

WMO Preparations to WRC-27

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WORLD
METEOROLOGICAL
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Outline

- Why radiofrequency spectrum matters for meteorology
- WMO participation in radiofrequency matters
- The WMO Position Paper
- Preliminary WMO Positions on WRC-27 Agenda Items
- From here to WRC-27
- Looking beyond WRC-27

Why Radio Frequency Spectrum Matters for Meteorology

The invisible infrastructure of modern weather services

>50%

of all reported disasters globally are weather, climate or water related

1 500+

radiosondes launched daily worldwide to feed global weather forecast models

30

of 232 UN SDG indicators depend on satellite remote sensing data

~90%

of European C-band weather radars affected by Wi-Fi interference annually

Meteorological systems such as weather radars, radiosondes, meteorological satellites and data collection platforms all depend on specific radio frequency bands. Interference or loss of access to those bands degrades forecasts, weakens early warnings, and undermines the services that protect lives and economies. The decisions made at WRC-27 will determine spectrum access for the next decades.

Why Radio Frequency Spectrum Matters for Meteorology

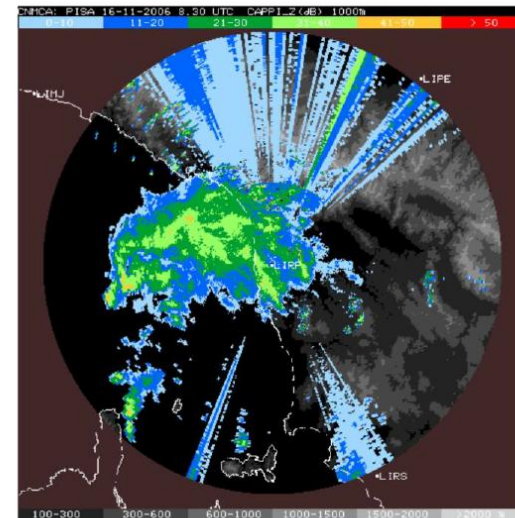
The invisible infrastructure of modern weather services

The WMO community relies on the radio frequency spectrum to:

- 1) **observe the Earth** (e.g., with satellites, weather radars)
 - 2) **Disseminate data** to meteorologists and **disseminate products** and services to emergency managers, impacted industry sectors, and the general public
- Radiofrequency spectrum is a **physically limited** and increasingly **contested resource**, with emerging technologies continually raising demand
 - Assured access to radiofrequency spectrum is **essential** to the operation of WMO global infrastructure → it underpins the service delivery of all Members and is essential to protecting lives, property and livelihoods
 - As weather, climate and the water cycle know no national boundaries, international cooperation at a global scale is essential

FIGURE 4-14

Interference to meteorological radar (precipitation mode)



Meteo-04-14

WMO Participation in Radiofrequency Matters

- [WMO Resolution 31 \(Cg-19\)](#), adopted by Congress in Spring 2023, highlights the importance of radio frequencies for meteorological and related environmental activities.
- It stresses that **some frequency bands are a unique natural resource** which deserve adequate allocation to the EESS (passive) and absolute **protection from interference**.
- It urges all **WMO Members to do their utmost to ensure the availability and protection of suitable radio-frequency bands** required for meteorological and related environmental operations and research.

Resolution 31 (Cg-19)

WMO Position on the World Radiocommunication Conference 2023 (WRC-23) Agenda

THE WORLD METEOROLOGICAL CONGRESS,

Having considered:

- (1) [Recommendation 4 \(EC-76\)](#) - WMO Position on the World Radiocommunication Conference 2023 (WRC-23) Agenda,
- (2) The Recommendation by the President of WMO on the adoption of the updated WMO Position on the World Radiocommunication Conference 2023 (WRC-23) Agenda,

Recalling [Resolution 42 \(Cg-18\)](#) – Radio frequencies for meteorological and related environmental activities,

Considering:

