

***OBJECTIVES OF THE
SPACE FREQUENCY
COORDINATION GROUP (SFCG)***



***FOR THE 2027
WORLD RADIOCOMMUNICATION
CONFERENCE***

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Space Frequency Coordination Group



Introduction

This Annex presents the objectives of SFCG members concerning issues affecting space science services on the agenda of the World Radiocommunication Conference 2027 (WRC-27). The contents may be used by SFCG members to inform their Administrations and regional groups, and to facilitate conference preparation and WRC consideration.

The presentation is organized to align with the Agenda for the WRC-27 as presented in Resolution **813 (WRC-23)** and the preliminary Agenda for the WRC-31 as presented in Resolution **814 (WRC-23)**. Not all the Agenda items are of interest to the SFCG, and therefore only those relating to SFCG issues are discussed herein. Agenda items not discussed will be monitored and included if they are determined to have an impact on space science services.

The SFCG is concerned with the effective use and management of those radio frequency bands that are allocated by the Radio Regulations (RR) of the ITU to the space research, space operation, Earth exploration-satellite, meteorological-satellite, inter-satellite, radionavigation-satellite and radio astronomy (to the extent that it is relevant to spacecraft missions) services, as well as meteorological aids service for space weather applications. SFCG promotes spectrum efficiency and recognizes the need for and the value of sharing frequency bands between more than one radio service, in cases where mutually agreed sharing and protection criteria have been established based upon the results of ITU-R studies.

SFCG attaches a particular importance to the protection of frequency bands used by space-based passive sensors to provide vital data for climate science and meteorology that is unobtainable by any other means. The successful operation of these passive sensors depends on the use of specific frequency bands that are defined by physical laws.

SFCG supports regulatory conditions in the RR to guarantee continuation of existing use, as well as future use of radio frequency bands, allocated by the RR to space science services, including development of new applications for space science services.

However, in frequency bands allocated to the space science services or in adjacent frequency bands, and where sharing has been shown not to be feasible or would lead to additional constraints for space science services impacting applications on worldwide basis, the SFCG holds the view that such sharing should not be implemented. In such cases where infeasible sharing situations already exist in the RR, the SFCG would support any review by Administrations that might lead to a reduction in the number of such infeasible sharing situations in the Table of Frequency Allocations contained in the ITU Radio Regulations.

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Agenda Item 1.1 to consider the technical and operational conditions for the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space), or parts thereof, by aeronautical and maritime earth stations in motion communicating with space stations in the fixed-satellite service and develop regulatory measures, as appropriate, to facilitate the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space), or parts thereof, by aeronautical and maritime earth stations in motion communicating with geostationary space stations and non-geostationary space stations in the fixed-satellite service, in accordance with Resolution **176 (Rev.WRC-23)**;

The purpose of this agenda item is to study the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz in the Earth-to-space direction by aeronautical and maritime earth stations in motion (ESIMS) communicating with geostationary satellite orbit (GSO) and non-GSO (NGSO) space stations operating in the fixed-satellite service (FSS) and to develop regulatory measures for this purpose.

This agenda item introduces a potential for increased interference to the Earth exploration-satellite service (EESS) (passive) operating in the adjacent frequency band 50.2-50.4 GHz. It is worth noting that the frequency band 50.2-50.4 GHz corresponds to a reference window for atmospheric temperature profiling (surface temperature). It should also be noted that both footnote RR No. **5.340** and Resolution **750 (Rev.WRC-19)** apply in this frequency band.

Resolution **750 (Rev.WRC-19)** already contains unwanted emissions limits applicable to FSS (Earth-to-space) in the bands 49.7-50.2 GHz and 50.4-50.9 GHz for the protection of EESS (passive) in the band 50.2-50.4 GHz. These limits were determined for traditional FSS fixed earth stations and these limits may not be appropriate for ESIMs.

Studies are necessary to determine whether the unwanted emission limits currently contained in Resolution **750 (Rev. WRC-19)**, if applied to the FSS ESIMs operating in the frequency bands of 47.2-50.2 GHz and 50.4-51.4 GHz, will be sufficient to ensure the protection of the EESS (passive) systems operating in adjacent frequency band 50.2-50.4 GHz or, whether specific new limits will have to be added to Resolution **750 (Rev. WRC-19)**.

SFCG Objective

SFCG does not oppose the operation of ESIMs in the bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space) provided that the protection of the EESS (passive) in the adjacent frequency band 50.2-50.4 GHz continues to be ensured through mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)**.

Agenda Item 1.2 to consider possible revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes, in accordance with Resolution **129 (WRC-23)**;

The frequency band 13.75-14 GHz has been allocated to the fixed-satellite service (FSS) (Earth-to-space) since 1992, under the technical conditions described in RR Nos. **5.502 (Rev.WRC-03)**, applicable to the sharing between FSS and the radiolocation service (RLS), and **5.503 (Rev.WRC-03)**, applicable to the sharing in the band 13.77-13.78 GHz between FSS and the geostationary space stations in the space research service (SRS) for which advance publication information has been received by the Bureau prior to 31 January 1992.

Resolution **129 (WRC-23)** calls for studies on the technical and operational limitations regarding the minimum antenna size and associated power limitations of GSO and NGSO FSS earth stations in the frequency band 13.75-14 GHz (Earth-to-space), while ensuring the protection of the services stipulated in RR Nos. **5.502** and **5.503**. It also calls for studies on possible changes to these provisions along with possible associated regulatory measures.

Currently, GSO earth stations are limited to a minimum 1.2 m antenna and NGSO earth stations are limited to a minimum 4.5 m antenna. There are also EIRP limits placed on FSS earth stations.

