



# WRC-15 OUTCOMES (Space Services)

*Presented by :*

*ITU (International Telecommunication Union)*

*BR-Space Services Department*

*Akim FALOU DINE*

*akim.faloudine@itu.int*



**ITSO/ITU Workshop on Satellite Communications**

**AFRALTI, Nairobi-KENYA, 8-12 August 2016**



World Radiocommunication Conference, 2015  
took place from 2 to 27 November 2015 in Geneva



# Purpose of ITU WRCs



- **Create regulatory certainty for a multi-trillion dollars industry which plays an increasingly important role in the development of our societies**
- **For fixed, mobile, satellites and broadcasting industries, global spectrum harmonization is essential to create economies of scale, roaming and interoperability**
- **Creating certainty requires consensus in order to achieve stable results. This demands time, efforts and patience.**





# WRC-15 general information



- **3275** participants attended WRC-15, including:
  - **2780** participants from **162** Member States, and
  - **495** participants representing **130** other entities, including industry, which also attended as observers
- **678** Documents including **2888** proposals were submitted before WRC-15. Two thirds (66%) of those were common proposals (either regional or multi-country).
- WRC-15 addressed over **40** topics related to frequency allocation and frequency sharing for the efficient use of spectrum and orbital resources.



# Mobile Broadband

(agenda items 1.1, 1.2)



# Challenges

- **Everybody is in favor of spectrum harmonization**
- **But**
- **Everybody wants it to be his own way**
- **The success of mobile broadband and its ubiquitous nature represents a threat of disruption to other services if IMT is identified in the same band, even though technical solutions may exist to share it between countries**
- **The main success of WRC-15 was to continue global harmonization for IMT and to secure future access to spectrum by other services**



# Spectrum for mobile broadband



agenda items 1.1 and 1.2

## ■ Background

- There is a need to satisfy rapidly growing traffic requirements for IMT (estimated IMT additional spectrum by 2020: from 159 to 1075 MHz depending on Region and user density)
- Bands considered: 470 MHz - 6 425 MHz. Harmonized bands were highly desirable to facilitate global roaming and economies of scale
- As for 700 MHz band in R1, WRC-15 had to specify conditions for mobile service in 694-790 MHz already allocated by WRC-12

## ■ WRC-15 results

- Allocations to mobile service and/or identifications for IMT in: 470-694/698 MHz, 694 – 790 MHz (Region 1), 1427-1518 MHz, 3300-3400 MHz, 3400-3700 MHz, 4800 – 4990 MHz
- Allocations are subject to various conditions, e.g. non-interference basis, pfd limits, 9.21 -> to secure protection of incumbent services
- Action “Identification for IMT” was for the first time associated with regulatory/technical conditions imposed on this application in MS



# WRC-15 results for specific bands



agenda items 1.1 and 1.2

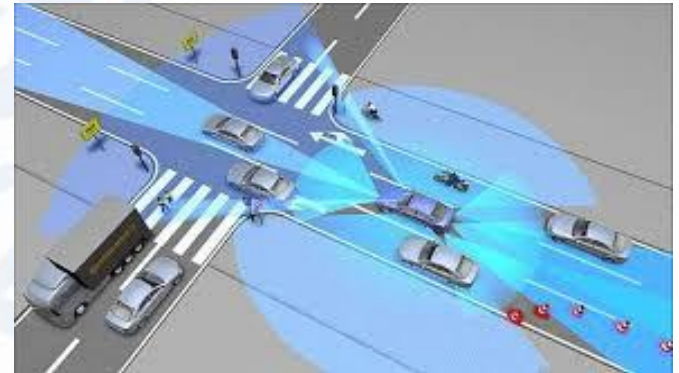
- **470–698 MHz:** IMT identification of parts of this band for 14 Regions 2, 3 countries (9.21, non-interference basis). For R1: consideration at WRC-23
- **1 427 – 1 518 MHz:** IMT identification in R2 and 3. Also in R1, except 1452–1492 MHz that identified only in 54 R1 countries (9.21 for R.1, 3)
- **3 300 – 3 400 MHz:** allocation to, or upgrade of MS in 36 countries worldwide. IMT identification in 33 R1, 6 R2 and 6 R3 countries
- **3 400 – 3 600 MHz:** upgrade of MS and identification for entire R.1, 2 and for 11 R3 countries (subject to 9.17, 9.18, 9.21 and pfd limit)
- **3 600 – 3 700 MHz:** IMT identification in 4 Region 2 countries subject to coordination under 9.17, 9.18, 9.21 and a pfd limit
- **4800–4990 MHz** IMT identification in 1 Region 2 and 3 Region 3 countries
- **694 – 790 MHz in Region 1:** allocation to MS and identification for IMT. **In force from 28.11.2015.** Provides harmonized worldwide allocation of this band. Ensures compatibility with broadcasting and ARNS (Res. 224, 760). Accommodates applications ancillary to broadcasting in 470 – 694 MHz





# Aeronautical services and automotive applications

(agenda items 1.5, 1.17, 1.18 and Global Flight Tracking)





# Use of fixed-satellite service for unmanned aircraft systems (UAS)



agenda item 1.5

## ■ Background

- rapid UAS development, future integration in conventional air traffic
- reliable terrestrial and satellite links are critical for controlling UAS
- WRC-12 made allocation to terrestrial component in 5 GHz, but satellite component still required frequencies due to limited AMSS spectrum and lack of operational AMSS systems
- possible solution: to use FSS links for UAS, taking into account increasing requirement to utilize existing capacity of GSO FSS

## ■ Specific issues

- need for ensuring reliability of UAS links, given interference in FSS
- need for protection of terrestrial services because placing FSS earth station on aircraft changes interference situation
- need for taking decision in the absence of available ICAO standards





# Use of fixed-satellite service for unmanned aircraft systems (2)



agenda item 1.5

## ■ WRC-15 results

- approval of No. 5.484B and Res. 155 [COM4/5] allowing the use of FSS assignments for UAS
- Designation of 8 bands for such usage. Total spectrum: Ku band: 970 MHz globally, 1520 MHz regionally, Ka band: 1000 MHz globally
- FSS can be used only after development of related ICAO aeronautical standards and recommended practices (SARPs);
- measures to avoid impact on terrestrial services and other FSS
- requirement to UA ES to operate in existing interference environment
- instructions to the Bureau: to identify a new class of stations for UAS, to examine Res. 155 to identify actions by administrations, not to process filings until all conditions are met, liaise with ICAO

## ■ Implications

- paves the way for commercial utilization of UAS after 2023



# Spectrum for wireless avionics intra-communications (WAIC)



agenda item 1.17

## ■ Background

- about 30% of electrical wires are candidates for wireless substitute
- example A380: wire count 100 000; length 470 km; weight 5 700 kg
- need for spectrum for WAIC to replace cables. WAIC provides safety-related data in single aircraft (e.g. from sensors to cockpit)

## ■ WRC-15 results

- allocation of 4 200-4 400 MHz to AM(R)S reserved for WAIC
- approval of Res. 424 [COM4/1]: conditions for WAIC, including a non-interference basis vs. aeronautical radio altimeters, obligation to comply with ICAO SARPs



## ■ Implications

- this technology would make new generation of aircraft more reliable, light, less fuel consuming and environmentally friendly



