

WMO-ITU Seminar

**ITU and World
Meteorological
Organization (WMO)**



ITU-R PREPARATION to WRC-27



ITUWRC
WORLD RADIOCOMMUNICATION
CONFERENCE

**ITU World Radiocommunication
Conference 2027 (WRC-27)**

18 October – 12 November 2027, Shanghai, China

Agenda Item 1.1: ESIM at 50 GHz
Agenda Item 1.3: Protection of
EESS (passive) in the 52.6-54.25 GHz

Agenda Item 1.7: IMT 🙄 🙄 🙄

Agenda Item 1.8: 231.5-275 GHz

Agenda Item 1.11: space to space links

Agenda Item 1.12: MSS IOT

Agenda Item 1.13: IMT-satellite

Agenda Item 1.14: MSS

Agenda Item 1.17: space weather

Agenda Item 1.18: unwanted emissions
EESS(passive)

Agenda Item 1.19: SST

RELEVANT LIST OF AGENDA ITEMS OF WRC-27

Agenda Item 1.1

DESCRIPTION

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

RESOLUTION 176 (Rev.WRC-23)

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 GSO and NGSO space stations operating in the fixed-satellite service (FSS) and to develop regulatory measures for this purpose.

ESIM: an Earth station is a radio station (i.e. a set of transmitters and receivers) located on the Earth's surface or in the Earth's atmosphere that communicates with a radio station located on an object in space (i.e. space station).

An Earth station that is placed on a moving platform, such as a ship at sea, a moving train, or an aircraft in flight, is referred to as an **Earth station in motion (ESIM)**.

Three types of ESIMs: ESIM on board aircraft (aeronautical ESIM), ESIM on board ships (maritime ESIM), and ESIM on board land vehicles (land ESIM), such as trains.

OBJECTIVE

Agenda Item 1.1

UIT

Potential for increased interference to the EESS (passive) operating in the adjacent frequency band 50.2-50.4 GHz.

50.2-50.4 GHz corresponds to a reference window for atmospheric temperature profiling (surface temperature).

Resolution **750 (Rev.WRC-19)**: 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.

METHODS

Method A: NOC

Method B: operational and regulatory provisions for the operation of A-ESIM and M-ESIM communicating with GSO and non-GSO space stations in the fixed-satellite service in the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space)

Revision of Resolution (WRC) 750

Agenda Item 1.3

DESCRIPTION

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)**.

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).

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

Resolution **750 (Rev.WRC-19)**: 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.

Unwanted emission limits are not specified for non-GSO FSS networks.

Protection of the EESS (passive) in the frequency band 52.6–54.25 GHz to be ensured through mandatory unwanted emission limits in Resolution **750**.

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 in order 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.**

METHODS

Method A FSS (Earth-to-space) allocation in the frequency band 51.4-52.4 GHz limited to gateway earth stations communicating with GSO FSS space stations. Resolution 750 (Rev.WRC-19) updated with additional regulatory provisions to ensure protection to EESS (passive) operations in the frequency band 52.6-54.25 GHz

Method B Allocation to non-GSO FSS gateway earth stations in the frequency band 51.4-52.4 GHz, with appropriate conditions to protect in-band and adjacent-band primary services Resolution 750 (Rev.WRC-19) would be updated to ensure protection to EESS (passive) operations in the frequency band 52.6-54.25 GHz;

Method C Allocation to non-GSO FSS gateway earth stations in the frequency band 51.4-52.4 GHz, with appropriate conditions to protect in-band and adjacent-band primary services Resolution 750 (Rev.WRC-19) updated to ensure protection to EESS (passive) operations in the frequency band 52.6-54.25 GHz;

Agenda Item 1.7

UIT

DESCRIPTION 1/2

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),
14.8-15.35 GHz

taking into account existing primary services operating in these, and adjacent, frequency bands

Resolution **256 (WRC-23)**;

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, on services in adjacent bands.

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.