It should be noted that the adjacent frequency band 13.25-13.75 GHz is allocated to the Earth exploration-satellite service (EESS) (active). Remote sensing instruments such as synthetic aperture radars, scatterometers, altimeters and precipitation radars are operating in that frequency band. However, based on the experience from the studies carried out under WRC-23 Agenda Item 1.15, the compatibility between FSS uplinks in the frequency band 13.75-14 GHz and EESS (active) in the adjacent band is not expected to be problematic subject to further confirmation.

The SFCG main concern with this agenda item is the ensured protection of data relay satellite systems which continue to operate in the SRS on a primary basis under RR No. **5.503**. SFCG member agencies still operate SRS systems on an equal basis relative to the FSS due to the advance publication information for those systems being received by the ITU Radiocommunications Bureau prior to 31 January 1992. These existing SRS systems provide important intersatellite communications in support of Earth and space science missions, including human spaceflight missions.

A further reduction in antenna diameter for FSS earth stations operating in this band could greatly increase the number of earth stations and, consequently, significantly increase the aggregate interference power into space-based receivers of these data relay satellite systems, resulting in possible loss of command-and-control capabilities.

SFCG Objective

SFCG is not opposed to the possible revisions of the conditions for the use of the frequency band 13.75-14 GHz by uplink FSS earth stations, provided that it does not adversely impact the SRS in the band 13.77-13.78 GHz.

Agenda Item 1.3 to consider studies relating to the use of the frequency band 51.4-52.4 GHz to enable use by gateway earth stations transmitting to non-geostationary-satellite orbit systems in the fixed-satellite service (Earth-to-space), in accordance with Resolution **130 (WRC-23)**;

This agenda item seeks to revise conditions associated with the primary allocation to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space) to enable its use by gateway earth stations of non-GSO FSS systems (Earth-to-space).

This agenda item introduces a potential for increased interference to the EESS (passive) in the 52.6-54.25 GHz frequency band. It should be noted that both footnote RR No. **5.340** and Resolution **750 (Rev.WRC-19)** apply in the 52.6-54.25 GHz frequency band.

Resolution **750 (Rev.WRC-19)** already contains unwanted emissions limits applicable to GSO FSS (Earth-to-space) networks in the band 51.4-52.4 GHz for the protection of EESS (passive) in the band 52.6–54.25 GHz. However, unwanted emission limits are not specified for non-GSO FSS networks.

This agenda item also calls for compatibility studies between non-GSO FSS gateway operation in the frequency band 51.4-52.4 GHz and the existing primary passive services operating in the frequency band 52.6-54.25 GHz to review and revise Resolution **750 (Rev.WRC-19)** to protect the EESS (passive) considering the aggregated interference from GSO gateway earth stations and non-GSO FSS gateway earth stations.

The activities under WRC-27 agenda item 1.3 should develop the relevant corresponding limits for non-GSO FSS (Earth-to-space) networks in the band 51.4-52.4 GHz taking into account the aggregation effects due to the use of this band by gateway earth stations transmitting to GSO FSS networks. Adjustments to those existing limits in Resolution **750 (Rev.WRC-19)**, as stipulated in *recognizing j*) and *resolves 2* of Resolution **130 (WRC-23)**, may be needed.

SFCG Objective

SFCG does not oppose the use of the frequency band 51.4-52.4 GHz by gateway earth stations transmitting to non-GSO systems in the FSS (Earth-to-space) provided that the protection of the EESS (passive) in the frequency band 52.6–54.25 GHz continues to be ensured through mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)**. These mandatory limits must account for aggregate interference from GSO and non-GSO FSS systems into the EESS (passive). Revisions to Resolution **750 (Rev.WRC-19)** may require both addition of unwanted emission limits for the non-GSO Earth stations as well as revision of the existing unwanted emission limits applicable to the GSO Earth stations.

Agenda Item 1.4 to consider a possible new primary allocation to the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz and a possible new primary allocation to the broadcasting-satellite service (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, and to consider equivalent power flux-density limits to be applied in Regions 1 and 3 to non-geostationary-satellite systems in the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz, in accordance with Resolution **726 (WRC-23)**;

This agenda item is to address sharing and compatibility between the fixed-satellite service (FSS) (space-to-Earth), the broadcast-satellite service (BSS) (space-to-Earth) and the FSS (Earth-to-space) designated by RR No. **5.516** in order to consider a possible new primary allocation to the FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz for Region 3 and to the BSS (space-to-Earth) in the frequency band 17.3-17.8 GHz for Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands. The primary SFCG concern with this agenda item is the protection of the EESS (active) in the adjacent 17.2-17.3 GHz frequency band.

SFCG Objective

SFCG does not oppose a new primary allocation to the FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz and a new primary allocation to the BSS (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3 if current and future use of the band 17.2-17.3 by EESS (active) is not constrained. This may require the development of new mandatory FSS and BSS unwanted emission limits to protect the EESS (active) operations in 17.2-17.3 GHz.

Agenda Item 1.7 to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands, in accordance with Resolution **256 (WRC-23)**;

This agenda item calls for the consideration of technical, operational and regulatory issues pertaining to the possible use of the terrestrial component of IMT in the frequency bands 4400-4800 MHz, 7125-8400 MHz (or parts thereof), and 14.8-15.35 GHz. The agenda item also calls for sharing and compatibility studies, with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, or on services in adjacent bands.

