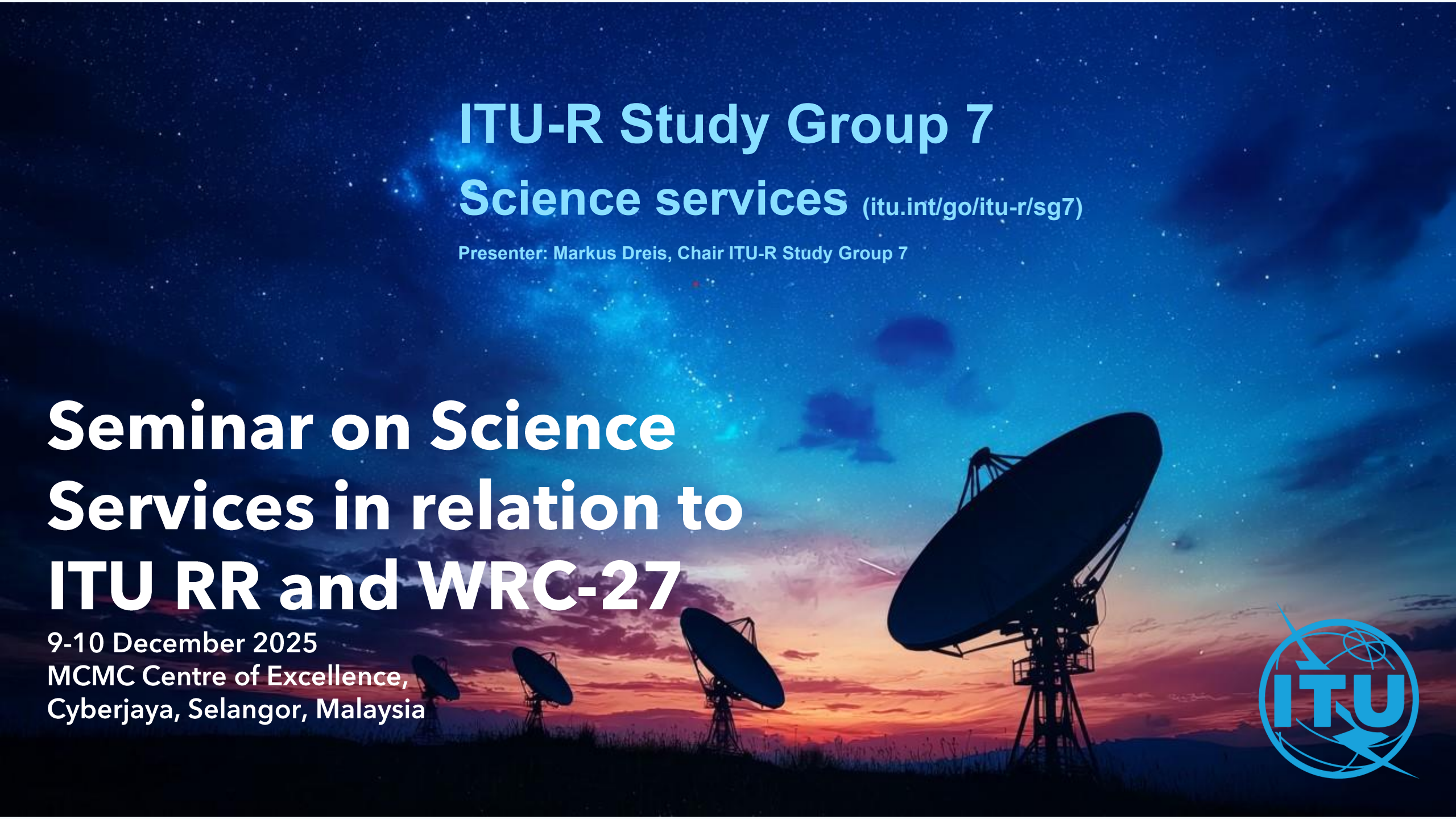
ITU-R Study Group 7

Science services (itu.int/go/itu-r/sg7)

