

ITUWORKSHOPS

1st ITU Inter-regional Workshop on WRC-19 Preparation

21 - 22 November 2017

Geneva, Switzerland

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1st ITU INTER-REGIONAL WORKSHOP ON WRC-19 PREPARATION (Geneva, 21-22 November 2017)

Science issues

Discussions on WRC-19
agenda items
1.2, 1.3, & 1.7

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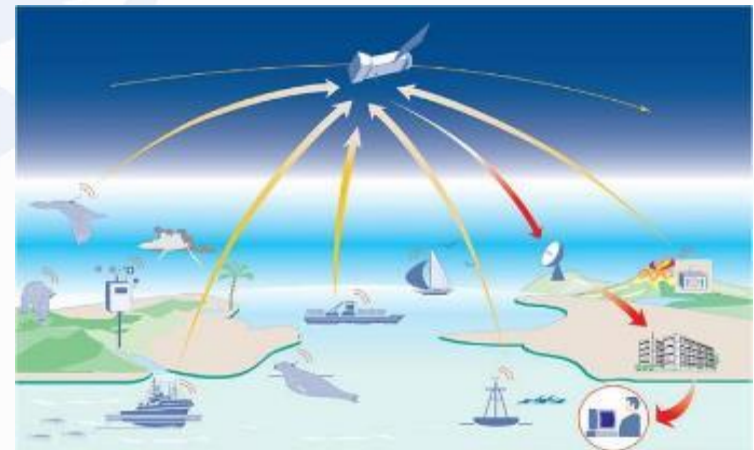
90th Anniversary
CCIR - ITU-R Study Groups
(1927-2017)

Organized by:



to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution 765 (WRC-15);

- The band 399.9-400.05 MHz is allocated to MSS and 401-403 MHz is allocated to EESS and MetSat
- These bands have traditionally used for Data Collection Systems (DCS)
 - Weather stations, ocean buoys, atmospheric monitors
 - Transmitters are typically low/medium power
- Satellite operators want to use band for TT&C
 - Much higher power
 - Large constellations of satellites
- Intent is to protect MSS, EESS, and MetSat satellites





Agenda Item 1.2

Allocations sharing with MSS, MetSat, and EESS

Allocation to services		
Region 1	Region 2	Region 3
399.9-400.05	MOBILE-SATELLITE (Earth-to-space)	5.209 5.220

Allocation to services		
Region 1	Region 2	Region 3
401-402	METEOROLOGICAL AIDS SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	
402-403	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	



Agenda Item 1.2

Status of studies

- Objective of WRC-19 AI 1.2 is to establish, within the Radio Regulation, in-band power limits applicable to earth stations in the frequency bands 399.9-400.05 MHz and 401-403 MHz in order to ensure the operation of existing and future systems that usually implement low or moderate output powers for EESS, MetSat and MSS systems.
- A preliminary draft new Report ITU-R SA.[400 MHz-LIMITS] under development contains:
 - Elements related to background on WRC-19 agenda item 1.2
 - Technical considerations on EESS, METSAT, and MSS in the frequency ranges 399.9-400.05 MHz and 401-403 MHz bands.
 - Analysis providing a method to derive the relevant power/e.i.r.p. limits under this agenda item.

Preliminary results of studies

PDN REPORT SA.[400 MHz-LIMITS] shows compatibility with the following conditions:

Service	Frequency band	Maximum e.i.r.p. of the earth stations	
MSS	399.9 – 400.05 MHz	5 dBW	
MetSat and EESS	401 – 403 MHz	GSO/HEO	22 dBW
		non-GSO (MEO and LEO)	7 dBW ⁽¹⁾

⁽¹⁾For the band 401.899-402.001 MHz, the maximum e.i.r.p for existing non-GSO MetSat system can be increased up to 12 dBW. [*Still under consideration*]



Agenda Item 1.3

to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution 766 (WRC-15)

- The band 460-470 MHz is used for Data Collection Systems (DCS) downlinks under a secondary MetSat allocation
- Some countries observe it as a primary allocation
- EESS may use the band on a sub-secondary level
- Many small satellites have an EESS function
- The band 450-470 MHz is identified for IMT - Administrations are adopting pfd limits for their protection



Agenda Item 1.3

Status of studies

- Determine in the frequency band 460-470 MHz, the possibility of:
 - Upgrading secondary MetSat (space-to-Earth) allocation to primary status
 - Adding a primary EESS (space-to-Earth) allocation
- Requirements:
 - Protect and not impose any additional constraints on existing allocated primary services and those in the adjacent frequency bands
 - Maintain the conditions contained in RR No. **5.289**.
- A preliminary draft new Report ITU-R SA.[460 MHz METSAT-EESS] is in development:
 - Background (regulatory and characteristics) on use of the 460-470 MHz band by MetSat and EESS systems
 - Provides results of studies evaluating the potential for interference from MetSat and EESS spacecraft operating in the 460-470 MHz band to incumbent systems in primary allocated services.
 - MS, Maritime Mobile, MSS, FS, and Broadcasting studied