The frequency range 7125-8400 MHz is critical for SFCG since it includes, or is adjacent to, several allocations to the EESS, MetSat service and SRS, as outlined below:

- SOS (Earth-to-space) in 7125 – 7155 MHz and 7190 – 7235 MHz;
- SRS (deep space), (Earth-to-space) in 7145-7190 MHz;
- SRS (Earth-to-space) in 7190-7235 MHz.
- EESS (Earth-to-space) in 7190-7250 MHz;
- MetSat (space-to-Earth) in 7450-7550 MHz and 7750-7900 MHz;
- MetSat (Earth-to-space) in 8175-8215 MHz;
- EESS (space-to-Earth) in 8025-8400 MHz;
- SRS (deep space), (space-to-Earth) in the adjacent band 8400-8450 MHz.

Member agencies operate MetSat downlinks in the frequency bands 7450 – 7550 MHz and 7750–7900 MHz providing global dissemination of meteorological data. Member agencies also operate EESS downlinks in the band 8025 – 8400 MHz and this use is still growing. There are currently a very large number of EESS and MetSat earth stations worldwide, including a large number of receive-only stations with ubiquitous deployment. These deployments include urban areas and some of these earth stations are portable stations, meaning that their locations may not be known.

Member agencies operate SRS, SOS, MetSat and EESS uplinks in support of various science missions in the bands 7145-7250 MHz and 8175-8215 MHz which have the potential to cause harmful interference to IMT.

High power SRS deep space uplinks operating in the frequency band 7145 – 7190 MHz have the potential to cause harmful interference to IMT for separation distances of up to 1000 km. This is likely to cover several countries and could make it impossible to deploy IMT systems where SRS deep space uplinks are deployed in neighbouring administrations.

While there is overlap in frequency ranges under consideration between this agenda item and Agenda Item 1.15, no interference is expected between terrestrial systems proposed under this agenda item and systems operating in the lunar region under consideration in Agenda Item 1.15.

It should also be noted that footnote RR No **5.458** indicates that administrations should bear in mind the needs of the EESS (passive) and SRS (passive) in their future planning of the bands 6425-7075 MHz and 7075-7250 MHz as passive microwave sensor measurements are carried out in these frequency bands. Preliminary results of studies ongoing in ITU-R WP 7C show that interference will occur to current and planned sea surface temperature (SST) measurements, especially in coastal areas, if IMT is deployed in any portion of the 6425-7125 MHz band. A similar conclusion can be drawn for the 7125-7250 MHz band if an IMT identification is made in that frequency band. In addition, there is a need to study the impact from possible new IMT identifications in the bands 4400-4800 MHz and 7125-8400 MHz on the potential new primary EESS (passive) allocations for SST measurements in the bands 4200-4400 MHz and 8400-8500 MHz being considered under WRC-27 agenda item 1.19.

The 14.8-15.35 GHz band is allocated to SRS, upgraded to primary status at WRC-23. SFCG is concerned with identification of this band for IMT, where Member agencies operate current and future missions, including manned missions. In addition, a primary allocation to the EESS (passive) exists in the adjacent band 15.35-15.4 GHz, where RR No **5.340** applies. However, no use of the frequency band for passive operations has been identified. The 14.8 - 15.35 GHz SRS band is a portion of the frequency range identified for lunar relay-to-relay service in Recommendation SFCG **32-2R6**. Member agencies also use this band for data relay satellite systems.

SFCG Objective

SFCG opposes the identification for IMT in the bands 7125 – 8400 MHz and 14.8 – 15.35 GHz unless EESS, SRS, SOS and MetSat are fully protected and no additional constraints are placed on their current operations and future development, including unconstrained ubiquitous worldwide deployment of EESS and MetSat receiving earth stations in those bands.

In addition, studies are necessary to ensure that the IMT operators are fully aware of the impact of coexistence with high power uplinks from SRS, SOS, MetSat and EESS earth stations.

Considering the impacts mentioned above, regulatory provisions for possible IMT identifications should not establish any priority over incumbent services, to ensure the continuous use and development of existing and future space science stations operations.

SFCG recognises the linkage to Agenda Item 1.19 and supports study of the potential impact from IMT operations in the frequency ranges 4400-4800 MHz and 8215-8400 MHz to potential new EESS (passive) allocations in the frequency bands 4200-4400 MHz and 8400-8500 MHz .

Agenda Item 1.8 to consider possible additional spectrum allocations to the radiolocation service on a primary basis in the frequency range 231.5-275 GHz and possible new identifications for radiolocation service applications in the frequency bands within the frequency range 275-700 GHz for millimetric and sub-millimetric wave imaging systems, in accordance with Resolution **663 (Rev.WRC-23)**;

Agenda item 1.8 considers regulatory changes to support the operation of radiolocation systems within the 231.5-700 GHz frequency range. These systems require large portions of bandwidth (20 GHz) for vehicular and handheld radars. The specific frequency bands to be studied for radiolocation operations have not yet been specified. There is significant potential that the frequency bands to be studied will overlap, or be adjacent to, frequency bands allocated to EESS (passive) below 275 GHz or identified for EESS (passive) in RR No. **5.565** above 275 GHz.

SFCG interests in the 231.5 – 275 GHz frequency band are:

- The adjacent band 226-231.5 GHz is allocated to SRS/EESS (passive) and is subject to RR No. **5.340**;
- The 235 – 238 GHz range is allocated to EESS (passive) and SRS (passive) limited to limb sounders;
- A new primary allocation to the EESS (passive) in the frequency bands 239.2-242.2 GHz and 244.2-247.2 GHz was made at WRC-23;
- The 250 – 252 GHz range is allocated to EESS (passive) and SRS (passive) and subject to RR No. **5.340**.