Presenter: Markus Dreis, Chair ITU-R Study Group 7

Seminar on Science Services in relation to ITU RR and WRC-27

9-10 December 2025
MCMC Centre of Excellence,
Cyberjaya, Selangor, Malaysia



Scope

Study Group 7 develops ITU-R Recommendations, Reports and Handbooks and prepares for WRC agenda items, either as leading or contributing group, related to:

- Dissemination, reception and coordination of standard-frequency and time-signal services on a worldwide basis, including the application of satellite techniques → Working Party 7A
- Systems for space operation, space research, Earth exploration and meteorology, including the related use of links in the inter-satellite service → Working Party 7B
- Systems for passive and active remote sensing, including space weather sensors, operating on both ground-based and space-based platforms → Working Party 7C
- Radio astronomy (RAS) and radar astronomy → Working Party 7D

Importance

- The systems linked with Study Group 7 are used in activities that are a critical part of our everyday life such as:
  - global environment monitoring – atmosphere (including greenhouse gases emissions), oceans, land surface, biomass, etc.;
  - weather forecasting and climate change monitoring and prediction;
  - detection and tracking of many natural and man-made disasters (earthquakes, tsunamis, hurricanes, forest fires, oil leaks, etc);
  - providing alerting/warning information;
  - damage assessment and planning relief operations;
  - satellites for studying the sun, the magnetosphere and all the elements of our solar system;
  - spacecraft for human and robotic exploration of extraterrestrial bodies;
  - Earth and satellite-based radioastronomy to study the universe and its phenomena.

Structure (1)

- Chair: Mr. Markus DREIS (EUMETSAT)
- Counsellor: Mr. Vadim NOZDRIN (ITU)
- Vice Chairs:

Ms. Baydaa AL-AKABI (IRAQ)	Mr. Kevin KNIGHTS (Australia)
Mr. Batholomew GA-AKEKU (Cameroon)	Mr. Anuar MAGZUMOV (Kazakhstan)
Mr. Viresh GOEL (India)	Dr. Hwangjae RHEE (Rep. of Korea)
Mr. Rui HAN (China)	Mr. Sergo SHAVGULIDZE (Georgia)
Mr. Mohamed KHALIFA (Eqypt)	Mr. Abdelilah TALEB (Morocco)

Structure (2)