# Global Flight Tracking (GFT)



agenda item GFT

## ■ Background

- need for continuous aircraft surveillance; satellite tracking could complement terrestrial tracking, e.g. radars, HF communications, etc.
- the issue was urgent, following disappearance of MH370. PP-14 adopted Resolution 185 and established additional AI on GFT
- By WRC-15 terrestrial automatic dependent surveillance-broadcast (ADS-B) was available that could be extended to satellite reception

## ■ WRC-15 results

- primary allocation of 1087.7-1092.3 MHz for satellite reception ADS-B messages (5.328AA)
- allocation conditions are in Resolution 425: not claiming protection from ARNS, ability operate in existing interference environment, compliance with ICAO standards



- **Implications:** improves aircraft tracking through utilization of an existing technology; especially important for polar, oceanic, remote areas



# Fixed satellite service (FSS)

(agenda items 1.6, 1.7, 1.8)





# Allocations to the fixed-satellite service in 10 – 17 GHz



agenda item 1.6

## Background

- Before WRC-15, for unplanned FSS in the Ku band:
  - *Region 1: 750 MHz of spectrum both for uplink and downlink*
  - *Region 2: 1000 MHz of spectrum for downlink, only 800 MHz for uplink*
  - *Region 3: 1050 MHz of spectrum for downlink, only 750 MHz for uplink*

## Results of WRC-15

- New allocations for the FSS
- in the space-to-Earth direction (Downlink)
  - *13.4-13.65 GHz in Region 1*
- in the Earth-to-space direction (Uplink)
  - *14.5-14.75 GHz, limited to 30 countries in Regions 1 and 2*
  - *14.5-14.8 GHz, limited to 9 countries in Region 3*



## Better balance between uplink/downlink and between Regions

- *1000MHz (UP/Down) in **Region 1**; 1050MHz (UP), 1000MHz (Down) in **Region 2**; 1050MHz (UP/Down) in **Region 3***