Above 275 GHz, there are currently no frequency allocations in the Radio Regulations, but RR No. **5.565** identifies several frequency bands that are relevant and already used for EESS (passive) measurements: 275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, 439-467 GHz, 477-502 GHz, 523-527 GHz, 538-581 GHz, 611-630 GHz, 634-654 GHz, and 657-692 GHz. It should be noted that in the development of RR No. **5.564A**, spectrum sharing between EESS (passive) and FS and MS in a number of these frequency bands has been shown to be infeasible.

In addition, the band 237.9-238 GHz is also allocated to EESS (active) (see RR No. **5.563B**).

SFCG Objective

SFCG supports the protection of passive services using this spectrum, particularly in bands subject to RR No. **5.340**, where all emissions are prohibited.

Further studies may be required with respect to compatibility between the radiolocation service and EESS/SRS (passive) both within band and in adjacent bands.

SFCG opposes any new allocations to the radiolocation service in the frequency band 250-252 GHz where footnote RR No. **5.340** applies.

SFCG is not opposed to new allocations to the radiolocation service on a primary basis in the

frequency range 231.5-275 GHz, except for 250-252 GHz as noted above, or to new identifications in the frequency range 275-700 GHz, provided that the protection of the existing allocations/identifications to the EESS (passive) and the EESS (active) is ensured, from both in-band and/or out-of-band emissions of these possible new radiolocation service applications.

SFCG is of the view that potential active applications, such as UWB, not falling within the radiolocation service, should not be considered under WRC-27 Agenda Item 1.8.

Agenda Item 1.11 to consider the technical and operational issues, and regulatory provisions, for space-to-space links among non-geostationary and geostationary satellites in the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz allocated to the mobile-satellite service, in accordance with Resolution **249 (Rev.WRC-23)**.

Resolution **249 (Rev.WRC-23)** calls for studies of sharing and compatibility between space-to-space links and other existing primary services allocated in the same frequency bands, other existing primary services allocated in adjacent frequency bands, and existing passive services allocated in adjacent frequency bands.

The purpose of this agenda item is to consider the possibility of operating space-to-space links among NGSO and GSO satellite systems in various frequency bands below 2500 MHz within the frequency bands allocated to MSS or via additional inter-satellite service allocations.

These MSS operations are typically used by commercial networks. However, with the deorbiting of SFCG members' legacy data relay options, some SFCG agencies will need to rely on the commercial data relay options that will be enabled by this agenda item. As satellites with scientific missions generate increasing volumes of data and requirements for reduced data latency become more restrictive, some SFCG members are planning for their future missions to make use of commercially available data relay systems. MSS systems operating as data relays could provide vital TT&C support to scientific missions as well as supporting low data rate mission data support. Some SFCG members do not have other viable options for future data relay operations if this agenda item is not successful.

SFCG members are also concerned about the consideration of the frequency band 1670-1675 MHz and its potential impact on the meteorological-satellite (MetSat) service operating in the adjacent band of 1675-1710 MHz. SRS (passive) is allocated in the frequency band 1660.5 – 1668.4 MHz.

The band 1525-1535 MHz is allocated to the space operation service (SOS) (space-to-Earth) on a primary basis and partially overlaps the 1518-1544 MHz range under consideration.

It should be noted that the frequency band 2483.5-2500 MHz is also under consideration under WRC-27 agenda item 1.15 for a potential new allocation to the SRS (space-to-space) for lunar communications.

SFCG Objective

SFCG supports enabling space-to-space operations that are necessary for future SFCG member missions while ensuring protection of the MetSat service in the frequency band 1670-1675 MHz, as well as in the adjacent band 1675-1690 MHz.

SFCG supports treating this agenda item and Agenda Item 1.15 separately because there is no potential for interference in overlapping bands.

Agenda Item 1.12 to consider, based on the results of studies, possible allocations to the mobile-satellite service and possible regulatory actions in the frequency bands 1 427-1 432 MHz (space-to-Earth), 1 645.5-1 646.5 MHz (space-to-Earth) (Earth-to-space), 1 880-1 920 MHz (space-to-Earth) (Earth-to-space) and 2 010-2 025 MHz (space-to-Earth) (Earth-to-space) required for the future development of low-data-rate non-geostationary mobile-satellite systems, in accordance with Resolution **252 (WRC-23)**.

Resolution **252 (WRC-23)** calls for studies on sharing and compatibility between the non-GSO low-data-rate MSS systems and the existing primary services operating in the frequency bands 1427-1432 MHz (space-to-Earth), 1645.5-1646.5 MHz (space-to-Earth) (Earth-to-space), 1880-1920 MHz (space-to-Earth) (Earth-to-space) and 2010-2025 MHz (space-to-Earth) (Earth-to-space) and in the relevant adjacent frequency bands, in order to ensure protection of existing services.

SFCG noted that the possible new allocations to the MSS in the frequency bands 1427-1432 MHz (space-to-Earth) and 2010-2025 MHz (space-to-Earth) (Earth-to-space) are adjacent to important science service allocations; the 1400-1427 MHz EESS (passive) band which is subject to RR No. **5.340**, and the 2025-2100 MHz SOS/SRS/EESS (Earth-to-space) and (space-to-space) primary allocations.

In addition to studies to ensure protection of incumbent services from low data rate MSS, adjacent band compatibility studies are necessary with high power SRS and SOS uplinks in the frequency band 2025-2110 MHz.

SFCG Objective

SFCG is not opposed to the consideration of possible new allocations for low data rate NGSO MSS systems provided that:

- The protection of EESS (passive) in the frequency band 1400-1427 MHz is ensured, through mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)** applicable to MSS systems operating in the band 1427-1432 MHz;
- There is no negative impact on the EESS/SOS/SRS in the 2025-2110 MHz frequency band.

