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EMEA SATELLITE OPERATORS ASSOCIATION

# Global Satellite Industry Positions

## on Key Agenda Items for WRC19

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Agenda Item
1.13
40/50GHz

# WRC-19 Agenda Item 1.13: IMT & Satellite User Terminals in the 40/50 GHz range

**Overview: WRC-19 Agenda item 1.13** calls for sharing and compatibility studies for a possible identification to IMT in more than 33 GHz of spectrum between 24 and 86 GHz. This documents addresses the following bands:

| | |
|---|---|
| 37-40.5 GHz | BAND C |
| 40.5-42.5 GHz | BAND D |
| 42.5-43.5 GHz | BAND E |
| 45.5-47.0 GHz | BAND F |
| 47.0-47.2 GHz | BAND G |
| 47.2-50.2 GHz | BAND H |
| 50.4-52.6 GHz | BAND I |

From the 33.25 GHz considered, only 4 are identified for high density deployment of user terminals (HDFSS) in Region 2 and similar amounts of spectrum in Regions 1 and 3 are planned for ubiquitous satellite terminal deployments. The GSC recommends that this core satellite spectrum for ubiquitous earth station deployment (40-42 GHz and 48.2-50.2 GHz in Region 2, 37-40.5 GHz in Regions 1 and 3 for FSS and FS) not be identified for IMT.

The remaining FSS spectrum is utilized by lower density applications in the FSS, i.e. gateways earth stations for which station locations are generally knowable in advance. The known locations and station characteristics of such gateway FSS earth stations and IMT base stations may allow for sharing under certain conditions. The GSC believes that the 37-40 GHz frequency bands may be identified for IMT in ITU Region 2, subject to the adoption of power and pointing limitations for IMT base stations (that do not put undue constraints on IMT) in FSS uplink bands, as well as provisions for ensuring continued, viable access by gateway FSS earth stations to use these frequency bands. Similarly, the 40.5-43.5 GHz bands in Regions 1 and 3 could be identified for IMT with similar conditions to enable sharing with the FSS. This will provide IMT access to substantial spectrum in each Region in the broader 37-43.5 GHz frequency range, allowing both terrestrial and satellite broadband services to play a crucial role in providing access to businesses and consumers worldwide and be critical components of 5G networks.

**Background and ITU-R Studies:** Broadband satellite systems require access to unencumbered spectrum to operate widely deployed transmitting and receiving user terminals. To satisfy this minimum requirement, footnote 5.516B of the Radio Regulations (RR) identifies the bands 48.2-50.2 GHz (Earth-to-space) and 40-42 GHz (space-to-Earth) for high-density fixed-satellite service (HDFSS) operations in Region 2 (see Resolution 143 (Rev. WRC-07)). In other regions, a core amount of HDFSS spectrum is identified in this footnote, but it is left to administrations to determine which additional bands should be used in their countries to provide ubiquitous broadband satellite services. The GSC believes that parts of the 37-40.5 GHz band should similarly be reserved for ubiquitous earth station deployments in Regions 1 and 3.

To provide satellite broadband services directly to ubiquitously deployed end users, these advanced satellite systems require flexible, rapid and unrestricted deployment of large numbers of cost-optimized earth stations employing small antennas. The identification of bands for ubiquitous earth station deployment facilitates the implementation of such broadband services and maximizes global access and economies of scale.

ITU-R studies demonstrated that co-existence between the IMT and FSS is feasible in the case of FSS earth stations at specified locations, assuming the systems operate in accordance with the studied parameters. In the case where small FSS earth stations are to be deployed at unspecified locations, however, co-existence could not be ensured between both services. Therefore, co-frequency operations of FSS user terminals and other ubiquitous terrestrial services in the same geographical area cannot be considered feasible at this time.