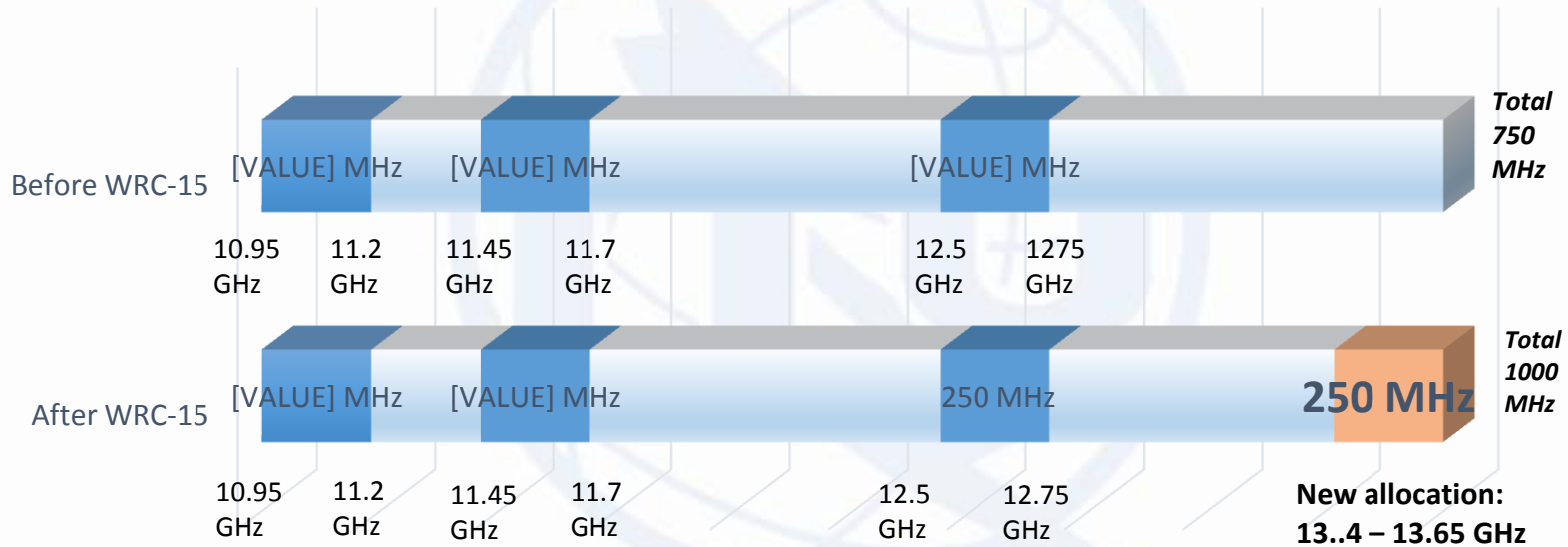


# Ku-band frequency allocation for unplanned FSS Downlink (R1)



agenda item 1.6

## Downlink 33% increase



- Existing allocation
- New allocation

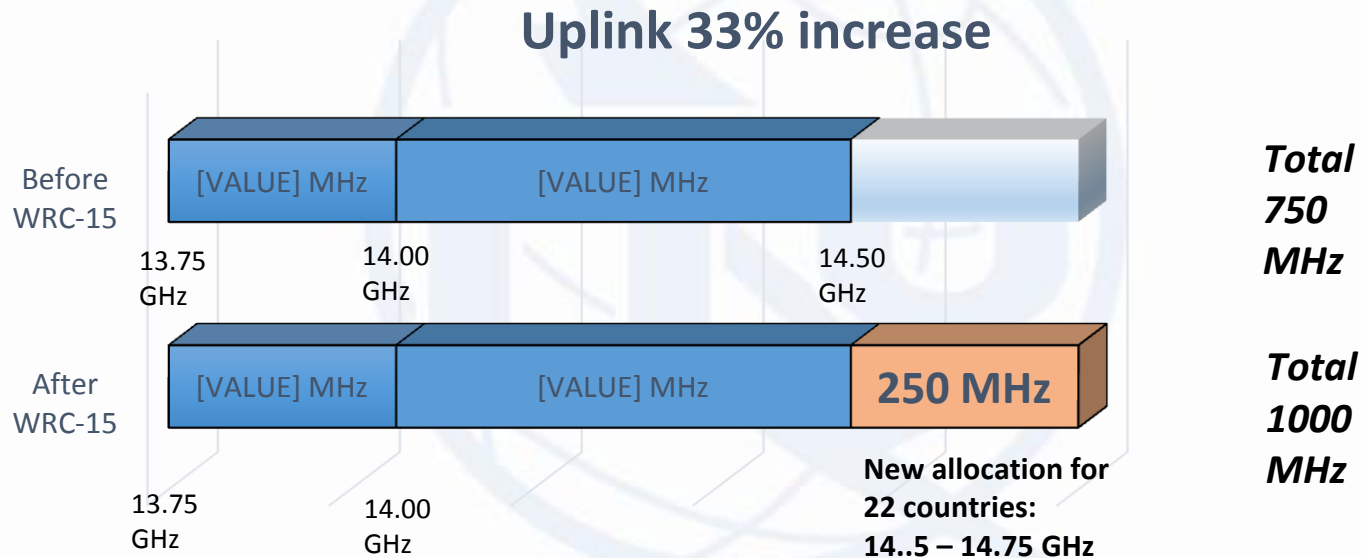






# Ku-band frequency allocation for unplanned FSS uplink (R1)



agenda item 1.6



-  Existing allocation
-  New allocation

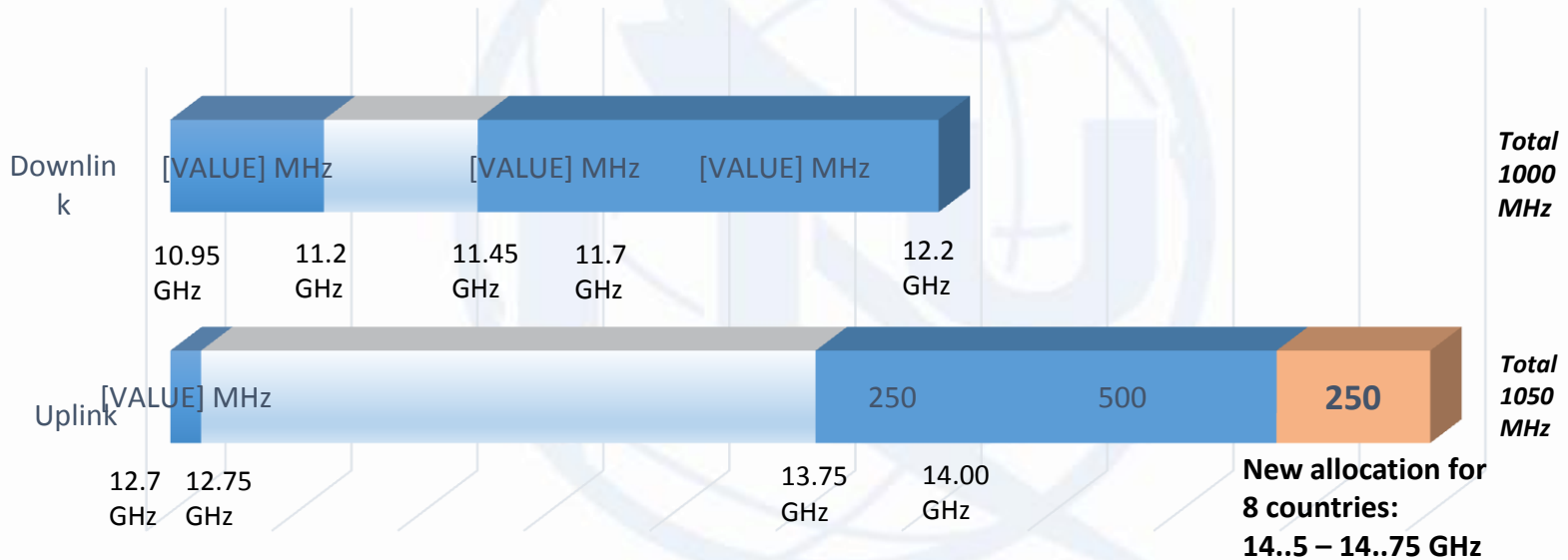


# Ku-band frequency allocation for unplanned FSS (Region 2)



agenda item 1.6

## Improved balance between uplink and downlink



- Existing allocation
- New allocation

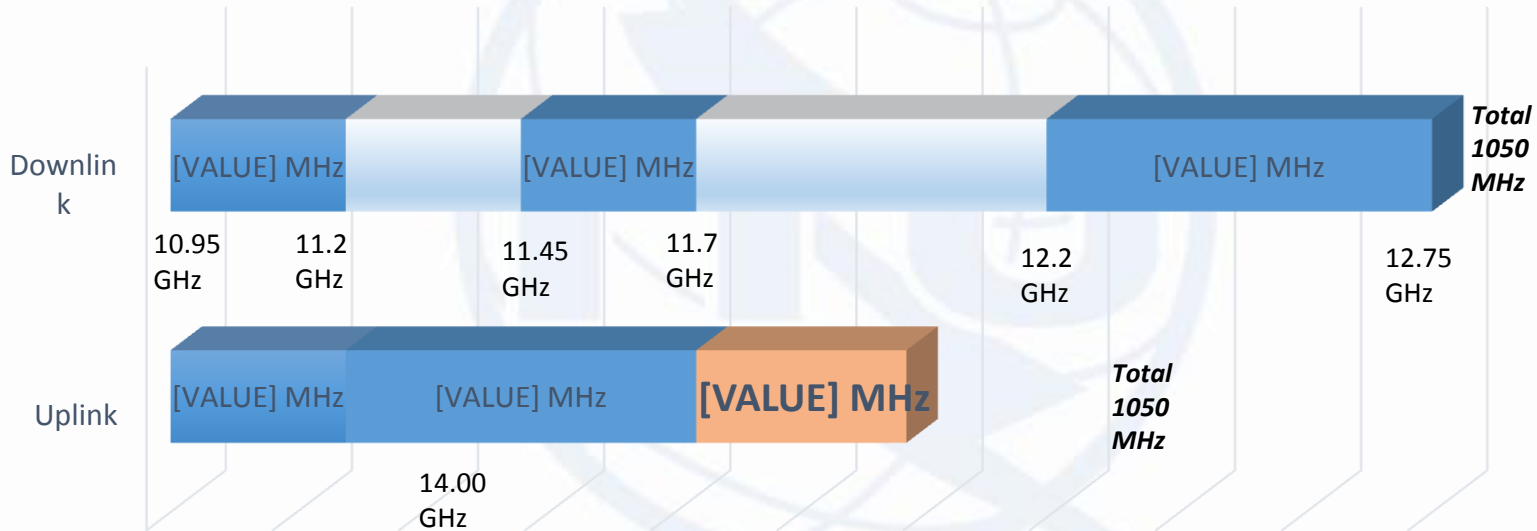


# Ku-band Frequency allocation for unplanned FSS (Region 3)



agenda item 1.6

## Improved balance between uplink and downlink



**New allocation for 10 countries:  
14..5 – 14..8 GHz**

 Existing allocation

 New allocation



# Allocations to FSS in 10 – 17 GHz



agenda item 1.6

## ➤ Conditions of utilization (to protect incumbent services)

- Downlink: 13.4 – 13.65 GHz
  - *Limited to GSO*
  - *power flux density limits specified in No.21.16*
  - *Coordination procedures under Nos.9.7 and 9.21*
- Uplink: 14.5-14.8 GHz in Region 3, 14.5-14.75 GHz in Regions 1 and 2
  - *Limited to GSO*
  - *Limited to specific countries, subject to several limitations, e.g.:*
    - minimum earth station antenna diameter, power spectral density limits, power flux density limits towards the coast, power flux density limits towards the geostationary-satellite orbit, minimum separation distance of earth stations from the borders of other countries.
  - *Coordination procedures under No.9.7 and Article 7 of AP30A*

## ➤ Implications

- Increased and balanced allocations will facilitate development of various applications e.g. VSAT, video distribution, broadband networks, internet service, satellite news gathering, backhaul link etc.