Agenda Item 1.13 to consider studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage, in accordance with Resolution **253 (WRC-23)**.

Resolution **253 (WRC-23)** calls for studies on possible allocations to the MSS in the frequency range between 694/698 MHz and 2.7 GHz, taking into account the IMT frequency arrangements addressed in the most recent version of Recommendation ITU-R M.1036. It also calls for studies on sharing and compatibility between incumbent services, including in adjacent frequency bands, ensuring the protection of incumbent services.

This agenda item considers new frequency allocations to the MSS to supplement terrestrial IMT network coverage where IMT user equipment would obtain service via MSS space stations. The agenda item does not indicate specific frequency bands to be considered within the broad frequency range of 694-2700 MHz. However, specific frequency bands for study have been agreed upon in WP 4C and they are limited to bands already identified for IMT and for which IMT frequency arrangements are defined in Recommendation ITU-R M.1036. The adjacent band interference scenario from DC-MSS-IMT (Direct connectivity between MSS and IMT) space station transmitters above 2110 MHz into SOS/EESS/SRS space stations in the frequency band 2025-2110 MHz was identified as one of the interference scenarios to be studied.

Considering (i) the preliminary list of frequency bands developed by WP 4C for these envisaged satellite systems, (ii) the assumptions on the directionality of the links for DC-MSS-IMT, (iii) that IMT user equipment is already transmitting in each of the relevant bands, and (iv) the IMT UE parameters are to remain unchanged when operating with DC-MSS-IMT, SFCG interest for this agenda item is related to the following aspects:

- protection of the EESS (passive) in the 1400-1427 MHz band from MSS (Earth-to-space) operated in 1427-1470 MHz;
- protection of the MetSat service in the 1675-1710 MHz band from MSS (Earth-to-space) operated in the 1710-1785 MHz band;
- protection of EESS, SOS and SRS in 2025-2110 MHz from MSS (Earth-to-space) operated below 2025 MHz and MSS (space-to-Earth) above 2110 MHz ;
- protection of SRS (deep space) in the 2110-2120 MHz band from MSS (space-to-Earth) operated in the 2110-2120 MHz band;
- protection of EESS, SOS and SRS in the 2200-2290 MHz band from MSS (space-to-Earth) operated in the 2180-2200 MHz band;
- protection of SRS (deep space) in the 2290-2300 MHz band from MSS operated in the 2300-2400 MHz band.

For scenarios involving MSS (Earth-to-space), the interference environment on the uplink should not change, provided that user equipment (UE) of the DC-MSS-IMT systems operate with unwanted emission limits, applicable for IMT UEs.

SFCG Objective

SFCG supports adhering to the bands identified by WP 4C for study where “Uplink” refers to IMT user equipment transmissions (from Earth-to-space) and “Downlink” refers to DC-MSS-IMT transmission from space-to-Earth:

Direction	
Uplink(MHz)	Downlink (MHz)
[814/824-849]	[859/869-894]
880-915	925-960
832-862	791-821
698-716	716-746
776-798	746-768
698-748	753-803
1 427-1 470	1 475-1 518
1 920-1 980	2 110-2 170
1 710-1 785	1 805-1 880
1 850-1 920	1 930-2 000
1 710-1 780	2 110-2 180
2 000-2 020	2 180-2 200
2 010-2 025	1 880-1 920
2 305-2 320	2 345-2 360
2 500-2 570	2 620-2 690

SFCG is not opposed to the consideration of possible new MSS allocations for direct connectivity between space stations and IMT user equipment provided that:

- The protection of EESS (passive) in the frequency band 1400-1427 MHz is ensured, through application of the mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)** already defined for IMT mobile stations in the 1427-1452 MHz to MSS terminals;
- There is no negative impact on the MetSat service in the 1675-1710 MHz band;
- There is no negative impact on the EESS/SOS/SRS in the 2025-2110 MHz and 2200-2290 frequency bands, in particular on spacecraft operating at altitudes lower than those of MSS for direct connectivity;
- There is no negative impact on SRS (deep space) in the 2110-2120 and 2290-2300 MHz bands.

SFCG supports treating AI 1.13 and AI 1.15 studies independently.

Agenda Item 1.14 to consider possible additional allocations to the mobile-satellite service, in accordance with Resolution **254 (WRC-23)**;

This agenda item considers possible new frequency allocations to the mobile-satellite service (MSS) in the frequency bands 2010-2025 MHz (Earth-to-space) and 2160-2170 MHz (space-to-Earth) in Regions 1 and 3 and 2120-2160 MHz (space-to-Earth) in all Regions. Resolution **254 (WRC-23)** calls for studies on sharing and compatibility of possible new allocations to the MSS to ensure the protection of existing services allocated on a primary basis, and in adjacent frequency bands.

SFCG is mainly concerned with the protection of the SOS, SRS and EESS operating in the space-to-space and Earth-to-space directions in the adjacent 2025-2110 MHz band, and the operations of the SRS (deep space) (Earth-to-space) allocated to the adjacent 2110-2120 MHz band. In addition to studies to ensure protection of incumbent services from MSS, adjacent band compatibility studies are necessary with high power SRS, EESS and SOS uplinks in the frequency band 2025-2110 MHz.

SFCG Objective

SFCG is not opposed to the consideration of possible new MSS allocations provided that there is no negative impact on the EESS/SOS/SRS in the 2025-2110 MHz frequency band and on the SRS (deep space) in the 2110-2120 MHz band.