Agenda Item 1.7

DESCRIPTION 2/2

MetSat downlinks in the frequency bands 7450 – 7550 MHz and 7750–7900 MHz, providing global dissemination of meteorological data.

EESS downlinks in the band 8025 – 8400 MHz: use is still growing.

Currently a very large number of EESS and MetSat earth stations worldwide, including a large number of receive-only stations with ubiquitous deployment.

Deployments: urban areas (including portable stations: their locations may not be known).

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 several hundreds of km.

Required 60 km separation distance to protect MetSat downlinks from IMT

Required 50-320 km separation distance to protect EESS downlinks from IMT

Sharing between IMT and EESS in the 8 GHz band is not feasible

The range 14.8-15.35 GHz is adjacent to 15.35-15.4 GHz, where RR No 5.340 applies. However, no use of the frequency band for passive operations has been identified

Agenda Item 1.7

OBJECTIVE

No 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 that no additional constraints are placed on their future development.

Protection of existing and future use of the spectrum, for unconstrained ubiquitous worldwide deployment of EESS earth stations in the 8025-8400 MHz band.

Linkage to agenda item 1.19: studies on the potential impact from IMT operations in the frequency ranges 4400-4800 MHz and 8 215-8 400 MHz to potential new EESS (passive) allocations.

Frequency band 2: 7 125-7 250 MHz (globally)

Method 2A: No Change

scenarios involving interference from SRS earth stations to IMT stations in the band 7 145-7 235 MHz, coordination distances can range from 400 km to 800 km, and in some cases up to 900 km.

Method 2B: Identification of the band for IMT with footnote and new Resolution including conditions for space services, Alternatives: pointing restrictions and power or TRP restriction, Limit on the expected e.i.r.p., Maximum e.i.r.p. mask and base station density limit

Method 2C, 2D: Identification of the band for IMT with footnote, alternative elements and new Resolution

Frequency band 3: 7 250-7 750 MHz (Regions 2 and 3)

Method 3A: No Change

scenarios involving interference from IMT stations to earth stations in the band 7 250-7 750 MHz, separation distances can be up to 400 km, and in some cases range from several tens of kilometers to several hundreds of kilometres

Method 3B: Identification of the band for IMT with footnote and new Resolution including conditions for space services Alternatives: Pointing restrictions and power or TRP restriction, Limit on the expected e.i.r.p., Maximum e.i.r.p. mask and base station density limit, pfd limit

Method 3C, 3D: Identification of the band for IMT with footnote, alternative elements and new Resolution

Agenda Item 1.7

METHODS 2/2

Frequency band 4: 7 750-8400 MHz (globally)

Method 4A: No Change

separation distances can be up to 300 km. In addition, several studies have also shown that, in scenarios involving interference from IMT stations to space stations, interference can exceed the protection criteria of space services by up to 33/35 dB.

Method 4B: Identification of the band for IMT with footnote and new Resolution including conditions for space services
Various alternatives:

Pointing restrictions and power or TRP restriction, Limit on the expected e.i.r.p., Maximum e.i.r.p. mask and base station density limit

Method 4C, 4D: Identification of the band for IMT with footnote, alternative elements and new Resolution

Agenda Item 1.8

UIT

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

Resolution **663 (Rev.WRC-23)**;

Potential that 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.

The adjacent band 226-231.5 GHz is allocated to SRS/EESS (passive) and is subject to RR No. **5.340**

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

250 – 252 GHz: EESS (passive) and SRS (passive) and subject to RR No. **5.340**.

Above 275 GHz: no frequency allocations

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.

Agenda Item 1.8

OBJECTIVE

Protection of passive services using this spectrum, particularly in bands subject to RR No.5.340: no emissions are permitted.

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

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

No 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.