- (1) The prime importance of the specific radiocommunication services for meteorological and related environmental activities required for the detection and early warning of hazards and the prevention and mitigation of natural and technological (human-induced) disasters, the safety of life and property, the protection of the environment, climate change studies and scientific research,
- (2) The importance of information provided by the Earth exploration systems including meteorological systems for a wide range of economic activities such as agriculture, transportation, construction and tourism,
- (3) The crucial importance of the allocation of suitable radio-frequency bands for the operation of surface-based meteorological observing systems, including in particular radiosondes, weather radars, radiometer and wind profiler radars,
- (4) The crucial importance of the allocation of suitable radio-frequency bands for the operation of meteorological and research and development satellites, including remote sensing, data collection and data distribution links,
- (5) Implications of losing critical radio frequencies reserved for meteorological services provided by Members in support of the above economic activities as well as protection of life and property, and potential erosion of such services,
- (6) The impact of future transmitting technology transmissions on the capability of Members to monitor and predict variables related to the availability of water resources,

Stressing that some radio-frequency bands are a unique natural resource due to their special characteristics and natural radiation enabling space-borne passive sensing of the atmosphere and the Earth's surface, which deserve adequate allocation to the Earth exploration-satellite service (passive) and absolute protection from interference,

WMO Participation in Radiofrequency Matters

- WMO's participation in RF matters is primarily led by its [Expert Team on Radio Frequency Coordination \(ET-RFC\)](#), which reports to the Standing Committee on Earth Observing Systems and Monitoring Networks (SC-ON)
- ET-RFC is responsible for drafting the **WMO Position Paper** on the Agenda of the forthcoming World Radiocommunication Conference (updated annually)
- ET-RFC members participate actively in domestic, regional and ITU-R processes, particularly within Study Group 7, to represent WMO interests
- WMO is carrying out **capacity development** initiatives to increase participation of its Members in RF matters
 - e.g., WMO [National Focal Points on Radio Frequency Matters \(NFP-RF\)](#)

The WMO Position Paper

What it is & why it matters

What it is

The WMO Position on WRC-27 Agenda Items is a formal technical document developed by WMO's Expert Team on Radio Frequency Coordination (ET-RFC).

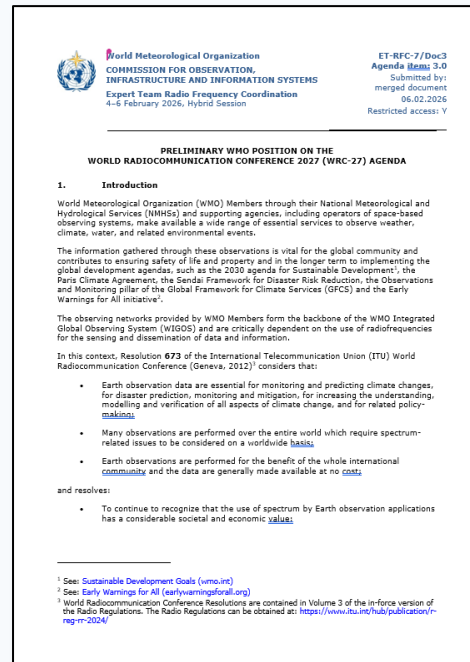
It sets out WMO's position on each WRC-27 agenda item that implicates meteorological and related environmental services.

Why it matters

WMO has observer status at WRCs — it cannot vote.

The Position Paper is the voice of the global meteorological community.

It is made available to ITU-R and WMO Member States to support informed decision making at WRCs.



The Preliminary WMO Position Paper is available in all six UN languages at: [WRC-27 Position Paper](#)

WRC-27 — Overview of Agenda Items Relevant to WMO

7 items of prime interest • 5 of concern • 2 standing items

PRIME INTEREST — RISK: agenda items that pose a risk to key meteorological services — WMO opposes or has concerns

AI 1.1

ESIMs (aircraft/ship)
47.2–50.2 / 50.4–51.4 GHz

AI 1.3

NGSO FSS gateways
51.4–52.4 GHz

AI 1.7

IMT identification
4.4–4.8 / 7.125–8.4 / 14.8–
15.35 GHz

AI 1.8

Radiolocation
231.5–700 GHz

PRIME INTEREST — OPPORTUNITY : agenda items where new allocations or protections can be obtained — WMO actively supports