Agenda Item 1.15 to consider studies on frequency-related matters, including possible new or modified space research service (space-to-space) allocations, for future development of communications on the lunar surface and between lunar orbit and the lunar surface, in accordance with Resolution **680 (WRC-23)**;

Resolution **680 (WRC-23)** calls for studies on systems in the SRS which may operate on the lunar surface, or systems in lunar orbit communicating with systems on the lunar surface, in the following frequency ranges or portions thereof:

- 390-406.1 MHz, 420-430 MHz and 440-450 MHz, limited to outside the Shielded Zone of the Moon (SZM);
- 2400-2690 MHz, 3500-3800 MHz, 5150-5570 MHz, 5570-5725 MHz, 5775-5925 MHz, 7190-7235 MHz, 8450-8500 MHz and 25.25-28.35 GHz;

noting that:

- Section V of Article 22 addresses protection of radio astronomy in the SZM;
- that Recommendation ITU-R RA.479-5 relates to the protection of frequencies for radioastronomical measurements in the SZM, with a view to preserving the unique radioastronomical capabilities in this zone;
- that the impact of unintended electromagnetic radiation from electrical and electronic systems into radio astronomy receivers should be assessed (see Question ITU-R 243/1).

SFCG Member agencies are involved in the planning and use of systems on the lunar surface and lunar orbit and are cooperatively working on lunar spectrum use plans to support these planned and future space missions. SFCG recognizes the importance of protecting the SZM for future use by the radio astronomy community.

SFCG recognizes that the Radio Regulations can currently accommodate some lunar applications through existing SOS, SRS and ISS allocations. Potential new allocations to SRS (space-to-space) under WRC-27 Agenda Item 1.15 are expected to cover planned lunar applications in frequency bands where no suitable allocation currently exists in the Radio Regulations.

SFCG Objective

SFCG supports possible new or modified space research service (space-to-space) allocations for the future development of communications on the lunar surface and between stations in lunar orbit and stations operating on the lunar surface based on the results of ITU-R studies:

- Frequency bands 390-405 MHz, and 440-450 MHz are intended for communications between lunar orbit and the lunar surface limited to outside the shielded zone of the Moon (SZM).
- Frequency bands 2400-2483.5 MHz, 2500-2690 MHz, 3500-3800 MHz, 5150-5570 MHz, 5570-5725 MHz, 5775-5925 MHz and 27.5-28.35 GHz are intended for communications on the lunar surface, subject to protection of the existing allocations to SRS (active) in the band 5250-5570 MHz and SRS (space to Earth) in the band 25.5-27 GHz.

- Frequency band 406-406.1 MHz is intended for communications between lunar orbit and the lunar surface limited to outside the SZM.
- Frequency band 420-430 MHz is intended for communications on the lunar surface limited to outside the SZM.
- Frequency band 2483.5-2500 MHz is intended for communications from lunar orbit to lunar surface.
- Frequency bands 7190-7235 MHz and 8450-8500 MHz are intended for forward and return links in data relay communications with users in the lunar orbit and on the lunar surface, subject to the protection of the existing allocations to SRS (Earth-to-space) in the band 7190-7235 MHz and SRS (space-to-Earth) in the band 8450-8500 MHz.

SFCG supports the protection of the SZM for its use for radio astronomy observations.

SFCG supports that AI 1.15 be treated independently from AIs 1.7, 1.11 and 1.13.

Agenda Item 1.17 to consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies, in accordance with Resolution **682 (WRC-23)**;

This agenda item is the follow-up to WRC-23 agenda item 9.1 Topic a). WRC-23 approved Resolution **675 (WRC-23)** and added Article **29B**, which defines space weather and designates space weather sensors to the meteorological aids (MetAids) service as the subset MetAids (*space weather*).

Resolution **682 (WRC-23)** calls for sharing and compatibility studies pertaining to potential new primary allocations to MetAids (*space weather*) for receive-only sensors operating in the frequency bands 27.5-28.0 MHz, 29.7-30.2 MHz, 32.2-32.6 MHz, 37.5-38.325 MHz, 73.0-74.6 MHz and 608-614 MHz. It also calls for studies on possible regulatory provisions to notify a receive-only space weather sensor station to be included in the MIFR.

SFCG interest for this agenda item is driven by the opportunity provided by Resolution **682 (WRC-23)** to establish regulatory provisions for the protection of receive-only space weather sensors within the selected frequency bands, which are already being used by space weather receive-only sensors and need to be protected from new entrants into these bands in the future.

SFCG Objective

SFCG supports primary allocations to MetAids (*space weather*) being made for receive-only sensors in the 27.5-28.0 MHz, 29.7-30.2 MHz, 32.2-32.6 MHz, 37.5-38.325 MHz, 73.0-74.6 MHz, and 608-614 MHz frequency bands without imposing constraints on incumbent services.

Agenda Item 1.18 to consider, based on the results of ITU Radiocommunication Sector studies, possible regulatory measures regarding the protection of the Earth exploration-satellite service (passive) and the radio astronomy service in certain frequency bands above 76 GHz from unwanted emissions of active services, in accordance with Resolution **712 (WRC-23)**;

The work on this agenda item is split into two topics in Resolution **712 (WRC-23)**. The interest of SFCG falls under *resolves* 1, where regulatory measures are to be considered for protection of the EESS (passive) from unwanted emissions of active services operating in the frequency bands adjacent to certain EESS (passive) allocations where RR No. **5.340** applies, as shown in the table below:

EESS (passive) frequency band	Active service frequency band	Active service
86-92 GHz	81-86 GHz	Fixed-satellite service (FSS) (Earth-to-space), mobile service (MS)
	92-94 GHz	MS, radiolocation service (RLS)
114.25-116 GHz	111.8-114.25 GHz	Fixed service (FS), MS
164-167 GHz	158.5-164 GHz	FS, FSS (space-to-Earth), MS, mobile-satellite service (MSS) (space-to-Earth)
	167-174.5 GHz	FS, FSS (space-to-Earth), inter-satellite service (ISS), MS
200-209 GHz	191.8-200 GHz	FS, ISS, MS, MSS, radionavigation service (RNS), radionavigation-satellite service (RNSS)
	209-217 GHz	FS, FSS (Earth-to-space), MS

Subject to the results of the compatibility studies, the consequential regulatory measures are expected to be the inclusion of out-of-band emission limits applied to the active services in a revision to Resolution **750 (Rev. WRC-19)**.

