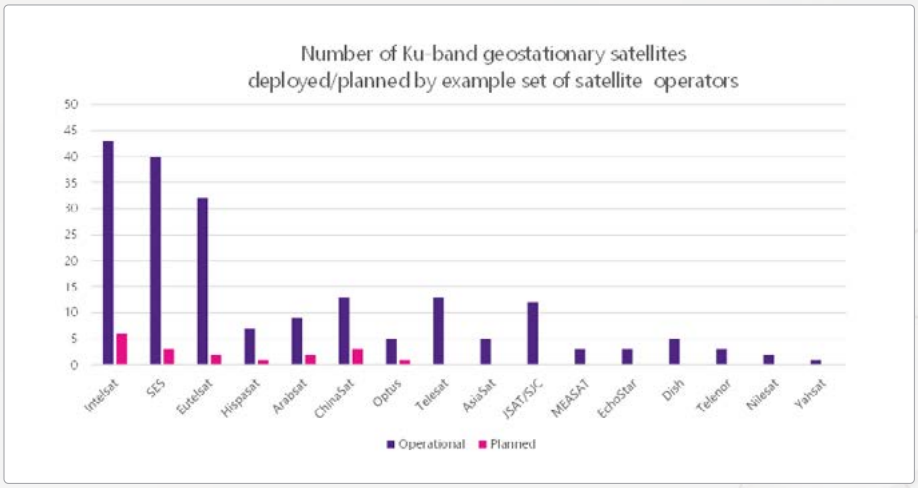
- In addition to spectrum identified for IMT at WRC-19, the current WRC-23 study cycle through some WRC-23 Agenda Items (i.e., Agenda Items 1.1 and 1.2) are considering additional spectrum that could be potentially identified for IMT.
- Justification and user requirements for additional IMT spectrum for dense urban applications must be clarified since 6G mobile systems are still in research phase. This is especially the case when satellite operators struggle to accommodate the growing services demand in core FSS & MSS & BSS bands operating in these ranges.
- Co-frequency sharing between satellite and IMT services would not be practicable and the introduction of IMT services would cause harmful interference, interruption and displacement of satellite services in these bands.

Key Points

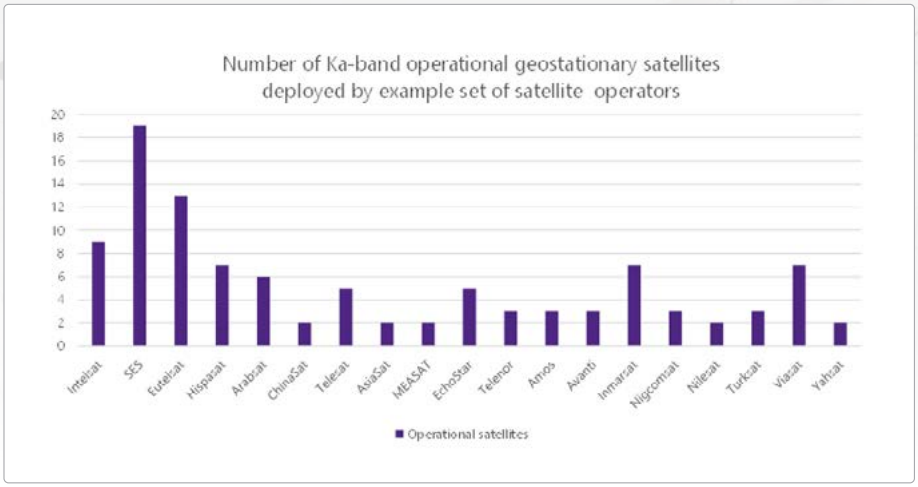
› As shown in the figure right – representing the Radio Regulations Article 5 – the frequency range 7-24 GHz is allocated to 16 types of radio services which often share the same spectrum. In addition to being very congested, parts of the range are used for critical strategic applications, such as radiolocation and security services. Therefore, the frequency range does not allow for large system bandwidths for IMT services. This is one of the main reasons why it was already decided not to study this range for IMT during WRC-15.



› Since 2015, thousands more LEOs and new High Throughput Satellite (HTS), Very High Throughput Satellite (VHTS) and Software Defined Satellite (SDS) GSO satellites using Ku & Ka bands came into service and there are several Agenda Items in WRC-23 - ISL, ESIMs – seeking possible additional efficient usage for satellite in those bands.



› Ku-band allocations have been globally harmonised for satellite uplink and downlink use for decades and include planned services described in ITU RR Appendices 30/30A/30B where ITU member states are provided with guaranteed access to orbital slots to be used when required.



GSOA Position

7-24 GHz are core and vital frequency bands for satellite telecommunications with existing and already committed investments by the satellite industry of over US $20 billion in more than 100 Ku/Ka-band GEO satellites and thousands of Ku/Ka-band non-GSO satellites using this spectrum which provide vital and valuable services to 100s of millions of consumers / customers globally.

Considering IMT obtained at WRC -19 a total of 17.25 GHz of spectrum that is today mostly unused, GSOA strongly opposes the proposal by some parties to seek an additional spectrum for IMT within the 7-24 GHz range to be considered under Agenda Item 10 for WRC-27.

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