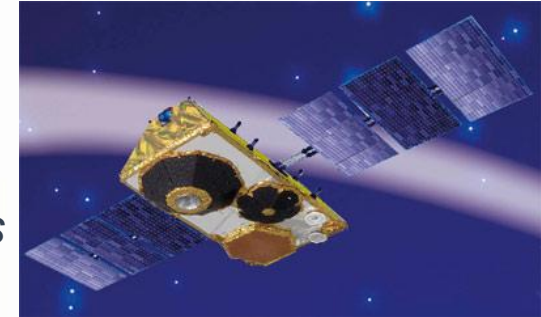
# Use of the band 5 091-5 150 MHz by FSS



agenda item 1.7

## Background

- 5 091-5 150 MHz was allocated to FSS (uplink) for feeder links of MSS non-GSO systems on a primary basis up to 1.1.2018 with the conditions:
  - *it becomes secondary to ARNS after 1 Jan 2018*
  - *no new assignments shall be made to earth stations providing these feeder-links after 1 Jan 2016.*



## Results of WRC-15

- From 28.11.2015 this allocation is primary without any time limitation.
- Subject to Resolution **114 (Rev.WRC-15)**
- New coordination requirement for FSS earth stations within 450 km from the territory of an administration operating ARNS ground stations

## Implications

- The long term availability of the spectrum for feeder links of non-GSO systems in MSS with sufficient protection to existing ARNS stations



# Earth stations located on board vessels (ESVs)



agenda item 1.8

## Background

- **5.457A** and Res. **902 (WRC-03)** provide technical, regulatory and operational conditions under which ESVs may communicate with space stations of FSS in bands 5 925-6 425 MHz and 14-14.5 GHz



## Results of WRC-15

- Possibility to use smaller (1.2m) antenna for ESVs transmitting in the frequency band 5 925-6 425 MHz
- Resolution **902 (WRC-03)** continues to apply

Frequency band	Before WRC-15		After WRC-15	
	5 925-6 425 MHz	14-14.5 GHz	5 925-6 425 MHz	14-14.5 GHz
Minimum diameter of ESV antenna	2.4 m	0.6 m	2.4 m	<b>1.2 m</b>
Minimum distance from the low-water mark as officially recognized by the coastal State beyond which ESVs can operate without the prior agreement of any administration	300 km	125 km	300 km	<b>330 km</b>

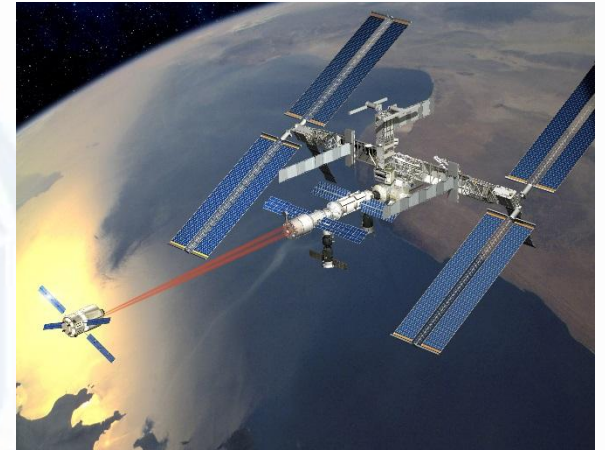
## Implications

- Increased use and further development of ESVs in the frequency band 5 925-6 425 MHz with sufficient protection to the terrestrial services



# Maritime-mobile satellite and science services

(agenda items 1.9.2, 1.11, 1.12, 1.13 and  
1.14)





# 7375-7750/8025-8400 MHz for maritime-mobile satellite



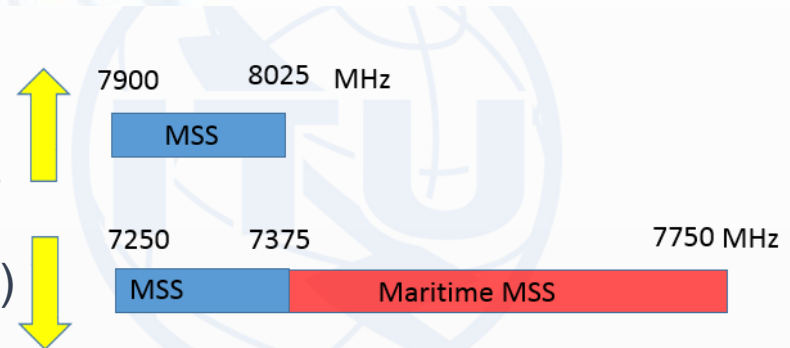
agenda item 1.9.2

## ➤ Background

- spectrum shortfall for current and future applications in 7/8GHz

## ➤ Results of WRC-15

- New allocation to MMSS in 7 375 – 7 750 MHz in the space-to-Earth direction
- No allocation for uplink in 8025-8400 MHz (traffic demand in uplink is much less and sharing with incumbent services is difficult)



## ➤ Conditions of utilization

- Limited to GSO
- Earth stations in MMSS shall not claim protection, nor constrain use of fixed and mobile stations, except aeronautical mobile. **5.43A** does not apply.

Increase of 400% of spectrum in the downlink!

## ➤ Implications

- Additional bandwidth for downlink data transmissions of the next-generation satellites in the MMSS





# Earth exploration-satellite service (EESS) in 7-8 GHz



agenda item 1.11

## Background

- The need for uplink large amounts of data for operations plans and dynamic spacecraft software modifications, which might not be accommodated by heavily used 2 025-2 110 MHz and 2 200-2 290 MHz TT&C bands



## Results of WRC-15

- New primary EESS up link allocation limited to tracking, telemetry and command (TT&C) in the 7 190-7 250MHz band (34% increase)
- Provision to protect existing and future stations in the fixed, mobile and space research services from the new allocation

## Implications

- In combination with existing EESS downlink allocation in 8 025-8 400 MHz this new allocation will lead to simplified on-board architecture and operational concepts for future missions of EESS



# Earth exploration-satellite service (active) in 8-9 GHz



agenda item 1.12

## ➤ Background

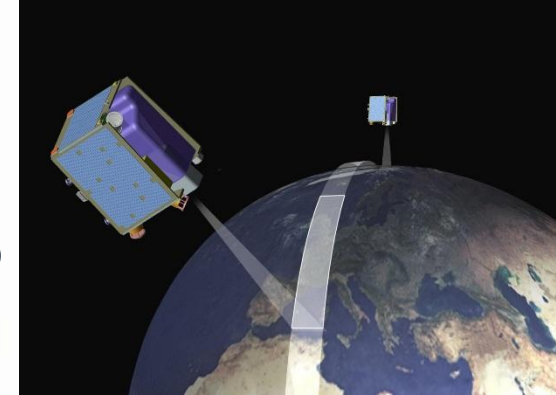
- EESS (active) bandwidth in 8-9 GHz was 600MHz. Growing demand for higher resolution to satisfy global environmental monitoring raised the need to increase the bandwidth up to 1200 MHz in total.

## ➤ Results of WRC-15

- New primary EESS(active) allocations totally of 600 MHz in the 9 200-9300MHz, 9 900-10 000MHz and 10.-10.4GHz bands (100% increase)
- Provision to protect existing and future fixed and mobile stations

## ➤ Implications

- Development of modern broadband sensing technologies and space-borne radars on active sensing EESS that provides high quality measurements in all weather conditions with enhanced applications for disaster relief and humanitarian aid, large-area coastal surveillance





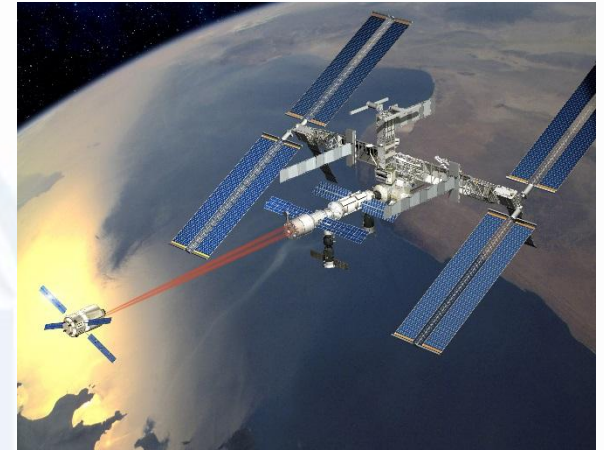
# 5 km distance limitation in space research service



agenda item 1.13

## ➤ Background

- Use of 410-420MHz band for Extra Vehicular Activities was limited to communication within 5 km of an orbiting, manned space vehicle. Rendezvous and docking maneuvers required the use of the band over larger distances.