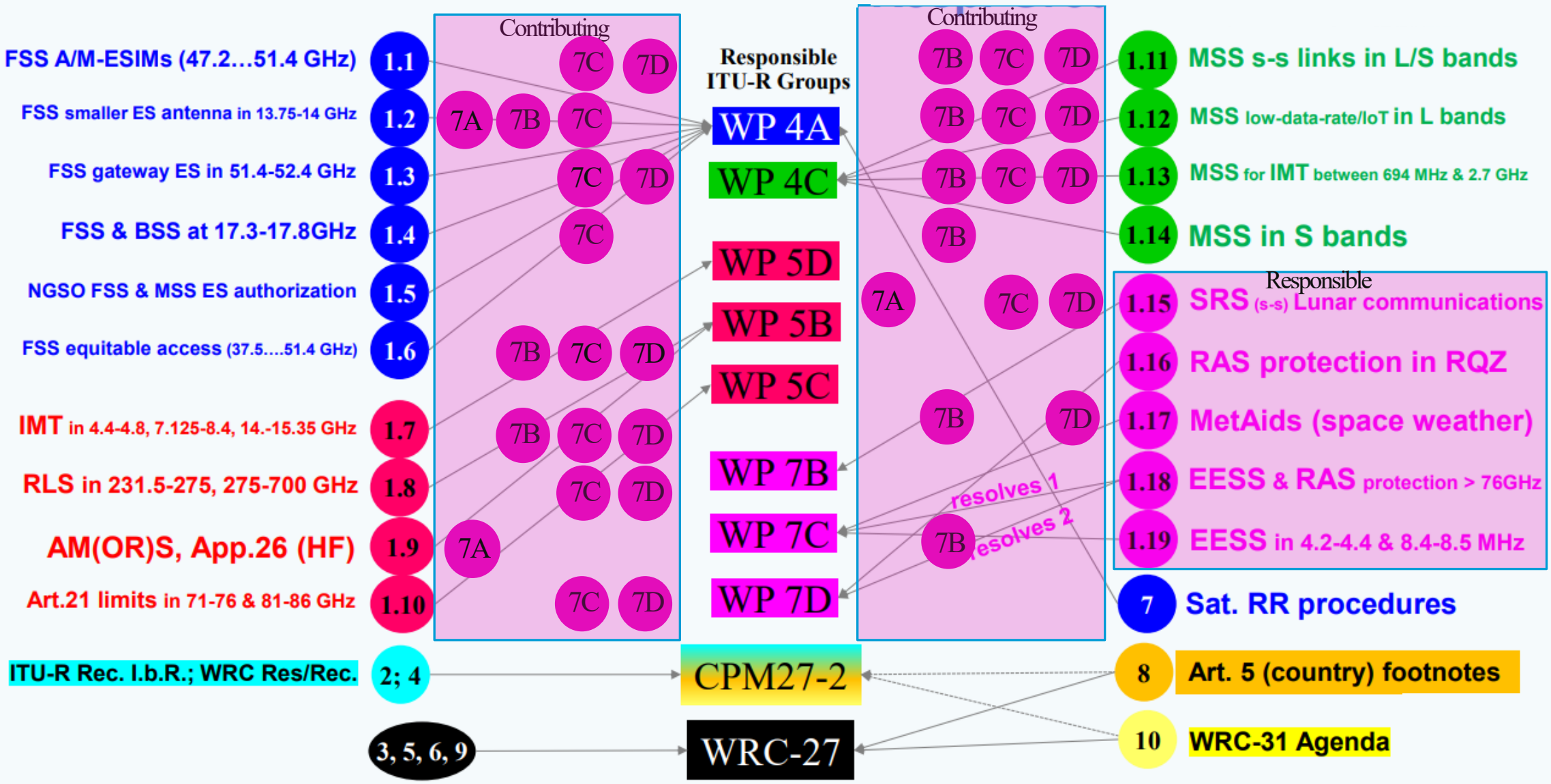
- Working Party 7A (WP 7A) - Time signals and frequency standard emissions: Systems and applications (terrestrial and satellite) for dissemination of time signals and frequency standard → Chair: Mr. Joseph Achkar (France)

- Working Party 7B (WP 7B) - Space radiocommunication applications: Systems for transmission/reception of telecommand, tracking and telemetry data for space operation, space research, Earth exploration-satellite, and meteorological satellite services, including the related use of links in the inter-satellite service → Chair: Ms. Catherine Sham (USA), Vice-chairs: Mr. Theodore Berman (USA), Mr Kevin Knights (Australia), Mr Anton Stepanov (Russian Federation)

- Working Party 7C (WP 7C) - Remote sensing systems: active and passive remote sensing applications in the Earth exploration-satellite service and systems of the MetAids service, including space weather sensors as well as space research sensors, including planetary sensors → Chair: Mr. Bruno Espinosa (European Space Agency (ESA)), Vice-chairs: Mr. Tarcísio Aurélio Bakaus (Brazil), Mr Takahiro Mitome (Japan)

- Working Party 7D (WP 7D) - Radio astronomy: radio astronomy and radar astronomy sensors, both Earth-based and space-based, including space very long baseline interferometry (VLBI) → Chair: Mr. Balthasar Indermuehle (Australia), Vice-chairs: Ms. Bevin Vanderley (USA), Mr. Federico Di Vruno (Square Kilometre Array Observatory (SKAO))