Agenda Item 1.8

METHODS

Issue A: RLS Allocation below 275 GHz

Method A1: No change

sharing and compatibility of the radiolocation service applications with incumbent services may be difficult

Method A2: Allocation of the band 252-275 GHz

protection of EESS (passive) in the band 250-252 GHz four options

protection of EESS (passive) in the band 296-356 GHz two options

Issue B: RLS Identification above 275 GHz

Method B1: No change

Method B2: Identification of the ranges 275-296 and 356-439 GHz

protection of EESS (passive) in the band 296-356 GHz two options

Method B2bis: Identifications of 275-296 GHz, 325-470 GHz and 640-690 GHz

The same options for provisions as in Method B2 can be applied.

Agenda Item 1.11

DESCRIPTION

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
2 483.5-2 500 MHz

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.

Potential impact on the MetSat service operating in the adjacent band of 1675-1710 MHz.

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

Agenda Item 1.11

UIT

OBJECTIVE

Protection of the MetSat service in the frequency band 1670-1675 MHz while developing regulatory provisions for operation of space-to-space links.

Studies show that reasonable mitigation measures can be employed that would reduce the interference to MetSat earth stations below the required protection levels. The measures modelled were: (a) avoidance of inline events; (b) user space station blockage; (c) user space station transmitter duty cycle.

With regard to **SOS (space-to-Earth) in 1525-1535 MHz**, the interference environment will not change with the introduction of MSS (space-to-space

Agenda Item 1.12

DESCRIPTION

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)
- 2 010-2 025 MHz (space-to-Earth) (Earth-to-space)

Low-data-rate non-geostationary mobile-satellite systems

Resolution **252 (WRC-23)**

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).

Several of the bands identified are adjacent to important science service allocations, notably the 1400 to 1427 MHz EESS (passive) band, which is subject to RR No. **5.340**, and the primary 2025 – 2100 MHz SOS/SRS/EESS (Earth-to-space) and (space-to-space) allocations.

Agenda Item 1.12

OBJECTIVE

Consideration of possible new allocations for low data rate (LDR) 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; The work is on going.

there is no negative impact on the EESS/SOS/SRS in the 2025-2110 MHz frequency band. Currently no study on the adjacent band compatibility between LDR MSS in 2010-2025 MHz and EESS/SOS/SRS in the 2025-2110 MHz frequency band. These studies are yet to be completed

Agenda Item 1.13

UIT

DESCRIPTION

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

Resolution **253 (WRC-23)**

MSS in the frequency range between 694/698 MHz and 2.7 GHz

IMT frequency arrangements addressed in the most recent version of Recommendation ITU-R M.1036

Preliminary list of frequency band developed by WP 4C for these envisaged satellite systems, some issues:

- protection of the EESS (passive) in the 1400-1427 MHz band from MSS operated in 1427-1518 MHz;
- protection of the MetSat service in the 1675-1710 MHz band from MSS operated in the 1710-1785 MHz band;
- protection of EESS, SOS and SRS in 2025-2110 MHz from MSS operated in the 1805-2025 MHz band;
- protection of EESS, SOS and SRS in the 2200-2290 MHz band from MSS operated in the 2110-2200 MHz band;

Agenda Item 1.13

UIT

OBJECTIVE

Consideration of possible new MSS allocations for direct connectivity between space stations and IMT user equipment provided that ...

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;

No negative impact on the MetSat service in the 1675-1710 MHz band;

No negative impact on the EESS/SOS/SRS in the 2025-2110 MHz and 2200-2290 MHz frequency bands, in particular on spacecraft operating at altitudes lower than those of MSS for direct connectivity; some mitigation measures to protect EESS/SRS in the frequency band 2025-2110 MHz should be implemented to DC-MSS-IMT to be operated in the adjacent frequency bands.

Agenda Item 1.14

UIT

DESCRIPTION

To consider possible additional allocations to the mobile-satellite service

Resolution **254 (WRC-23)**

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.

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.

Adjacent band compatibility studies are necessary with high power SRS, EESS and SOS uplinks in the frequency band 2025-2110 MHz.

Agenda Item 1.14

OBJECTIVE

No opposition 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.

Study addressing the protection of the SOS in the band 2025-2110 MHz from a deployment of MSS UE in the band 2010-2025 MHz: a C/I of 20 dB is always be met.