## ➤ Results of WRC-15

- Removal of the 5 km distance limitation in No. **5.268**

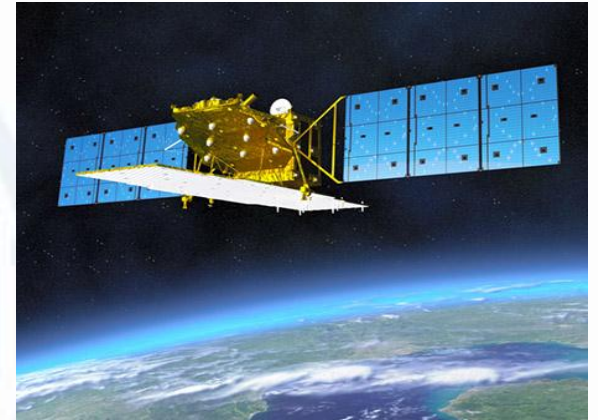
## ➤ Implications

- Facilitation rendezvous and docking maneuvers which leads to safety of human life in a manned vehicle



# Satellite regulatory procedures

(agenda item 7)





# Satellite regulatory procedures



agenda item 7



## ➤ Background

Articles 9, 11 and 13 provide the regulatory procedures for advance publication, coordination, notification and recording of frequency assignments pertaining to satellite networks

## ➤ Results of WRC-15: various improvements of the procedures, e.g.:

- *Mod. 11.49 to reduce regulatory period of suspension day-by-day when the information of suspension is received beyond 6 month after suspension*
- *Sup. Requirement for submission of Advance Publication Information for networks subject to coordination*
- *New Res. 40 (WRC-15) to increase transparency when one space station is used to bring into use assignments to GSO networks at different orbital locations within a short period of time*
- *Mod. 13.6 to include reason for BR' query and specify period for BR to inform administration of its conclusion in response to administrations' replies*

## ➤ Implications

- Facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit.



# Reduction of the coordination arc



agenda item 9.1.2

## ➤ Background

- Appendix **5** provides technical conditions for identification of administrations to coordinate with under Article **9**.



## ➤ Results of WRC-15

- Reduction of coordination arc in App. **5** from 8 to 7 degrees in C band and from 7 to 6 degrees in the Ku band
- New Res. **762** with pfd for uplink in C band and up/downlinks for Ku band outside coordination arc to consider no potential for harmful interference
- These pfd criteria in the Resolution shall be used in No. **11.32A** examination. A new footnote was added to No. **11.32A**

## ➤ Implications

- The reduction of the coordination arc and new Resolution **762 (WRC-15)** will facilitate the rational and efficient use of, as well as the access to, radio frequencies and associated geostationary-satellite orbit.



# Earth Stations in Motion (ESIM)



## ➤ Background

- **5.526** provides conditions for ESIM communications with GSO FSS space stations in 19.7-20.2 GHz and 29.5-30 GHz in Region 2 as well as 20.1-20.2 GHz and 29.9-30 GHz in Regions 1 and 3.



## ➤ Results of WRC-15

- New **5.527A** and new Res. **156** to set conditions for ESIM communication with GSO FSS space stations in 19.7-20.2, 29.5-30.0 GHz in all Regions
- This Res. extends the possibility offered for ESIM by **5.526** in the bands 19.7-20.2 GHz and 29.5-30 GHz in Region 2 and in bands 20.1-20.2 GHz and 29.9-30 GHz in Regions 1 and 3.

## ➤ Implications

- Increased use and further development of ESIM in the frequency bands 19.7-20.2 and 29.5-30.0 GHz in all Regions with sufficient protection to other GSO satellite networks and terrestrial services



# General issues

(agenda items 2, 4, 5, 8, 9.1 and 9.2)







# Incorporation by reference (IbR) of ITU-R Recommendations



agenda item 2 (see Res. 27 (Rev.WRC-12) and Res. 28 (Rev.WRC-03)\*)

\* revised at WRC-15

- Most of ITU-R Recommendations incorporated by reference in the RR were updated to the version in force (incl. use of -0 for 1<sup>st</sup> version)
- **Rec. ITU-R TF.460-6 on UTC still Incorporated** by Reference but now via Res. 655 (WRC-15)
- **IbR of Rec. ITU-R M.1638-0 not updated** since further studies are required to take into account in particular the new radar characteristics of M.1638-1 (see Res. 764 (WRC-15))
- New IbR of **Rec. ITU-R RS.2066-0 and RS 2065-0** (to protect RAS and SRS as a result of AI 1.12 new EESS (active) allocations in 9.2-9.3 & 9.9-10 GHz)



# Review of W(A)RC Res. & Rec.



agenda item 4 (see Res. 95 (Rev.WRC-07))

- Suppression of 6 “outdated or obsolete” Resolutions
- Modification of 26 Resolutions and 2 Recommendations to basically take into account results of requested activities and update outdated references.

## Report from RA-15



agenda item 5 (see Nos. 135 and 136 of the ITU Convention)

- **New 880 km predetermined coordination distance** in RR Appendix 7, Annex 7, Table 10 for receiving earth stations in the **SRS in 2.2-2.29 GHz**, in relation to aircraft stations in the **aeronautical mobile service**
- Information included in the Report was used to update relevant references in the RR to the revised or new ITU-R publications



# RR Art. 5 Country footnotes



agenda item 8 (see Res. 26 (Rev.WRC-07))

- SUP of 17 footnotes and MOD of 86 footnotes towards **higher harmonization of spectrum use**, but including also more than 10 requests for additional or alternative national allocations

## Updating & re-arrangement of the RR



agenda item 9.1, issue 9.1.4 (see former Res. 67 (WRC-12))

- Removal of unused reference to “Metric abbreviations for the bands” in RR No. **2.1**
- **Facilitate RR browsing** with introduction of relevant Chapter title in headers on each page of RR Vol. I

## Definitions fixed service, fixed station, mobile station



agenda item 9.1, issue 9.1.6 (see former Res. 957 (WRC-12))

- **NOC to current definitions in RR Article 1** that provide enough flexibility



# Difficulties or inconsistencies in the application of the RR



agenda item 9.2

- **New RR Art. 1 definitions of MetAids land & mobile stations**
- **New RR No. 4.24 (Art. 4) to allow SRS systems, intended to operate in deep space, to use SRS (deep space) allocations when spacecraft is near the Earth**
- **MOD some RR App. 4 mandatory items to identify transmission system for VHF/UHF digital broadcasting outside GE06 Agreement**
- **Endorsed RRB decisions on Russia's CSDRN-M (reinstatement) & Laos LAOSAT-128.5E (exceptional extension of regulatory period for BiU)**
- **Extension of regulatory period for BiU of Colombia's SATCOL-1B**
- **Continue use by KOR of RAS in KOR (around 129 & 172 GHz) after 2015 on a non-interference, non-protection basis**
- **SUP of 10 RR Art. 5 footnotes (e.g. outdated cases) and MOD of 3 footnotes & 3 other provisions specifically under this AI**
- **Identification of editorial MODs of RR (e.g. language issues) to be included directly in next RR Edition**