WRC-27 Agenda Items lead/contribution overview for SG7



WRC-27 Agenda Items lead/contribution overview for SG7

Allocation of ITU-R preparatory work for WRC-27			
WRC-27 agenda item	WRC Resolution	Responsible Group	Contributing Group
1.1	176 (Rev.WRC-23)	WP 4A	WP 7C; WP 7D
1.2	129 (WRC-23)	WP 4A	WP 7A; WP 7B; WP 7C
1.3	130 (WRC-23)	WP 4A	WP 7C; WP 7D
1.4	726 (WRC-23)	WP 4A	WP 7C
1.5	14 (WRC-23)	WP 4A	
1.6	131 (WRC-23)	WP 4A	WP 7B; WP 7C; WP 7D
1.7	256 (WRC-23)	WP 5D	WP 7B; WP 7C; WP 7D
1.8	663 (Rev.WRC-23)	WP 5B	WP 7C; WP 7D
1.9	411 (WRC-23)	WP 5B	WP 7A
1.10	775 (Rev.WRC-23)	WP 5C	WP 7C; WP 7D
1.11	249 (Rev.WRC-23)	WP 4C	WP 7B; WP 7C; WP 7D
1.12	252 (WRC-23)	WP 4C	WP 7B; WP 7C; WP 7D
1.13	253 (WRC-23)	WP 4C	WP 7B; WP 7C; WP 7D
1.14	254 (WRC-23)	WP 4C	WP 7B
1.15	680 (WRC-23)	WP 7B	WP 7A; WP 7C; WP 7D
1.16	681 (WRC-23)	WP 7D	
1.17	682 (WRC-23)	WP 7C	WP 7B; WP 7D
1.18	712 (WRC-23)	WP 7C (resolves 1) WP 7D (resolves 2)	
1.19	674 (WRC-23)	WP 7C	WP 7B

WRC-27 Agenda Item preparations under SG7 lead

WRC-27 Agenda Item	Responsibility
1.15 Possible new or modified space research service (space-to-space) allocations, for future development of communications on the lunar surface and between lunar orbit and the lunar surface (Resolution 680 (WRC-23))	**WP 7B** (WP 7A, 7C, 7D to contribute)
1.16 Protection of radio astronomy operating in specific Radio Quiet Zones and, in frequency bands allocated to the radio astronomy service on a primary basis globally, from aggregate radio-frequency interference caused by non-geostationary satellite orbit systems, in accordance with Resolution 681 (WRC-23)	**WP 7D**
1.17 Regulatory provisions and potential primary allocations to the meteorological aids service (space weather) to accommodate receive-only space weather sensor applications in the RR, in accordance with Resolution 682 (WRC-23)	**WP 7C** (WP 7B, 7D to contribute)
1.18 Possible regulatory measures regarding the protection of the Earth exploration-satellite service (passive) and the radio astronomy service in certain frequency bands above 76 GHz from unwanted emissions of active services, in accordance with Resolution 712 (WRC-23)	**WP 7C** (resolves 1) **WP 7D** (resolves 2)
1.19 Possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz, in accordance with Resolution 674 (WRC-23)	**WP 7C** (WP 7B to contribute)

WRC-27 Agenda Item preparations with SG7 contributing

WRC-27 Agenda Item	Contributor
1.1 Technical and operational conditions for the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space), or parts thereof, by aeronautical and maritime earth stations in motion communicating with space stations in the fixed-satellite service and develop regulatory measures, as appropriate, to facilitate the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space)	WP 7C, 7D
1.2 Possible revisions of sharing conditions in the band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes	WP 7A, 7B, 7C
1.3 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)	WP 7C, 7D
1.4 Possible new primary allocation to the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz and a possible new primary allocation to the broadcasting-satellite service (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3	WP 7C
1.6 Technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency band	WP 7B, 7C, 7D
1.7 Use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands	WP 7B, 7C, 7D
1.8 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	WP 7C, 7D
1.9 Appropriate regulatory actions to update Appendix 26 to the Radio Regulations in support of aeronautical mobile (OR) high frequency modernization	WP 7A
1.10 Developing power flux-density and equivalent isotropically radiated power limits for inclusion in Article 21 of the Radio Regulations for the fixed-satellite, mobile-satellite and broadcasting-satellite services to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz	WP 7C, 7D
1.11 Technical and operational issues, and regulatory provisions, for space-to-space links among non-geostationary and geostationary satellites in the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz allocated to the mobile-satellite service	WP 7B, 7C, 7D
1.12 Possible allocations to the mobile-satellite service in the bands 1 427-1 432 MHz (space-to-Earth), 1 645.5-1 646.5 MHz (space-to-Earth) (Earth-to-space), 1 880-1 920 MHz (space-to-Earth) (Earth-to-space) and 2 010-2 025 MHz (space-to-Earth) (Earth-to-space) for low-data-rate non-geostationary mobile-satellite systems	WP 7B, 7C, 7D
1.13 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	WP 7B, 7C, 7D
1.14 Possible additional allocations to the mobile-satellite service	WP 7B