The other spectrum in the 37-43.5 GHz band (i.e. 40.5-43.5 GHz in Regions 1 and 3, and 37-40 GHz in Region 2) provides wide bandwidths that are particularly valuable to satellite systems requiring large amounts of spectrum to support broadband connectivity. As this spectrum is generally planned for use by individually licensed FSS earth stations, it is feasible to share with terrestrial services, but only if measures are adopted to allow for the continued and future deployment of the FSS services. As a result, if WRC-19 makes an IMT identification in these bands, it is important to include provisions to facilitate compatibility with existing and future satellite services. Two scenarios must be addressed: (1) protection of reception at the satellite from aggregate interference from numerous IMT transmitters deployed on the territories of countries within the satellite coverage area; and (2) continued access for FSS earth stations that might cause interference to or receive interference from nearby IMT deployments.

**The GSC recommends** that WRC-19 adopt a balanced solution for the identification of IMT in the 40/50 GHz bands.

- In Region 2, the Conference should not identify for IMT the spectrum identified for HDFSS (40-42 GHz and 48.2-50.2 GHz), as per Methods C1, D1, & H1 in the CPM Report. GSC supports an identification for IMT in the 37-40 GHz band.
- In Regions 1 and 3, the GSC supports identification for IMT in the 40.5-43.5 GHz bands, and No Change to the Radio Regulations in the 37-40.5 GHz band to preserve spectrum for other services such as HDFSS and FS.

**Protection measures for FSS in sub-bands proposed for IMT identification:**

Appropriate parts of spectrum allocated to the FSS could be identified for IMT on a shared basis with the FSS, with suitable conditions to ensure compatibility. Specifically, we recommend that any method to identify IMT in the 37-40 GHz (Region 2) and 40.5-43.5 GHz (Regions 1 and 3) frequency bands include:

- Power and pointing limitations on IMT base stations to protect FSS satellite receivers, that do not put undue constraints on IMT.
- Assistance to administrations in defining measures for future FSS earth station deployment, including required separation distances.

**Methods and Options for the protection of FSS in sub-bands proposed for IMT identification:**

For the 37-40 GHz (R2 – band C) band, these measures are contained in Method C2 of the CPM text, Resolution [B113-IMT 40/50 GHz] and Condition C2b Option 1 (allowing future FSS earth station deployments).

For the 40.5-42.5 GHz (R1/R3 – band D) band, these measures are contained in Method D2 of the CPM text, Resolution [B113-IMT 40/50 GHz] and Condition D2a Option 1 (allowing future FSS earth station deployments).

For the 42.5-43.5 GHz (R1/R3 – Band E) band these measures are contained in Method E2 of the CPM text, Resolution [B113-IMT 40/50 GHz], Condition E2a Option 2 with a level of 40 dBm/200 MHz (protecting FSS receiving satellites) (note that this power level is significantly higher than that put forward by IMT proponents in the ITU studies, and thus not constraining on IMT deployments) and Condition E2d Option 1(allowing future FSS earth station deployment).

In the bands 45.5 –47.0 GHz (band F) and 47.0-47.2 GHz (band G) for which no studies were conducted in TG5/1, no change to the RR is recommended (Methods F1 and & G1).

In the bands 47.2 –50.2 GHz (band H) and 50.4-52.6 GHz (band I) no change to the RR is recommended, since already large amounts of spectrum are supported for IMT identification in the bands 24.25-27.5 GHz globally, 40.5-43.5 GHz in R1 and R3 and 37-40 GHz in R2, and 66-71 GHz globally.

If however an IMT identification were to be considered by WRC-19 in the 47.2-48.2 GHz band (band H) or 50.4-52.6 GHz (band I), measures similar to the ones for 42.5-43.5 GHz band, as described above, should be adopted.

In summary, if an IMT identification is to be proposed to WRC-19 in the 40/50 GHz band, this should only be made with a clear requirement this would not provide a barrier/deterrent to the FSS.