# Agenda for the 2019 World Radiocommunication Conference

**WRC  
2019**



agenda item 10

# WRC-19 Agenda



17 specific & 6 standing items, **Res.809** (WRC-15)



## Fix. & Mob. BB Apps

(24.25 < IMT < 86 GHz,  
WAS/RLAN @ 5 GHz,  
HAPS, others > 275 GHz)

**Maritime (GMDSS  
modernization (+Sat.),  
VDES Sat component)**



**Amateur in R1  
@ 50-54 MHz  
(4WW allocation)**



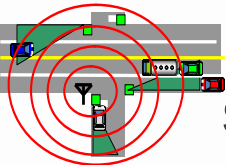
**Aeronautical  
(GADSS needs)**



# WRC 2019

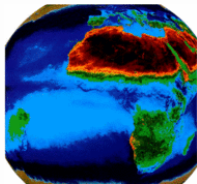
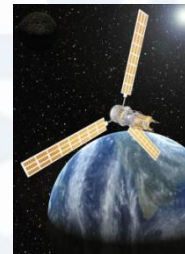
## New Transport systems

(harmonized bands  
for ITS, railways)



## Satellite issues

(ES in motion, RR for  
**N-GSO FSS @ 37.5  
up to 51.4 GHz**)



**Earth resources &  
Climate monitoring  
Weather forecast,  
DCS improvement, TT&C for  
N-GSO Sat. of short duration**

## Regulatory issues

(Sat. regulations,  
harmonization of  
spectrum use, etc.)





# Overlapping frequency bands\*\* between some WRC-19 agenda items



1.6 – NGSO FSS Res. 159 (WRC-15)	1.13 – IMT Res. 238 (WRC-15)	1.14 – HAPS Res. 160 (WRC-15)	9.1 (9.1.9) – FSS Res. 162 (WRC-15)
	24.25-27.5	24.25-27.5 (Reg. 2)	
37.5-39.5 (s-E*)	37-40.5	38-39.5 (globally)	
39.5-42.5 (s-E*)	40.5-42.5		
47.2-50.2 (E-s*)	47.2-50.2		
50.4-51.4 (E-s*)	50.4-52.6		51.4-52.4 (E-s*)

\* E-s: Earth-to-space; s-E: space-to-Earth.

\*\* Frequency bands in GHz

Studies to **address mutual compatibility & sharing feasibility** among the **services/applications** for which **allocation/identification is envisaged** under the corresponding Res. relating to the AI in the overlapping bands



# Urgent ITU-R studies



agenda item 6



Urgent studies included in **Res. 958 (WRC-15)**

to be reported under WRC-19 agenda item 9.1:

- (9.1.6) Wireless Power Transmission (WPT) for electric vehicles** – study suitable harmonized frequency ranges to minimize impact on radiocommunication services
- (9.1.7) Managing unauthorized operations of Earth Station terminals** – study need for possible additional measures and possible methods that will assist administrations
- (9.1.8) Narrowband & BB machine-type communication infrastructures** – study related technical and operational aspects of radio networks and systems (incl. spectrum needs & possible harmonized use of spectrum)





# Other studies in WRC-15 Resolutions to be reported to WRC-19



From different agenda items

Other studies to be reported under WRC-19 agenda item 9.1:

- (9.1.1) Res. 212 – Terrestrial and Satellite components (Rev.WRC-15) of IMT, co- existence & compatibility @ 1 885-2025 & 2110-2200 MHz**
- (9.1.2) Res. 761 – IMT and BSS sound @ 1452-1492 MHz (WRC-15) in R1&3**
- (9.1.3) Res. 157 – N-GSO Sat. in “C-Band” allocated to (WRC-15) the FSS**
- (9.1.4) Res. 763 – Stations on board sub-orbital vehicles (WRC-15)**
- (9.1.5) Res. 764 – Incorporation by reference of (WRC-15) Rec. ITU-R M.1638-1 & ITU-R M.1849-1**
- (9.1.9) Res. 162 – FSS needs @ 51.4-52.4 GHz (WRC-15)**



# Broadband applications in the MS (WRC-19 agenda items 1.13 and 1.16)



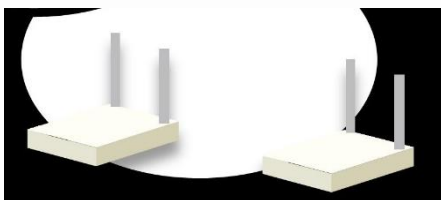
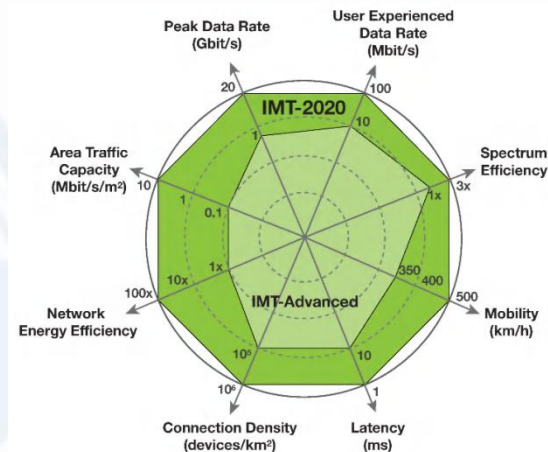
The following bands, which are already allocated to mobile, will be studied with a view to an **IMT-2020** identification:

- 24.25 – 27.5 GHz
- 37 – 40.5 GHz
- 42.5 – 43.5 GHz
- 45.5 – 47 GHz
- 47.2 – 50.2 GHz
- 50.4 – 52.6 GHz
- 66 – 76 GHz
- 81 – 86 GHz

The following bands will also be studied, although they **do not currently have global mobile allocations**:

- 31.8 – 33.4 GHz
- 40.5 – 42.5 GHz
- 47 - 47.2 GHz

▶ **Res. 238 (WRC-15)**



Appropriate regulatory actions, incl. additional MS allocations, for **WAS/RLAN** will be studied in the bands between 5 150-5 925 MHz

▶ **Res. 239 (WRC-15)**



# Other LMS & FS Systems & Apps. (WRC-19 agenda items 1.14 and 1.15)



Studies for considering **appropriate regulatory actions for HAPS\***, within existing FS alloc. at 47.2-47.5, 47.9-48.2 & 31.0-31.3\*\*/27.9-28.2\*\* GHz

(\*outside Reg. 2, +5 ADMs @6.5/6.5

MHz) or study new bands: 38-39.5 GHz & 21.4-22\*\*\* & 24.25-27.5\*\*\* GHz

(\*high-altitude platform stations (HAPS);