WRC-31 Agenda Item preparations under SG7 lead

WRC-31 Agenda Item	Responsibility
2.10 Possible new primary allocation to the Earth exploration-satellite service (Earth-to-space) in the frequency band 22.55-23.15 GHz, in accordance with Resolution 664 (Rev.WRC-23)	WP 7B
2.11 Upgrade of the secondary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band [37.5-40.5 GHz] or possible new worldwide frequency allocations on a primary basis to the Earth exploration-satellite service (space-to-Earth) in certain frequency bands within the frequency range [40.5-52.4 GHz], in accordance with Resolution 685 (WRC-23)	WP 7B
2.12 Possible new allocations to the Earth exploration-satellite service (active) in the frequency bands [3 000-3 100 MHz] and [3 300-3 400 MHz] on a secondary basis, in accordance with Resolution 686 (WRC-23)	WP 7C
2.13 Consideration of studies on coexistence between spaceborne synthetic aperture radars operating in the Earth exploration-satellite service (active) and the radiodetermination service in the frequency band 9 200-10 400 MHz, with possible actions as appropriate, in accordance with Resolution 722 (WRC-23)*)	WP 7C

*) Initially proposed by the proponent of this agenda item to be an agenda time for WRC-27, it was included in the draft provisional allocation of ITU-R preparatory work for WRC-31. It is emphasized that this draft agenda item is asking for studies on coexistence between radiodetermination systems (WP 5B) and EESS (active) systems (WP 7C). Final decision on responsible group would be made at later stage (CPM31-1).

WP 7A (Chair: Mr. Joseph Achkar (France))

WP 7A covers standard frequency and time signal services, both terrestrial and satellite. Its scope includes the dissemination, reception and exchange of standard frequency and time signals and coordination of these services, including the application of satellite techniques on a worldwide basis.

Some of the current topics:

- Resolution 655 (WRC-15) was successfully revised by WRC-23 paving the way for a continuous UTC without leap seconds. This opened the possibility to complete the work on the dissemination of time signals and standard frequencies by means of revision of Recommendation ITU-R TF.460-6 (Doc 7A/51, Annex 2) and a new ITU-R Report on "UTC dissemination" (Doc 7A/51, Annex 1) to be developed. To report on the progress of Resolution 655 (Rev.WRC-23) to WRC-27 (agenda item 9).
- Revision and update of the handbook "Selection and use of precise frequency and time systems" led by a Correspondence Group. Target date for completion of the update of the Handbook: March 2026.
- Recommendations ITU-R TF.583 and ITU-R TF.768 and supplements on SG 7 website allowing for frequent updating of the time codes, standard frequencies and time signals.
- Contributing to studies on WRC-27 agenda items 1.2, 1.9 and 1.15.
- WP 7A chair = Rapporteur to the ITU-R Coordination Committee for Vocabulary (CCV).

WP 7A important documentation (non-exhaustive)

- Characteristics:
  - Report ITU-R TF.2511 - Content and structure of time signals to be disseminated by radiocommunication systems and various aspects of current and potential future reference time scales, including their impacts and applications in radiocommunication
  - Recommendation ITU-R TF.374 – Precise frequency and time-signal transmissions
  - Recommendation ITU-R TF.1153 – The operational use of two-way satellite time and frequency transfer employing pseudorandom noise code
- Guidelines:
  - Recommendation ITU-R TF.460 – Standard-frequency and time-signal emissions (incorporated by reference in the Radio Regulations
  - Recommendation ITU-R TF.583 – Time codes
  - Recommendation ITU-R TF.768 – Standard frequencies and time signals
- Handbooks:
  - Selection and use of precise frequency and time systems
  - Satellite Time and Frequency Transfer and Dissemination
- Sharing/Performance/Protection Criteria:
  - Report ITU-R TF.2487 - Protection criteria for systems in the standard frequency and time signal services

WP 7B (Chair: Ms. Catherine Sham (USA))

WP 7B is responsible for the transmission and reception of telecommand, tracking and telemetry data for space operation, space research, Earth exploration-satellite, and meteorological satellite services. It studies communication systems for use with manned and unmanned spacecraft, communication links between planetary bodies and the use of data relay satellites.