AI 1.17

Space weather sensors
27.5 MHz – 614 MHz

AI 1.18

EESS passive protection
above 86 GHz

AI 1.19

SST allocations
4.2–4.4 / 8.4–8.5 GHz

OF CONCERN — WMO monitors these agenda items to protect meteorological services

AI 1.4

FSS/BSS
downlinks

AI 1.11

Space-to-space
MSS

AI 1.12

Low data rate
MSS

AI 1.13

MSS direct-to-
device

AI 1.14

MSS additional
allocations

STANDING ITEMS — recurring

AI 7

Satellite regulatory
procedures

AI 10

Preliminary WRC-
31 agenda



PRIME — Risk



PRIME — Opportunity



Of Concern (monitor)



Standing items

Aeronautical and Maritime Earth Stations in Motion (ESIMs)

Bands: 47.2–50.2 GHz and 50.4–51.4 GHz (Earth-to-space)

Service: Fixed-Satellite Service (FSS)

What is proposed: WRC-27 is studying the use of antennas mounted on aircraft and ships (called ESIMs) to transmit in these frequency bands to geostationary orbit (GSO) and non-geostationary orbit (NGSO) fixed-satellite service (FSS) systems — supporting global broadband connectivity for aviation and maritime users.

What is at risk: The bands proposed for ESIM operations sit immediately adjacent to 50.2–50.4 GHz — a passive sensing band used by weather satellites to measure lower atmospheric temperature. These measurements are critical for numerical weather prediction, severe weather warnings, and climate monitoring, and have been recorded since the late 1970s. ESIMs are mobile, making their emissions variable in time and space, which could pose challenges if they were to cause radiofrequency interference (RFI) to passive sensors.

WMO position: WMO does not oppose the proposed ESIM operations provided that the EESS (passive) band at 50.2–50.4 GHz is fully protected. This may require revision of existing mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)**, taking into account the aggregate interference from ESIMs and NGSO FSS systems and GSO FSS networks into the EESS (passive).

Gateway Stations for NGSO FSS Systems

Band: 51.4–52.4 GHz (Earth-to-space)

Service: Fixed-Satellite Service (FSS)

What is proposed: WRC-27 is studying the use of gateway stations to transmit uplinks in this band to non-geostationary orbit (NGSO) FSS systems — supporting the growing demand for satellite broadband services to be delivered by satellite constellations.

What is at risk: The 51.4–52.4 GHz band proposed for NGSO FSS gateway station uplink operations sits adjacent to 52.6–54.25 GHz — another critical passive sensing band for lower tropospheric temperature profiling. Existing unwanted emission limits in Resolution **750 (Rev. WRC-19)** cover gateway operations for GSO networks but do not yet extend to NGSO systems. Multiple gateway stations operating simultaneously to serve GSO FSS networks and NGSO FSS systems could cause aggregate interference to passive sensors that is not covered by current regulatory provisions.

WMO position: WMO is not opposed to the use of the frequency band 51.4–52.4 GHz for gateway Earth stations transmitting to NGSO systems in the FSS (Earth-to-space) provided that the protection of the EESS (passive) in the frequency band 52.6–54.25 GHz is ensured. This may require inclusion of relevant mandatory unwanted emission limits for NGSO FSS and, if necessary, adjustments to the existing GSO FSS limits in Resolution **750 (Rev. WRC-19)**, taking into account the aggregate interference from GSO FSS networks and NGSO FSS systems into the EESS (passive).

New IMT (5G) identifications in 4.4–4.8, 7.125–8.4 & 14.8–15.35 GHz

⚠ MAJOR CONCERN — These bands include critical MetSat downlinks and EESS (passive) measurement frequencies

What is proposed: WRC-27 is studying potential new spectrum identifications for International Mobile Telecommunications (IMT), in three frequency ranges: 4.4–4.8 GHz, 7.125–8.4 GHz, and 14.8–15.35 GHz. This is driven by demand for future mobile broadband systems beyond 5G, which are expected to emerge around 2030.

What is at risk: Multiple frequency bands within 7.125–8.4 GHz are used for MetSat and EESS satellite downlinks: 7 450–7 550 MHz (GSO MetSats), 7 750–7 900 MHz (NGSO MetSats), 8 025–8 400 MHz (EESS). IMT deployment in these bands could cut off access to satellite data from Meteosat, GOES, JPSS and other systems unless significant exclusion zones are implemented around MetSat/EESS earth stations. Additionally, SST measurements currently conducted at 6 425–7 250 MHz (unprotected) are also threatened. IMT deployment is effectively irreversible at scale — ensuring adequate regulatory protection measures are implemented before IMT is deployed is essential.