▶ **Res. 160 (WRC-15)**

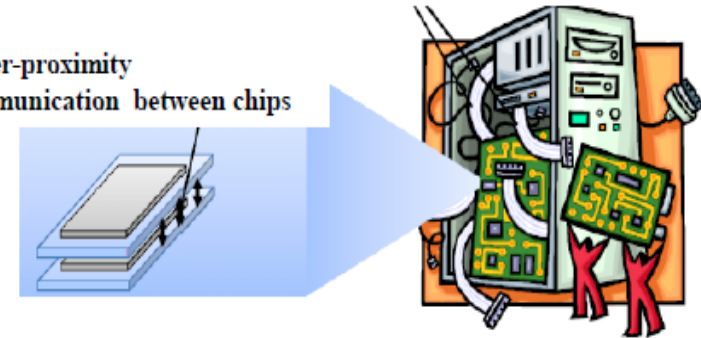
\*\*\* in Region 2)

Studies towards an **identification** for use by administrations for **LMS and FS applications** operating in the frequency range **275-450 GHz**

▶ **Res. 767 (WRC-15)**

Super-proximity communication between circuit board

Super-proximity communication between chips



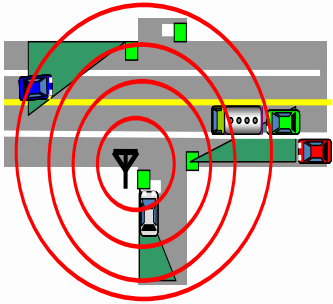


# New transport systems in the MS (WRC-19 agenda items 1.11 & 1.12)



Studies to take necessary actions, as appropriate, to facilitate **global or regional harmonized bands to support railway radiocommunication systems** between train & trackside within existing MS allocations

▶ **Res. 236 (WRC-15)**



Studies to consider possible **global or regional harmonized bands**, to the maximum extent possible, for **implementation of evolving ITS\*** within existing MS allocations

▶ **Res. 237 (WRC-15)**

\* Intelligent Transport systems (ITS)



# Maritime issues

(WRC-19 agenda items 1.8, 1.9.1 & 1.9.2)



Studies to consider possible **regulatory actions** to **support GMDSS** (Global Maritime Distress Safety Systems) **modernization** and the introduction of **additional satellite systems** into the GMDSS ► **Res. 359 (Rev.WRC-15)**

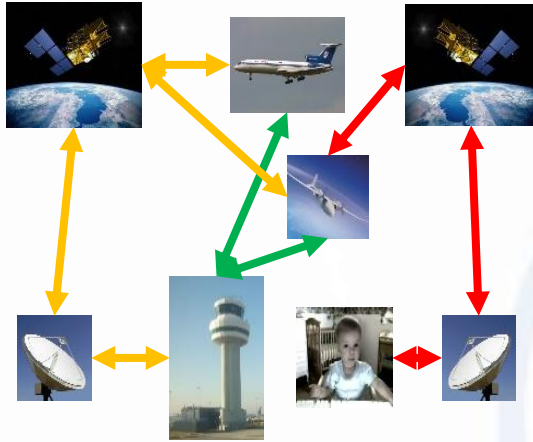


Studies to consider **regulatory actions** within the band **156-162.05 MHz** for **autonomous maritime radio devices** to protect the GMDSS and AIS (Automatic Identification System) ► **Res. 362 (WRC-15)**

Studies to consider RR MODs, including **new MMSS (E-s & s-E)** allocations, preferably **within 156.0125-157.4375 MHz & 160.6125-162.0375 MHz** of RR App. 18, to **enable a new VDES** (VHF data exchange system) **satellite component** ► **Res. 360 (Rev.WRC-15)**



# Aeronautical and Amateur issues (WRC-19 agenda items 1.10 & 1.1)



Studies to consider **spectrum needs & regulatory provisions for introduction and use of the GADSS (Global Aeronautical Distress and Safety System)**

▶ **Res. 426 (WRC-15)**



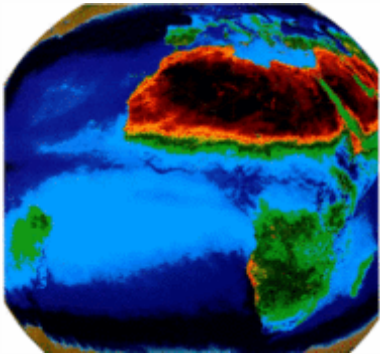
Studies for consideration of an allocation of the band **50-54 MHz to the amateur service in Region 1** (towards a worldwide allocation for

harmonized weak signal communications) ▶ **Res. 658 (WRC-15)**



# Science issues

(WRC-19 agenda items 1.2, 1.3 and 1.7)



Studies to consider **in-band power limits** for earth stations in **MetSat & EESS @ 401-403 MHz** and in the **MSS @ 399.9-400.05 MHz** for DCS\*

▶ **Res. 765 (WRC-15)**

Studies to consider possible upgrading of the **2<sup>nd</sup>ary MetSat (s-E)** allocation to **1<sup>mary</sup>** status & a possible **1<sup>mary</sup> EESS (s-E)** allocation @ **460-470 MHz** for DCS

▶ **Res. 766 (WRC-15)**



Study spectrum needs for **TT&C in the SOS** for non-GSO satellites with short duration missions & consider, if necessary, new SOS allocations

▶ **Res. 659 (WRC-15)**

\* Data Collection Systems (DCS) are used to monitor and predict climate change, monitor oceans, weather and water resources, weather forecasting and assisting in protecting biodiversity, improving maritime security



© CCRS / CCT

# Satellite issues

(WRC-19 agenda items 1.4, 1.5, 1.6 & 7)

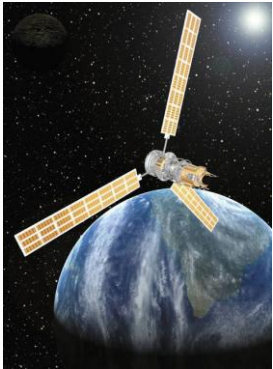


Consider results of studies on review, and possible revision if necessary, of RR App. 30 Annex 7 **limitations, incl. orbital position limitations**

▶ **Res. 557 (WRC-15)**

Studies to consider the **use of the bands 17.7-19.7 GHz (s-E) and 27.5 29.5 GHz (E-s) by earth stations in motion communicating with GSO space stations in the FSS** and take appropriate action

▶ **Res. 158 (WRC-15)**



Studies on development of a **regulatory framework for non-GSO FSS systems** that may operate in the bands **37.5-39.5 GHz (s-E), 39.5-42.5 GHz (s-E), 47.2-50.2 GHz (E-s) and 50.4-51.4 GHz (E-s)**

▶ **Res. 159 (WRC-15)**



**Satellite Regulatory issues**

▶ **Res. 86 (Rev.WRC-07)**





# Preliminary agenda for the 2023 World Radiocommunication Conference

**WRC  
2023**



# WRC-23 Preliminary Agenda



agenda item 10



## 5 preliminary agenda items, **Res. 810** (WRC-15)

- **Res. 361 – Spectrum for GMDSS modernization & implementation of e-navigation (WRC-15)**
- **Res. 656 – Possible new allocations for EESS (active) for spaceborne radar sounders @ 45 MHz (WRC-15)**
- **Res. 657 – Spectrum needs & designation of radio services for space weather sensors (WRC-15)**
- **Res. 161 – Possible new alloc. for FSS @ 37.5-39.5 GHz (WRC-15)**
- **Res. 235 – spectrum use and needs of existing services @ 470-960 MHz in Region 1 and possible regulatory actions @ 470-694 MHz in Region 1 (WRC-15)**