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Agenda Item
1.13
24.25-27.5 GHz

# WRC-19 Agenda Item 1.13: IMT & Satellite in the 26 GHz Band (24.25-27.5 GHz)

**Overview:** **WRC-19 Agenda item 1.13** considers the possibility of identifying a staggering 33 GHz of spectrum for IMT between 24.25 GHz and 86 GHz. This document addresses portions of these bands – 24.65-24.75 GHz (Regions 1 and Regions 3, subject to 5.532B), 24.75-25.25 GHz (Global) and 27-27.5 GHz (Regions 2 and 3) (**"the 26 GHz band"**) – that are allocated to satellite services in the uplink direction (Earth-to-space). Satellite operations for important gateway links already exist in these bands, and future satellite system gateway operations are planned to enhance connectivity. As this spectrum is generally planned for use by gateway FSS earth stations, it is feasible to share with terrestrial services. With reasonable protections to ensure ongoing viable gateway earth station access in these bands, IMT can be accommodated in the 26 GHz band.

**Background and ITU-R Studies:** ITU-R studies have been carried out to assess the feasibility of accommodating IMT in various frequency bands and how to ensure compatibility with existing services. The 24.65/24.75-25.25 GHz band is used by individually licensed earth stations for feeder links and other FSS uses. Notably, footnote 5.532B limits the use of the band 24.65-25.25 GHz in Region 1 and the band 24.65-24.75 GHz in Region 3 to earth stations using a minimum antenna diameter of 4.5 m. The 27-27.5 GHz band is generally used for gateway earth stations to support broadband connectivity and other FSS uses in ITU Regions 2 and 3. Due to the inherent nature of gateway facilities, the number of earth stations deployed in this band is expected to be limited.

As this spectrum is generally planned for use by gateway FSS earth stations, it is feasible to share with terrestrial services, but only if measures are adopted to allow for the continued and future deployment of the FSS services. As a result, if WRC-19 makes an IMT identification, it is important to include provisions to facilitate compatibility with existing and future satellite services. Two scenarios must be addressed: (1) protection of reception at the satellite from aggregate interference from numerous IMT transmitters deployed on the territories of countries within the satellite coverage area; and (2) continued access for FSS gateway earth stations that could be coordinated with IMT operations. Interference into satellite receivers generated by IMT networks deployed in different countries within the satellite coverage area cannot be managed through national regulation.

**The GSC recommends** that if an IMT identification in the 26 GHz band is made, specific provisions in the Radio Regulations must be adopted to protect FSS uplink satellite receivers and to enable viable, sustained access by existing and future FSS gateway earth stations, as detailed below. Such an approach will enable both IMT and FSS gateways.

**Specifically, we recommend that any method to identify IMT in these frequency bands include:**

- Power and pointing limitations on IMT base stations to protect FSS satellite receivers, that do not put undue constraints on IMT.
- Assistance to administrations in defining measures for future FSS earth station deployment.

**These measures are contained in the draft CPM Report as:**

- Condition A2e Option 3 with a level of 37 dBm/200 MHz (protecting FSS receiving satellites). Note that this power level is significantly higher (12 dB) than that put forward by IMT proponents in the ITU studies, and thus not constraining on IMT deployments; and
- Condition A2d Option 1 (allowing future FSS earth station deployment) in Method A2.

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28 GHz

# Global Satellite Coalition Position: 28 GHz Band (27.5-29.5 GHz)

**Overview:** Today, Ka-band satellites provide broadband connectivity to those that otherwise would not have it, and offer a competitive alternative to those with limited broadband choices. Satellite-delivered broadband service is a success story made possible by decades-old decisions to safeguard satellite's unique role in the broadband revolution by providing satellite access to the Ka-band portion of the radio spectrum. Based on Ka-band spectrum access certainty, the satellite industry has invested in and deployed into orbit over one hundred commercial Ka-band satellites, with many more in development and construction, set for launches soon. Satellite broadband networks may be the only way of affordably connecting many economically challenged people in both urban and rural areas. The 28 GHz (27.5-29.5 GHz) portion of the Ka band is part of the core satellite spectrum used today to deliver broadband globally and its deployment and use are expanding rapidly.

Even as satellite networks are increasingly providing critical services with ubiquitous coverage using the 28 GHz band, the terrestrial wireless industry is seeking to repurpose that spectrum for future terrestrial 5G networks, despite the availability of other, more appropriate, spectrum. If governments bypass the international process, and restrict or relocate satellite use from all or part of the Ka band, in favor of IMT-2020 terrestrial 5G radio interface technologies, this will only increase the digital divide.