NO CHANGE METHOD ONLY

Studies have demonstrated that sharing in frequency bands identified and heavily deployed for IMT with primary mobile satellite service is challenging. New MSS allocations should not be considered as a co-primary generic MSS system would impose constraints to the development and future deployment of incumbent mobile/IMT systems.

Agenda Item 1.17

DESCRIPTION

To consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations

Resolution **682 (WRC-23)**

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 MetAids service as the subset MetAids (*space weather*).

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

608-614 MHz.

To accommodate the possibility for an administration that desires to notify a receive-only space weather sensor station to be included in the MIFR.

Agenda Item 1.17

UIT

OBJECTIVE

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 in the future.

METHODS

METHOD A

New primary allocations to the meteorological aids service (space weather) 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 frequency bands. Stations operating in the meteorological aids service (space weather) are limited to receive-only sensors, and shall not claim protection from, nor constrain the future development of, incumbent services in these frequency bands or in adjacent bands

METHOD B

Same as Method A except the frequency band 608-614 MHz does not appear

METHOD C

New primary allocations on a band-by-band basis with the implementations of the regulatory provisions similar to those described in Method A. No change is also proposed on band-by-band basis. This provides flexibility to administrations.

Agenda Item 1.18

DESCRIPTION

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

Resolution 712 (WRC-23)

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

METHODS **Agenda Item 1.18 (issue A: EESS)**

Method A1 Part 1: Cases leading to a single proposal (no alternatives) for the protection of the 86-92 GHz.

Limits Table 1 Resolution WRC 750

FSS 81-86 GHz

Mobile service (RSTT applications) in the frequency band 92-94 GHz

Radiolocation service (FOD applications) in the frequency band 92-94 GHz

Method A1 Part 2: Fixed service (different alternatives) for the protection of 114.25-116 GHz and 164-167 GHz. Limits Table 1/Table 2 Resolution WRC 750

Fixed service in the frequency bands 111.8-114.25 GHz, 158.5-164 GHz, and 167-174.5 GHz

Method A1: Part 3: Cases for which only receiver characteristics were provided: no Limits in the RR or Limits Table 1 Resolution WRC 750

Fixed service in the Aeronautical mobile in the frequency band 81-86 GHz

Method A1 Part 4: Cases for which no parameters/ characteristics were provided in preparation for WRC-27

Since no parameters or characteristics were provided, studies could not be completed; therefore, limits derived for similar services and frequency bands are proposed as a basis for provisional limits

Calling for future studies and proposing provisional unwanted emissions limits for stations of the corresponding active services brought into use before the completion of these studies

Method A2: No Change to the Radio Regulations

The results of the technical analyses do not necessarily lead to additional regulatory measures in all cases. Under this method, no change to the RR may be applied for some of the cases.

Agenda Item 1.19

DESCRIPTION

To consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands

4 200-4 400 MHz

8 400-8 500 MHz

Resolution **674 (WRC-23)**

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).**

BAND 1: 4200-4400 MHz

Method 1A proposes no changes to the RR

Methods 1B, 1C and 1D: new global primary allocation to the EESS (passive) and a corresponding footnote specifying that the EESS (passive) operating in the new allocation shall not claim protection. Interference from Mobile Service, including potential IMT application in adjacent band, may also occur. This interference would affect EESS (passive) measurement near coastlines, in the areas where Mobile Service systems are used.

BAND 2: 8400-8500 MHz

Method 2A proposes no changes to the RR

Methods 2B, 2C and 2D: new global primary allocation to the EESS (passive) and a corresponding footnote specifying that the EESS (passive) operating in the new allocation shall not claim protection. Analyses carried out on the 8 400-8 500 MHz band have pointed out that interference into the EESS (passive) systems is expected near coastlines from the FS (in-band) and the FSS (in adjacent band). Interference from potential IMT applications below 8 400 MHz may also occur. This interference would affect EESS (passive) measurement near coastlines.

THANK YOU FOR YOUR ATTENTION