WMO position: WMO opposes IMT identification in the MetSat/EESS downlink bands 7 450–7 550 MHz, 7 750–7 900 MHz and 8 025–8 400 MHz. Introduction of IMT networks in these bands would limit the future deployment of MetSat and EESS earth stations that are essential for the distribution of Earth observation data to the WMO user community. Additionally, WMO does not support IMT identification in 7 125–7 250 MHz, which overlaps the 7 075–7 250 MHz frequency range used by EESS (passive) sensors for SST measurements. Further, WMO requests that the impact of IMT identification in the 4 200–4 400 MHz and 8 400–8 500 MHz bands on the potential new EESS (passive) allocations under AI 1.19 be taken into consideration. In particular, the definition of unwanted emission limits for IMT would be required.

New Radiolocation Systems above 231.5 GHz

Bands: 231.5–275 GHz and 275–700 GHz

Service: Radiolocation Service (RLS)

What is proposed: WRC-27 is studying new spectrum allocations for radiolocation systems — such as vehicle collision-avoidance radars and millimetric and sub-millimetric wave imaging systems like security scanners — above 231.5 GHz. These very high frequency systems are seen as enabling technologies for autonomous vehicles and transport safety and event security.

What is at risk: The frequency range above 231.5 GHz is uniquely suited to measuring atmospheric cloud ice, snowfall, supercooled liquid water, and water vapour — parameters essential for severe weather prediction and climate monitoring. Upcoming satellite missions (MetOp-SG-B ICI, EPS-Sterna) will use these frequencies operationally. Radiolocation systems — especially automotive devices that operate outdoors at scale — could cause aggregate interference to passive sensors that is essentially irreversible once these types of unlicensed equipment are deployed.

WMO position: WMO opposes new radiolocation allocations in 250–252 GHz (where RR No. 5.340 applies) and in the 296–356 GHz range (where passive sensors operate in nadir/conical scanning modes). WMO supports consideration only in 252–296 GHz and 356–439 GHz, provided that existing EESS (passive) allocations and identifications are protected via mandatory unwanted emission limits that take into account aggregate interference from widely deployed RLS systems. WMO is also of the view that consideration should be given to the protection of ground-based passive atmospheric sensing in the 235–238 GHz, 250–252 GHz, and 265–275 GHz frequency bands.

Formal Protection for Space Weather Monitoring Sensors

New allocations in six bands from 27.5 MHz to 614 MHz for receive-only space weather sensors

What is proposed: WRC-27 will consider establishing regulatory provisions for receive-only space weather sensors and their protection. This is a follow-up to WRC-23 AI 9.1 Topic A, which defined space weather and designated space weather sensors to the Meteorological Aids (MetAids) service as the subset MetAids (space weather). The six bands under consideration are: 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.

What is at risk: WMO emphasizes the importance of monitoring space weather, which is essential for safeguarding both ground- and space-based infrastructure. Riometers are essential monitoring tools for ICAO-designated Space Weather Centres that warn of ionospheric disruptions affecting trans-polar aviation. Solar flux monitors provide rapid detection and characterization of solar flares, supporting real-time alerts issued by space weather centres for their immediate effects on the ionosphere and radio communications. Currently, none of these receive-only sensors have formal regulatory status — they are vulnerable to interference with no legal basis to claim protection.

WMO position: WMO supports new primary MetAids (space weather) allocations for receive-only sensors in all six frequency bands. WMO supports the principle that these new allocations should be made without claiming protection from or imposing constraints on existing primary services. WMO also supports the introduction of regulatory provisions to the RR to notify a receive-only space weather sensor station for recording in the ITU Master International Frequency Register (MIFR).

Protecting EESS (passive) Systems Above 86 GHz

Regulatory provision to protect passive bands: 86–92 GHz, 114.25–116 GHz, 164–167 GHz, 200–209 GHz

What is proposed: WRC-27 will consider mandatory unwanted emission limits for active services (e.g., fixed, mobile, radiolocation, and fixed-satellite services) operating in frequency bands adjacent to four critical EESS (passive) sensing bands above 86 GHz. These limits would be added to Resolution **750 (Rev.WRC-19)**.