Further, such an approach would ignore a decision at the 2015 ITU World Radiocommunication Conference (WRC-15) where world governments resoundingly: (i) declined to consider studying the introduction of terrestrial 5G in the 28 GHz band; (ii) reaffirmed the critical need for satellite communications in the 28 GHz band; and (iii) further proposed expanding use of the 28 GHz band for satellite broadband service to airplanes, buses, trucks, trains, cars and ships – i.e. Earth Stations in Motion (ESIMs). What led countries at WRC-15 to study expanded satellite broadband use of the 28 GHz band to bridge the digital divide remains true today, as satellite broadband continues to expand its ability to provide broadband service to users across the globe, no matter their locations. In recognition of this, the CEPT has taken a position in its 5G Roadmap to set aside the 28 GHz band for satellite broadband and state clearly that 'this band is therefore not available for 5G'.

As a result of the consistent, longstanding regulatory decision to make the 28 GHz band available for use by satellite networks, the satellite industry has invested tens of billions of dollars in satellites and other critical infrastructure that rely on the 28 GHz band. These include launch and manufacturing facilities, Internet gateways and other ground infrastructure, and the devices that connect residential and mobile consumers, businesses, and government users worldwide. Because of that investment, hundreds of millions of satellite broadband connections now help citizens build nations and societies, as well as support countless high-paying jobs and increase national GDPs.

**The GSC recommends** that administrations ensure that satellite networks have full access to the 2 GHz of spectrum and operational flexibility in the 28 GHz band spectrum to provide ubiquitous fixed and mobile satellite broadband services, as these satellite operations are key to narrowing the digital divide. In addition, administrations should not identify the band for terrestrial 5G on a national or international basis, as studies have shown that terrestrial 5G is incompatible with satellite services in the same band. Moreover, there are vast amounts of spectrum already available or expected to be made available for terrestrial IMT/5G in low, mid, and high bands, outside the 28 GHz band. The 28 GHz band must continue to be made available for satellite broadband use. This frequency band supports satellite networks that provide critical broadband connectivity across the globe and are key enablers to meet the United Nations' broadband Sustainable Development Goals and its Broadband Commission for Sustainable Development's "Targets 2025", which support "Connecting the Other Half" of the world's population[1].

1 https://www.broadbandcommission.org/about/Pages/default.aspx

GLOBAL SATELLITE COALITION

Agenda Item
9.1
Issue 9.1.9

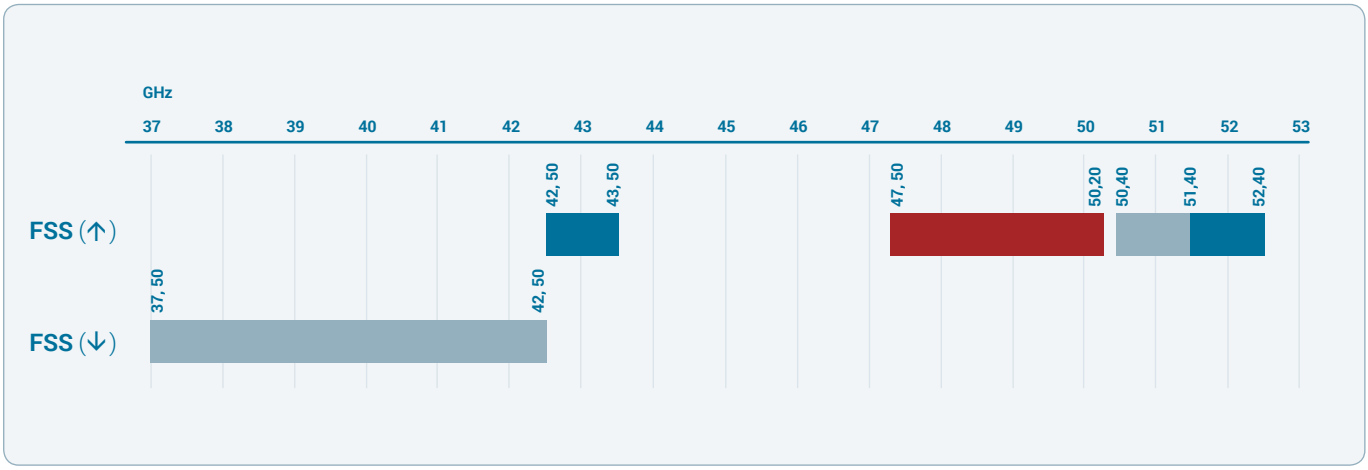
# Agenda Item 9.1, Issue 9.1.9: New FSS allocation at 51.4-52.4 GHz