SFCG Objective

SFCG supports mandatory unwanted emissions limits applied to active services to protect EESS (passive) operations in the bands 86-92 GHz, 114.25-116 GHz, 164-167 GHz and 200-209 GHz allocated to EESS (passive) on a primary basis and subject to RR No. **5.340**.

These limits should be included in a revision to Resolution **750 (Rev. WRC-19)**.

SFCG believes that this issue should be fully addressed by WRC-27 by establishing appropriate unwanted emissions limits for protection of EESS (passive) before there is widespread deployment of active services. This also applies to the active services for which no characteristics are currently available to perform compatibility studies.

Agenda Item 1.19 to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz, in accordance with Resolution **674 (WRC-23)**;

Resolution **674 (WRC-23)** calls for sharing and compatibility studies to determine the possibility of a primary allocation to the EESS (passive) in the frequency bands 4200-4400 MHz and 8400-8500 MHz in order to allow for the continuity of sea surface temperature (SST) measurements, which are of prime importance for weather forecasting and climate monitoring.

The frequency range 6425-7250 MHz is currently used for conducting SST measurements from satellites on an unprotected basis in accordance with footnote RR No. **5.458**. Measurements in this range are affected by interference, and preliminary studies performed in the ITU-R show that SST measurements in this frequency range would be severely constrained by high density deployment of communication systems (e.g. RLAN or IMT).

The aim of the studies under WRC-27 agenda item 1.19 is to determine the conditions of usage of the frequency bands 4200-4400 MHz and 8400-8500 MHz by the EESS (passive). Such potential new primary allocations to the EESS (passive) would be used in conjunction with the 6/7 GHz frequency range. Combining multiple nearby channels in such a way is required to improve science retrievals and to mitigate RFI to the greatest extent.

It is important to note that any new primary allocation to the EESS (passive) in the frequency bands 4200-4400 MHz and 8400-8500 MHz would be unable to claim protection from existing services in these frequency bands and in adjacent bands. Studies are therefore needed to determine whether the existing interference environment will allow for operation of EESS (passive) sensors in these bands.

SFCG Objective

SFCG supports additional global primary allocations to the EESS (passive) in the frequency bands 4200-4400 MHz and 8400-8500 MHz in order to ensure the long-term continuity of sea surface temperature (SST) measurements, in conjunction with the existing 6/7 GHz frequency range, without placing any additional constraints on existing services.

SFCG also supports the protection of these new EESS (passive) allocations from any possible new IMT identifications in adjacent bands under WRC-27 AI 1.7.

Other WRC-27 agenda items under SFCG monitoring

The WRC-27 agenda items listed below present some interests for SFCG. They are currently being monitored by SFCG and SFCG objectives on these agenda items may be developed at a later stage of the WRC-27 preparation process:

- **Agenda Item 1.6:** to consider technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency bands, in accordance with Resolution **131 (WRC-23)**;
- **Agenda Item 1.10:** to consider developing power flux-density and equivalent isotropically radiated power limits for inclusion in Article **21** of the Radio Regulations for the fixed-satellite, mobile-satellite and broadcasting-satellite services to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz, in accordance with Resolution **775 (Rev.WRC-23)**;
- **Agenda Item 4:** in accordance with Resolution **95 (Rev.WRC-19)**, to review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation;
- **Agenda Item 7:** to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;
- **Agenda Item 9:** to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention:
 - **9.1:** on the activities of the ITU Radiocommunication Sector since WRC-23;
 - **9.2:** on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and
 - **9.3:** on action in response to Resolution **80 (Rev.WRC-07)**;

Agenda Item 10 to recommend to the ITU Council items for inclusion in the agenda for the next world radiocommunication conference, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the ITU Convention and Resolution **804 (Rev.WRC-23)**.

SFCG Objective

It is very important to ensure that, before any new agenda item is agreed at WRC-27, the following elements are already available:

1. Clear demonstration and quantification of the spectrum requirements.
2. Technical and operational parameters of the new systems for which modification of the RR is proposed.
3. Identification of the exact bands to be considered for regulatory changes.
4. Preliminary studies on the feasibility of sharing in these bands.

Taking into account Resolution **804 (Rev. WRC-23)**, SFCG is of the view that adherence to these principles should be a condition for adoption of any new WRC agenda item.

Preliminary Agenda WRC-31 (Resolution 814 (WRC-23))

The following WRC-31 preliminary agenda items present some interests or concerns for SFCG.