# WRC-15 new Resolutions



WRC-15 No.	RR No.	WRC-15 No.	RR No.	WRC-15 No.	RR No.
COM4/1	424	COM5/8	556	COM6/14	767
COM4/2	425			COM6/15	958
COM4/3	759	COM6/1	764	COM6/16	809
COM4/4	760	COM6/2	810	COM6/17	158
COM4/5	155	COM6/3	361	COM6/18	159
COM4/6	235	COM6/4	656	COM6/19	659
COM4/7	761	COM6/5	657	COM6/20	238
		COM6/6	658	COM6/21	160
COM5/1	655	COM6/7	765	COM6/22	239
COM5/2	156	COM6/8	766	COM6/23	161
COM5/3	31	COM6/9	557	COM6/24	162
COM5/4	40	COM6/10	362	COM6/25	99
COM5/5	762	COM6/11	426		
COM5/6	157	COM6/12	236	PLEN/1	163
COM5/7	763	COM6/13	237	PLEN/2	164



# WRC-15 new RR Art. 5 footnotes



WRC-15 No.	RR No.	WRC-15 No.	RR No.	WRC-15 No.	RR No.
5.A14	5.133B	5.C11	5.429D	5.B112	5.474D
5.A116	5.228AA	5.R3d	5.429E	5.A15	5.484B
5.A911	5.265	5.R3e	5.429F	5.A161	5.499A
5.idR2a	5.295	5.IMT	5.431B	5.X161	5.499B
5.idR3	5.296A	5.IMT2	5.434	5.B161	5.499C
5.allocateR2	5.308	5.A117	5.436	5.B161A	5.499D
5.idR2B	5.308A	5.B117	5.437	5.C161	5.499E
5.A25	5.328AA	5.A11	5.441A	5.A16	5.509B
5.R1a *	5.341A	5.R3f	5.441B	5.B16	5.509C
5.R2a	5.341B	5.A111	5.460A	5.D16	5.509D
5.R3g	5.341C	5.B111	5.460B	5.E16	5.509E
5.R1b *	5.346	5.A192	5.461AA	5.F16	5.509F
5.R3h	5.346A	5.B192	5.461AB	5.C16	5.509G
5.R1a **	5.429A	5.A112	5.474A	5.5X	5.527A
5.R1b **	5.429B	5.C112	5.474B	5.A118	5.559B
5.B11	5.429C	5.D112	5.474C	* ~1.4/1.5 GHz ** 3.3-3.4 GHz	



# Radio service abbreviations (1/2)



<b>Abbreviations</b>	<b>Radio services</b>	<b>RR definition</b>
AMS	aeronautical mobile service	No. <b>1.32</b>
AM(R)S	aeronautical mobile (route) service	No. <b>1.33</b>
AMSS	aeronautical mobile-satellite service	No. <b>1.35</b>
AMS(R)S	aeronautical mobile-satellite (route) service	No. <b>1.36</b>
ARNS	aeronautical radionavigation service	No. <b>1.46</b>
ARNSS	aeronautical radionavigation-satellite service	No. <b>1.47</b>
ARS	amateur service	No. <b>1.56</b>
ARSS	amateur-satellite service	No. <b>1.57</b>
BS	broadcasting service	No. <b>1.38</b>
BSS	broadcasting-satellite service	No. <b>1.39</b>
EESS	Earth exploration-satellite service	No. <b>1.51</b>
FS	fixed service	No. <b>1.20</b>
FSS	fixed-satellite service	No. <b>1.21</b>
ISS	inter-satellite service	No. <b>1.22</b>
LMS	land mobile service	No. <b>1.26</b>
LMSS	land mobile-satellite service	No. <b>1.27</b>
MetAids	meteorological aids service	No. <b>1.50</b>
MetSat	meteorological-satellite service	No. <b>1.52</b>



# Radio service abbreviations (2/2)



<b>Abbreviations</b>	<b>Radio services</b>	<b>RR definition</b>
MMS	maritime mobile service	No. <b>1.28</b>
MMSS	maritime mobile-satellite service	No. <b>1.29</b>
MRNS	maritime radionavigation service	No. <b>1.44</b>
MRNSS	maritime radionavigation-satellite service	No. <b>1.45</b>
MS	mobile service	No. <b>1.24</b>
MSS	mobile-satellite service	No. <b>1.25</b>
RAS	radio astronomy service	No. <b>1.58</b>
RDS	radiodetermination service	No. <b>1.40</b>
RDSS	radiodetermination-satellite service	No. <b>1.41</b>
RLS	radiolocation service	No. <b>1.48</b>
RLSS	radiolocation-satellite service	No. <b>1.49</b>
RNS	radionavigation service	No. <b>1.42</b>
RNSS	radionavigation-satellite service	No. <b>1.43</b>
SOS	space operation service	No. <b>1.23</b>
SFTSS	standard frequency and time signal service	No. <b>1.53</b>
SFTSSS	standard frequency and time signal-satellite service	No. <b>1.53</b>
SRS	space research service	No. <b>1.55</b>



## Other abbreviations (1/3)



Abbreviations	Description	RR Nos.
ADS-B	Automatic Dependent Surveillance-Broadcast	-
AIS	Automatic Identification System	-
Art. or AP/App	An Article or an Appendix of the RR	-
BB	Broadband	-
BIPM	International Bureau of Weights and Measures	-
(D)BiU	(Date of) Bringing Into Use	-
BR	ITU Radiocommunication Bureau	-
DCS	Data Collection System	-
E-s, s-E	Earth-to-space, space-to-Earth	-
ES	Earth station	<b>No. 1.63</b>
ESIM	ES In Motion	-
ESV	ES on board Vessels	-
GE06	Geneva 2006	-
GFT	Global Flight Tracking	-



## Other abbreviations (2/3)



<b>Abbreviations</b>	<b>Description</b>	<b>RR Nos.</b>
GMDSS	Global Maritime Distress and Safety System	-
GSO	Geostationary-Satellite Orbit	No. <b>1.190</b>
HAPS	High Altitude Platform Station	No. <b>1.66A</b>
HF VHF UHF	High Frequency: 3 to 30 MHz Very High Frequency: 30 to 300 MHz Ultra High Frequency: 300 to 3000 MHz	No. <b>2.1</b>
ICAO	International Civil Aviation Organization	-
IMT	International Mobile Telecommunications	-
ITS	Intelligent Transport Systems	-
ITU	International Telecommunication Union	-
ITU-R	ITU Radiocommunication Sector	-
PPDR	Public Protection and Disaster Relief	-
SARPs	Standards and recommended practices	Nos. <b>5.2 to 5.9</b>
R1, R2, R3	RR Regions 1, 2 or 3	Nos. <b>5.2 to 5.9</b>





## Other abbreviations (3/3)



<b>Abbreviations</b>	<b>Description</b>	<b>RR Nos.</b>
Rec. / Rap.	Recommendation / Report	-
Res.	Resolution	-
RLAN	Radio Local Area Network(s)	-
RR	ITU Radio Regulations	-
RRB	ITU Radio Regulations Board	-
TT&C	Telemetry, Tracking and Command	(See Nos. 1.131-1.136)
UA / UAS	Unmanned Aircraft / Unmanned Aircraft Systems	-
UTC	Coordinated Universal Time	<b>No. 1.14</b>
VDES	VHF Data Exchange System	-
VSAT	Very Small Aperture Terminal	-
WAIC	Wireless Avionics Intra-Communications	-
WAS	Wireless Access System(s)	-
WRC	World Radiocommunication Conference	-