What is at risk: The 86–92 GHz, 164–167 GHz, and 200–209 GHz bands (window channels) are used in algorithms to detect precipitation, cloud ice, deep convection, hail, flooding and coastal inundation — they are critical for severe weather forecasting and tropical cyclone monitoring. The 114.25–116 GHz band is used for temperature sounding. Measurements in the 86–92 GHz band have been recorded since 1987, supporting climate data records for a variety of essential climate variables. Action to protect these bands is needed now, before active services are widely deployed in these adjacent bands, as once active services are deployed at scale, protection becomes effectively impossible.

WMO position: WMO supports the implementation of new mandatory unwanted emission limits in Resolution **750 (Rev.WRC-19)** applicable to active services operating in adjacent bands to ensure the protection and long-term usability of the four EESS (passive) bands. WMO also supports the need to develop regulatory provision to protect the EESS (passive) from unwanted emissions of active services allocated in adjacent frequency bands where no parameters have been provided. WMO stresses the need to address this issue by WRC-27 before there is widespread deployment of active services in the adjacent bands.

New Formal Protection for SST Measurements

New primary EESS (passive) allocations at 4.2–4.4 GHz and 8.4–8.5 GHz to ensure continuity of SST measurements

What is proposed: WRC-27 will consider creating new primary allocations to the EESS (passive) in the 4.2–4.4 GHz and 8.4–8.5 GHz frequency bands, without claiming protection from existing services, to allow the continuity of sea surface temperature (SST) measurements that are of prime importance for weather forecasting and climate monitoring.

What is at risk: sea surface temperature (SST) is an essential input to weather forecasting, a primary metric of global surface temperature change, and a key indicator for hurricane onset prediction. Microwave SST measurements are irreplaceable: infrared SST is only available under clear skies — less than 40% of the time globally. SST measurements currently made in the 6 425–7 250 MHz band, which currently have no regulatory protection, will be impacted by RFI resulting from increased deployment of mobile services, including IMT which was identified for use in the 6 425–7 125 MHz range at WRC-23. The new proposed bands would be used in conjunction with the current 6/7 GHz band to maximize the quality and accuracy of SST retrievals. Without these new bands, our capability to monitor SST globally is at serious long-term risk.

WMO position: WMO supports new primary EESS (passive) allocations in both 4.2–4.4 GHz and 8.4–8.5 GHz to ensure the long-term continuity of SST measurements, in conjunction with the existing 6/7 GHz band. WMO also supports protection of these new allocations from potential new IMT identifications in adjacent bands (as considered under Agenda Item 1.7). WMO also supports the development of regulatory provisions to ensure that high density mobile systems shall not be introduced in the 8.4–8.5 GHz band.

Additional Agenda Items of Concern to WMO

Of Concern

Standing Items

WMO monitors these items and has stated positions protecting related meteorological applications

AI 1.4 17.3–17.8 GHz

FSS/BSS downlinks. WMO is not opposed, provided EESS (active) systems in the adjacent 17.2–17.3 GHz band are protected.

AI 1.12 1427–2025 MHz

Low data rate MSS (IoT constellations). WMO is not opposed, provided EESS (passive) at 1 400–1 427 MHz is protected by mandatory unwanted emission limits (if required) and EESS/SOS TT&C at 2 025–2 110 MHz are protected.

AI 1.14 2010–2170 MHz

Additional MSS allocations. WMO is not opposed to new MSS in 2 010–2 025 MHz provided EESS/MetSat TT&C operations in the adjacent 2 025–2 110 MHz band are not impacted.

AI 1.11 1518–1675 MHz

MSS space-to-space links. WMO is not opposed, provided MetSat operations in 1 675–1 710 MHz and MetAids (radiosonde) operations in 1 668.4–1 700 MHz are protected.