Structure:

- Working Group 7B-1: GSO and below SRS/SOS systems and related issues
  - Chair: Mr. Ted Berman (USA)
- Working Group 7B-2: Above GSO SRS/SOS systems and related issues
  - Chair: Mr. Kevin Knights (Australia)
- Working Group 7B-3: EESS and MetSat Radiocommunication systems and related issues
  - Chair: Mr. Philippe Tristant (EUMETSAT)

WP 7B topics (non-exhaustive)

- Leading group for WRC-27 agenda item 1.15 (Lunar):
  - Report ITU-R SA.2553 - Technical and operational characteristics for space research systems in the vicinity of the Moon
  - Working Document towards a PDN Report ITU-R SA.[LUNAR_1.15_STUDIES] - Sharing studies of space research systems for lunar operations under WRC-27 agenda item 1.15 (Doc 7B/192, Annex 1);
  - Working document towards preliminary draft CPM text for WRC-27 agenda item 1.15 (Doc 7B/192, Annex 2);
  - Working document toward preliminary draft new Report ITU-R SA.[FUTURE LUNAR COMMUNICATION AND SYSTEMS STUDY] - Radiocommunication needs for future lunar vicinity activities (Doc 7B/192, Annex 4);
- Working document towards a preliminary draft new Recommendation ITU-R SA.[2.0 GHz SRS & EESS CHAR] - Technical and operational characteristics of EESS and SRS systems that use the 2 025-2 120 MHz (Earth-to-space) frequency band (Doc 7B/192, Annex 11);
- Draft revision of the Handbook on space research communication (2014) (Doc 7B/192, Annex 12);
- Working document toward a preliminary draft revision of Recommendation ITU-R SA.514-3 - Interference criteria for the EESS and MetSat services (Doc 7B/192, Annex 6);
- Contributing to for WRC-27 AIs 1.2, 1.6, 1.7, 1.11, 1.12, 1.13, 1.14, 1.17 and 1.19.
  - WRC-27 AI 1.7: Working document towards a preliminary draft new Report ITU-R SA.[EESS NGS 7-8GHz] - Existing and future development of [non-governmental] systems under the EESS in the frequency range 7 190 to 8 400 MHz ((Doc 7B/192, Annex 5).

Summary table of allocations to SOS, EESS, MetSat and SRS vs. WRC-27 AIs

Space operation service		Earth Exploration-satellite service		MetSat service		Space research service	
Frequency band	WRC-27 AI	Frequency band	WRC-27 AI	Frequency band	WRC-27 AI	Frequency band	WRC-27 AI
		1690-1710 MHz (s-E) (5.289)		1675-1710 MHz (s-E)	1.11, 1.13		
2025-2110 MHz (E-s) (s-s)	1.12, 1.13, 1.14	2025-2110 MHz (E-s) (s-s)	1.12, 1.13, 1.14			2025-2110 MHz (E-s) (s-s)	1.12, 1.13, 1.14
						2110-2120 MHz (E-s) (deep space)	1.13, 1.14
2200-2290 MHz (s-E) (s-s)	1.13	2200-2290 MHz (s-E) (s-s)	1.13			2200-2290 MHz (s-E) (s-s)	1.13
						2290-2300 MHz (s-E) (deep space)	1.13
7125-7155 MHz (E-s)	1.7					7145-7190 MHz (deep space)	1.7
7190-7235 MHz (E-s)	1.7	7190-7250 MHz (E-s)	1.7			7190-7235 MHz both (E-s) (P)	1.7, 1.15
				7450-7550 MHz (s-E) (GSO)	1.7		
				7750-7900 MHz (s-E) (NGSO)	1.7		
		8025-8400 MHz (s-E)	1.7	8175-8215 MHz (E-s)	1.7		
						8400-8500 MHz (s-E)	1.7, 1.15