**Overview: Under Agenda item 9.1, Issue 9.1.9, Resolution 162 (WRC-15)** calls for studies on spectrum requirements and the possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (FSS) (Earth-to-space). For satellite systems to deliver broadband services with high data rates to accommodate user demand, substantial forward link spectrum is needed (i.e., gateway uplinks and user terminal downlinks). As a result, GSC supports allocation of 51.4-52.4 GHz to FSS in the uplink direction to support this gateway requirement.

**Background and ITU-R Studies:** Satellite systems are increasingly being used to deliver broadband services with high data rates to accommodate user demand and service expectations worldwide. Next-generation satellite networks are expected to be able to provide data rate services of greater than 1 Gbit/s on a single channel to users regardless of location.

Current HTS systems are mainly operated in Ka-band and use the Earth-to-space allocations for both user links and gateway links. The hundreds of currently operating Ka-band satellite networks lead to the current scarcity of spectral resources in this frequency band. In order to increase the capacity of HTS systems and improve the services provided to end-users, it is proposed to expand the FSS (Earth-to-space) allocation in the 50 GHz frequency band for gateway uplinks (from gateway to space station) in order to facilitate freeing up the Ka-band FSS (Earth-to-space) allocation for user uplinks (from user terminals to space station). Therefore, the consideration of new primary allocations to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space) could help in that perspective.

The following figure shows the current primary allocations to the unplanned FSS Earth-to-space and space-to-Earth. The segment under study for a new FSS allocation is also shown, indicating how this new allocation would create an asymmetry to increase uplink spectrum.




In preparation for WRC-19, WP 4A developed two Reports; one on spectrum needs for development of the FSS and the second one on sharing and compatibility between FSS and existing services.

As indicated in the CPM Report, the spectrum needs were analyzed, and it was concluded that the additional allocation to the FSS being considered is beneficial to make broadband connections provided by HTS systems more widely accessible.

Additionally, the outcome of the studies has demonstrated the possibility of sharing and compatibility with the appropriate protection measures.

**Based on results from studies,** the additional allocation in frequency band 51.4-52.4 GHz to the FSS fixed-satellite service (Earth to space), limited to FSS gateway links for geostationary orbit use could be done ensuring adequate protection to existing radio services in - and in adjacent band such as:

- Appropriate separation distances between FSS earth stations and FS, IMT 2020 base stations and Radio astronomy observation stations would ensure adequate protection of incumbent services ;
- Appropriate unwanted emission limitations applicable to FSS earth stations are able to ensure due protection of NGSO EESS system operating in the adjacent band (52.6-54.25 GHz);
- The protection of future GSO EESS (passive) sensors could be ensured by angular separations between GSO FSS and GSO EESS (passive) satellites in the order of 0.0-3.2 degrees. Two options are now included in CPM text to address this issue:
  - **Option 1:** Ensuring a sufficient angular separation in the GSO arc between the FSS and the EESS (passive) space stations depending on the FSS ES unwanted emission levels (coordination on case by case basis).
  - **Option 2:** Giving priority to a limited number of orbital positions (predefined in the option) in the GSO arc for the operation of GSO EESS (passive) sensors. The GSO FSS networks with space stations located at less than 3.2 degrees separation of such positions should adjust the unwanted emission levels from earth stations to protect the EESS (passive) sensors on board the GSO satellite.