Agenda Item 1.3

Preliminary results of studies

- PDN Report ITU-R SA.[460 MHz METSAT-EESS] shows that sharing is feasible if the pfd limit for downlink emission as provided in terms of angle of arrivals α is:
 - For NGSO satellites:
$$pfd \text{ (dBW/4kHz)} = \begin{cases} -157 & 0^\circ \leq \alpha < 5^\circ \\ -157 + 0.5(\alpha - 5) & 5^\circ \leq \alpha < 15^\circ \\ -152 & 15^\circ \leq \alpha \leq 90^\circ \end{cases}$$
 - For GSO satellites:
[TBD]
 - Note:
 1. 460-470 MHz has been utilized by several satellite systems, some of which are not able to meet the above pfd limit masks.
 2. An appropriate arrangement is necessary to ensure that the existing satellite systems can continue their operation according to the provisions adopted at WRC-19.



Agenda Item 1.7

to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution 659 (WRC-15)

- *Small satellites (which typically have short mission durations) are being increasingly used*
- *First time satellite operators do not understand their spectrum responsibilities*
- *Very quick development, deployment and mission lifecycle in comparison to the regulatory process(es)*
- *Radio Regulations do not differentiate between big/small short/long duration missions*
- *Agenda Item calls for review of spectrum requirements SOS allocations < 1 GHz for TT&C*

Status of studies

- Determine the TT&C spectrum requirements for non-GSO satellites with short duration missions
- Conducting sharing and compatibility studies of current SOS allocations within the frequency ranges 150.05-174 MHz and 400.15-420 MHz to SOS to see if requirements can be met, while protecting incumbent in-band and adjacent band services
 - Take into account current use and that the existing allocations to SOS below 1 GHz, where RR No. 9.21 applies, are not suitable for short duration non-GSO satellites
 - Take into account RR No. 1.23 and assess the suitability of existing allocations to the SOS in the frequency range below 1 GHz
 - Consider possible new allocations or an upgrade of the existing allocations to the SOS in existing SOS bands below 1 GHz



Agenda Item 1.7

Status of studies (Continued)

- The work on AI 1.7 was split into 3 separate Reports:
 - DN Report ITU-R SA.[SHORT DURATION NGSO – REQUIREMENTS]
 - Spectrum requirements for short duration NGSO systems range: 0.625 MHz-2.5 MHz (space-to-Earth) and 0.682 MHz-0.938 MHz (Earth-to-space), depending on operational scenario.
 - DN Report ITU-R SA.[SHORT DURATION NGSO – CHARACTERISTICS]
 - Technical characteristics of short duration missions as well as initial studies of spectrum requirements and compatibility were reviewed and combined into the draft Report.
 - PDN Report ITU-R SA.[SHORT DURATION NGSO – SHARING STUDIES]
 - Examines suitability of existing SOS allocations below 1 GHz for TT&C of short duration non-GSO satellites
 - Summarizes whether spectrum requirements can be met in existing allocations and if not, additional compatibility studies are presented on possible new and/or upgraded allocations



Agenda Item 1.7

Preliminary results of studies

Simulations have give mixed results, although the vast majority show violation of protection criteria

- **150.05-174 MHz band – sharing not feasible**
 - 150.05-153 MHz – Radio astronomy
 - 150.05-174 MHz - Land-mobile stations
 - 154-156 MHz - Radiolocation systems (space surveillance radars)
 - 156-162.0375 MHz – GMDSS aircraft, coastal, ship, and space stations

- **400.15-406 MHz band – sharing may be feasible (still under assessment)**
 - 400.15-401 MHz band - Sharing with MetSat not feasible
 - 401-402 MHz band - Sharing with GSO DCS networks may not be feasible unless other technical and/or operational measures are further developed
 - 402-403 MHz band - Sharing compatibility similar to 401-402 MHz band
 - 403-406 MHz band - Sharing with radiosondes [TBD]

- **406.1-420 MHz band – sharing likely not feasible (still under assessment)**
 - 406.1-420 MHz - Sharing with land-mobile and fixed stations is not feasible
 - 410-420 MHz - Sharing appears to be not feasible with International Space Station SSCS at 414.2 MHz (Primary) and 417.1 MHz (Backup)