Agenda Item 2.1 to consider potential new allocations to the fixed, mobile, radiolocation, amateur, amateur-satellite, radio astronomy, Earth exploration-satellite (passive and active) and space research (passive) services in the frequency range 275-325 GHz in the Table of Frequency Allocations of the Radio Regulations, with the consequential update of Nos. **5.149**, **5.340**, **5.564A** and **5.565**, in accordance with Resolution **721 (WRC-23)**;

SFCG Objective: SFCG is of the opinion that justification is needed before considering any extension of the Table of Frequency Allocations in Article 5 of the Radio Regulations up to 325 GHz. It should be noted that RR No. **5.565** includes the required identifications for passive service applications above 275 GHz and that RR No. **5.564A** includes identifications to active services, with conditions to protect the EESS (passive), SRS (passive) and radio astronomy. If any extension of the Table of Frequency Allocations in Article 5 of the Radio Regulations up to 325 GHz is considered:

- Identifications to EESS (passive) and SRS (passive) between 275 GHz and 325 GHz should be converted into primary allocations,
- potential frequency allocations for EESS (active) in the range 275-325 GHz should also be considered.

Agenda Item 2.2 [to consider the possible [frequency bands] for [non-beam and beam] wireless power transmission to avoid harmful interference to the radiocommunication services caused by wireless power transmission, in accordance with Resolution **910 (WRC-23)**];

SFCG Objective: SFCG does not oppose wireless power transmission provided that the protection of science services is ensured.

Of particular concern is the current work in WP 1A considering development of WPT at 24 GHz and the potential adverse impact on EESS (passive) operating in 23.6-24 GHz band where RR No. **5.340** applies.

Agenda item 2.3 to consider the use of aeronautical and maritime earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service (Earth-to-space) in the frequency band 12.75-13.25 GHz, in accordance with Resolution **133 (WRC-23)**;

SFCG Objective: To ensure protection of the EESS (passive) sensors in the adjacent frequency band 10.6-10.7 GHz from unwanted emissions produced by non-GSO FSS systems communicating with A-ESIMs and M-ESIMs in the associated downlink frequency band 10.7-10.95 GHz (space-to-Earth).

Agenda Item 2.6 to consider the identification of the frequency bands [102-109.5 GHz, 151.5-164 GHz, 167-174.8 GHz, 209-226 GHz and 252-275 GHz] for International Mobile Telecommunications, in accordance with Resolution **255 (WRC-23)**;

SFCG Objective:

SFCG is concerned about ensuring protection of the EESS (passive) from IMT unwanted emissions, noting that WP5D has already begun work on this frequency range. SFCG notes that each of the proposed frequency bands is adjacent to an EESS (passive) allocation on either the lower and/or upper end. Furthermore, many of the EESS (passive) frequency bands are subject to RR No. **5.340**.

Agenda Item 2.10 to consider a possible new primary allocation to the Earth exploration-satellite service (Earth-to-space) in the frequency band 22.55-23.15 GHz, in accordance with Resolution **664 (Rev.WRC-23)**;

SFCG Objective:

SFCG supports a WRC-31 agenda item for the creation of a new primary allocation to the Earth exploration-satellite service (Earth-to-space) in the frequency band 22.55-23.15 GHz.

A new primary EESS (Earth-space) allocation in the band 22.55-23.15 GHz will pair with the band 25.5-27 GHz EESS (space-to-Earth) allowing uplinks and downlinks on the same transponder. Such an allocation will also provide future capacity for telemetry and telecommand as demand increases, as well as other potential benefits such as improved security.

Agenda Item 2.11 to consider an upgrade of the secondary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band [37.5-40.5 GHz] or possible new worldwide frequency allocations on a primary basis to the Earth exploration-satellite service (space-to-Earth) in certain frequency bands within the frequency range [40.5-52.4 GHz], in accordance with Resolution **685 (WRC-23)**;

SFCG Objective: SFCG supports the WRC-31 agenda item for the upgrade of the secondary

allocation to the EESS (space-to-Earth) in the frequency band 37.5-40.5 GHz or possible new worldwide frequency allocations on a primary basis to the EESS (space-to-Earth) in certain frequency bands within the frequency range 40.5-52.4 GHz, taking into account the increased EESS payload data capacity requirements. It is expected that preliminary studies during the cycle 2024-2027 would help in refining the scope of the item and clarifying the exact frequency bands for consideration.

Agenda Item 2.12 to consider possible new allocations to the Earth exploration-satellite service (active) in the frequency bands [3 000-3 100 MHz] and [3 300-3 400 MHz] on a secondary basis, in accordance with Resolution **686 (WRC-23)**;

SFCG Objective: SFCG supports inclusion of this preliminary agenda item on the Agenda for WRC-31 to consider possible new allocations to the EESS (active) in 3000-3100 MHz and 3300-3400 MHz.

Several SFCG member agencies already operate SAR missions in the 3100 – 3300 MHz range. This agenda item would permit higher bandwidths leading to increased resolution.

Agenda Item 2.13 to consider studies on coexistence between spaceborne synthetic aperture radars operating in the Earth exploration-satellite service (active) and the radiodetermination service in the frequency band 9 200-10 400 MHz, with possible actions as appropriate, in accordance with Resolution **722 (WRC-23)**.

SFCG Objective: In the absence of any evidence on potential incompatibility between EESS (active) and the radiodetermination service in the frequency band 9200-10400 MHz, SFCG does not support the inclusion of this preliminary agenda item on the Agenda for WRC-31. No information has been made available to indicate that a problem exists, and there has been no change to the sharing environment to justify reconsideration of current regulatory provisions.

Other possible agenda items for WRC-31 supported by SFCG

Agenda Item 2.XX to consider possible new worldwide allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 7 900-8 025 MHz on a primary basis;

SFCG Objective: SFCG supports inclusion of this as an agenda item for WRC-31 to consider possible new worldwide allocations to the Earth exploration-satellite service (space-to-Earth) in the 7 900-8 025 MHz on a primary basis in order to support wider bandwidth data links.