WP 7B important documentation (non-exhaustive)

- Characteristics:
  - Report ITU-R SA.2488 - Characteristics to be used for assessing interference to systems operating in the Earth exploration-satellite and meteorological-satellite services, and for conducting sharing studies
  - Report ITU-R SA.2553 - Technical and operational characteristics for space research systems in the vicinity of the Moon
  - Recommendation ITU-R SA.2169 - Technical and operational characteristics of the space operation service (SOS) systems that use the 2 025-2 110 MHz (Earth-to-space) (space-to-space) and 2 200- 2 290 MHz (space-to-Earth) (space-to-space) frequency bands for use in assessing of interference and for conducting sharing studies
- Guidelines:
  - Recommendation ITU-R SA.2155 - Guidelines on the use of the frequency band 2 200-2 290 MHz by Earth exploration-satellite service/space research service/space operation service satellite networks or systems that are not using spread-spectrum modulation
  - Recommandation ITU-R SA.2156 - Guidelines on the use of the frequency band 2 025-2 110 MHz by Earth exploration-satellite service/space research service/space operation service satellite networks or systems that are not using spread-spectrum modulation
- Handbooks:
  - Space Research Communications
- Sharing/Performance/Protection Criteria:
  - See the following two slides!

Recommendations related to the protection of EESS & MetSat services

Generic recommendations	
SA.1020-0	Hypothetical reference system
SA.1021-0	Methodology for determining performance objectives
SA.1022-1	Methodology for determining interference criteria
SA.1023-0	Methodology for determining sharing and coordination criteria

Specific recommendations			GSO						Non-GSO					
			data dissemination and direct data readout			data collection			data transmissions			data collection		
Band	Direction	Services	Performance	Interference	Sharing	Performance	Interference	Sharing	Performance	Interference	Sharing	Performance	Interference	Sharing
137-138 MHz	s-E	METSAT							SA.1159-4	SA.1026-5	SA.1027-6			
400.15-401 MHz	s-E	METSAT							SA.1159-4	SA.1026-5	SA.1027-6			
401-403 MHz	E-s	EESS and METSAT				SA.1159-4	SA.1163-3	SA.1164-4				SA.1159-4	SA.2044-0	
460-470 MHz	s-E	EESS and METSAT				SA.1159-4	SA.1163-3	SA.1164-4				SA.1159-4	SA.514-3	
1670-1675 MHz	s-E	METSAT	SA.1159-4	SA.1160-3	SA.1161-3		SA.1163-3	SA.1164-4	SA.1159-4					
1675-1690 MHz	s-E	METSAT	SA.1159-4	SA.1160-3	SA.1161-3		SA.1163-3	SA.1164-4	SA.1159-4					
1690-1698 MHz	s-E	EESS and METSAT	SA.1159-4	SA.1160-3	SA.1161-3				SA.1159-4					
1698-1700 MHz	s-E	EESS and METSAT	SA.1159-4	SA.1160-3	SA.1161-3				SA.1159-4	SA.1026-5	SA.1027-6			
1700-1710 MHz	s-E	EESS and METSAT	SA.1159-4	SA.1160-3	SA.1161-3				SA.1159-4	SA.1026-5	SA.1027-6			
2025-2110 MHz	E-s and s-s	EESS		SA.1160-3		SA.1159-4	SA.1163-3	SA.1164-4						
2200-2290 MHz	s-E and s-s	EESS		SA.514-3			SA.514-3			SA.514-3		SA.1159-4	SA.514-3	
7190-7250 MHz	E-s	EESS		SA.514-3			SA.514-3			SA.514-3			SA.514-3	
7450-7550 MHz	s-E	METSAT (GSO)	SA.1159-4	SA.514-3										
7750-7900 MHz	s-E	METSAT (NGSO)							SA.1159-4	SA.1026-5	SA.1027-6			
8025-8400 MHz	s-E	EESS							SA.1159-4	SA.1026-5	SA.1027-6			
8175-8215 MHz	E-s	METSAT		SA.514-3			SA.514-3			SA.514-3			SA.514-3	
18.1-18.3 GHz	s-E	METSAT	SA.1159-4	SA.1807-0										
25.5-27 GHz	s-E	EESS	SA.1159-4	SA.1160-3	SA.1161-3				SA.1159-4	SA.1026-5	SA.1027-6			
Other cases	all	EESS and METSAT		SA.514-3			SA.514-3			SA.514-3			SA.514-3	