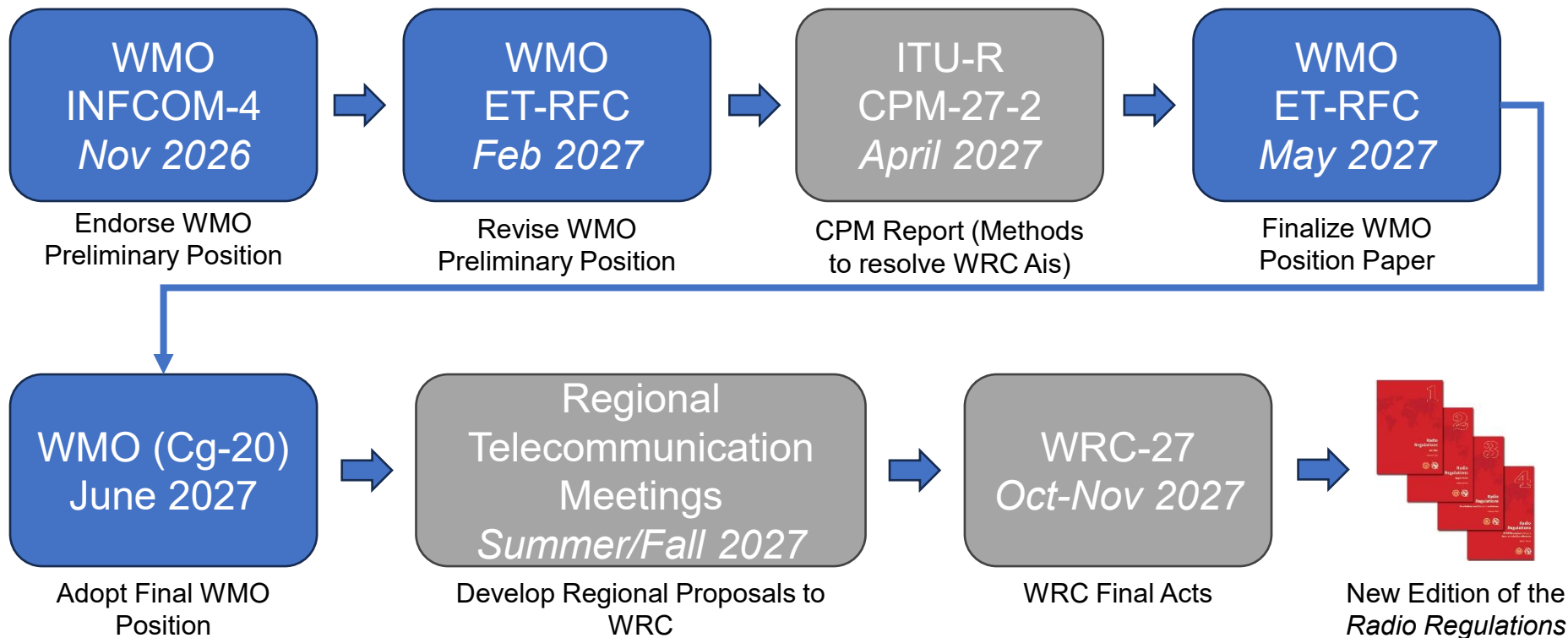
AI 1.13 694–2700 MHz

MSS direct-to-device (satellite-to-phone). WMO is not opposed provided no negative impact on: EESS (passive) 1 400–1 427 MHz; MetSat 1 675–1 710 MHz; EESS/SOS 2 025–2 110 MHz; and meteorological radars 2 700–2 900 MHz.

Als 7 & 10 *Standing items*

AI 7: (satellite filing procedures): avoid undue constraints on MetSat/EESS filings and preserve RR No. 5.340 protections.
AI 10: preliminary agenda for WRC-31 — keeping future meteorological spectrum topics in view.

From here to WRC-27...



Looking Beyond WRC-27

- WMO will continue to **advocate** for current and future spectrum needs of meteorological and related environmental services **for a safer, better future for all**
 - A new edition of the WMO Position Paper each WRC cycle
- WMO will continue to **encourage increased participation** of its Members in spectrum management fora (domestic, regional, and international)
 - E.g., via the WMO National Focal Points on Radiofrequency Matters (NFP-RF)
- WMO encourages NMHSs and NRAs to further **build and strengthen relationships** to ensure:
 - NRAs are well informed of the spectrum requirements of meteorological services,
 - the significant socio-economic benefits provided by meteorological services are understood and considered during regulatory decision-making processes

Thank you!

Questions?



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