**The GSC recommends** that WRC-19 add an allocation to the FSS in the 51.4-52.4 GHz band (Earth to space), limited to FSS gateway links for geostationary orbit use, and establish the required regulatory measures to protect co-primary services and services in adjacent bands.

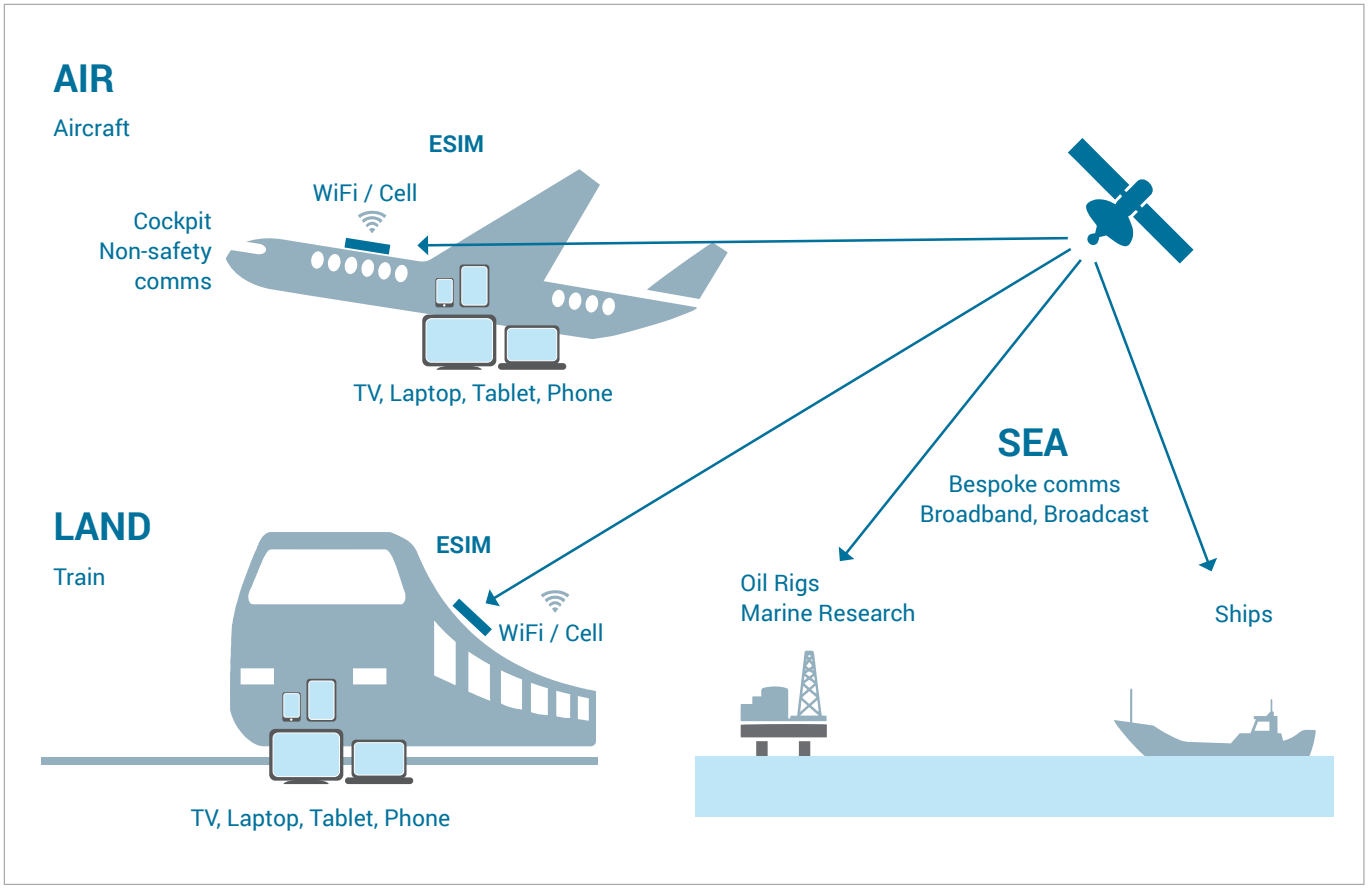
GLOBAL SATELLITE COALITION

Agenda Item 1.5

# WRC-19 Agenda item 1.5: Mobile Broadband via Ka-Band Satellites

**Overview:** **WRC-19 Agenda item 1.5** considers the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion (ESIMs) communicating with geostationary satellite orbit (GSO) FSS space stations. This agenda item builds on the provisions adopted at WRC-15 for the operation of ESIMs communicating with GSO FSS space stations in the 29.5-30 GHz and 19.7-20.2 GHz bands. Expanding the frequency bands for ESIMs is necessary to support the rapid growth in demand for broadband communications from the global average of 67 million people[1] on the move in the air, at sea, and overland at any time. The GSC supports a regulatory environment that recognizes the ability of ESIMs to operate within GSO FSS networks on all of the spectrum they currently use through adoption of the solution developed as Method B in the CPM Report.

**Background and ITU-R Studies:** ITU-R studies have identified ways for ESIMs to operate compatibly with other services (both space and terrestrial) and have also led to exemplary guidelines to assist administrations wishing to authorize ESIMs on their territories. The following diagram shows how ESIMs expand the traditional FSS applications by providing truly broadband services to mobile platforms.




1 The global population in transit is equivalent to the world's 21st largest country, the UK.

## Some of the key aspects are:

- Use of ESIMs with a GSO FSS network would not change the sharing environment with other GSO FSS networks, as ESIMs would operate within the same technical envelope as existing GSO FSS networks.
- For the 17.7-19.7 GHz band (i.e. the ESIM receive band), use of ESIMs would not impact the sharing with other services (space or terrestrial) as ESIMs will not claim additional protection and there would be no change to the transmission parameters from the GSO FSS satellite to serve ESIMs.
- For the 27.5-29.5 GHz band (i.e. the ESIM transmit band), means to protect other services have been developed with some options identified in the CPM Report to be decided:
  - To address compatibility with NGSO FSS systems in frequency bands where there is no coordination requirement, off-axis e.i.r.p. density limits for ESIMs are contained in Annex 1 of the draft WRC Resolution with options for on-axis e.i.r.p. limits. Compatibility with NGSO FSS in other bands, and with NGSO MSS feeder links, would be addressed through normal satellite coordination.
  - Aeronautical ESIMs protect terrestrial services by complying with the power flux density (pfd) limits on the Earth's surface contained in Annex 2 Part 2 of the draft WRC Resolution. The "Option 1" pfd mask is supported by the GSC and many administrations. The alternative pfd mask proposed would leave ESIMs without the necessary power to communicate effectively and would over-protect terrestrial services. An altitude limit is unnecessary, as the pfd limit maintains the required protection irrespective of the aircraft altitude. Any operations that do not satisfy the pfd mask would be subject to domestic regulation.
  - For maritime ESIMs, a distance from the shore beyond which ESIMs can safely operate without interfering with terrestrial services is required (Annex 2 Part 1 of the draft WRC Resolution). The distance of 70 km is supported by the GSC and many administrations, which provides adequate protection to fixed and mobile systems operating in the same band. ESIM operation inside that distance would be coordinated with the concerned administration. Larger distances suggested by some sector members would over-protect terrestrial services.
  - For land ESIMs, administrations can address compatibility with other services domestically, and through bi-lateral agreements with neighbouring administrations.

**The GSC recommends** that Method B with the above referenced Options in the CPM text be adopted by WRC-19. This regulatory solution will provide ESIM operators with access to existing and planned GSO FSS systems to support the growing demand from travellers for broadband connectivity on the move, and results in rational and efficient use of the radio spectrum resource. Existing services will be protected from possible interference.

**Note:** Iridium does not support the GSC position on ESIM use of 19.4-19.6 GHz and 29.1-29.3 GHz.

# Associations of the GSC

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