Recommendations related to the protection of SOS & SRS services

Specific recommendations			Space Research Service (SRS)						Space Operations Service (SOS)		
			Near Earth			Deep Space					
Band	Direction	Services	Performance	Interference	Sharing / apportionment	Performance	Interference	Sharing / apportionment	Performance	Interference	Sharing / apportionment
30.005-30.01 MHz	E-s and s-E	SRS and SOS	SA.1014-4	SA.609-2	SA.1743-0					SA.363-5	SA.1743-0
137-138 MHz	s-E	SRS and SOS	SA.1014-4	SA.609-2	SA.1743-0					SA.363-5	SA.1743-0
143.6-143.65	s-E	SRS	SA.1014-4	SA.609-2	SA.1743-0						
148-149.9 MHz	E-s	SOS								SA.363-5	SA.1743-0
272-273 MHz	s-E	SOS								SA.363-5	SA.1743-0
400.15-401 MHz	s-E	SRS	SA.1014-4	SA.609-2	SA.1743-0					SA.363-5	SA.1743-0
401-402 MHz	s-E	SOS								SA.363-5	SA.1743-0
410-420 MHz	s-s	SRS	SA.1014-4	SA.609-2	SA.1743-0						
1427-1429 MHz	E-s	SOS								SA.363-5	SA.1743-0
1525-1535 MHz	s-E	SOS								SA.363-5	SA.1743-0
2025-2110 MHz	E-s and s-s	SRS and SOS	SA.1014-4	SA.609-2	SA.1743-0					SA.363-5	SA.1743-0
2110-2120 MHz	E-s	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
2200-2290 MHz	s-E and s-s	SRS and SOS	SA.1014-4	SA.609-2	SA.1743-0					SA.363-5	SA.1743-0
2290-2300 MHz	s-E	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
7145-7190 MHz	E-s	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
7190-7235 MHz	E-s	SRS	SA.1014-4	SA.609-2	SA.1743-0						
8400-8450 MHz	s-E	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
8450-8500 MHz	s-E	SRS	SA.1014-4	SA.609-2	SA.1743-0						
14.8-15.35 GHz	all	SRS	SA.1014-4	SA.609-2	SA.1743-0						
22.55-23.15 GHz	E-s	SRS	SA.1014-4	SA.609-2	SA.1743-0						
25.5-27 GHz	s-E	SRS	SA.1014-4	SA.609-2	SA.1743-0						
31.8-32.3 GHZ	s-E	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
34.2-34.7	E-s	SRS Deep Space				SA.1014-4	SA.1157-1	SA.1743-0			
37-38	s-E	SRS	SA.1014-4	SA.1396-0	SA.1743-0						
40-40.5 GHz	E-s	SRS	SA.1014-4	SA.1396-0	SA.1743-0						
Other bands	all	SRS	SA.1014-4	SA.609-2	SA.1743-0						

WP 7C (Chair: Mr. Bruno Espinosa (European Space Agency (ESA))

WP 7C covers remote sensing applications in the Earth exploration-satellite service (EESS), both active and passive, systems of MetAids service, including space weather sensors, as well as space research sensors, including planetary sensors.

Structure:

- Working Group 7C-1: Active sensor issues
  - Chair: Mr. Takahiro Mitome (Japan)
- Working Group 7C-2: MetAids and space weather issues
  - Chair: Mr. Eric Allaix (France)
- Working Group 7C-3: Passive sensor issues
  - Chair: Vacant !!! (Working Party 7C members are invited to express their interest to chair this group in future)

WP 7C topics (1/2) (non-exhaustive)

- Updating of the "ITU/WMO Handbook on use of radio spectrum for meteorology“ (2017)
  → Completed, to be approved at SG7 in March 2026!
- Leading group for WRC-27 agenda item 1.17 (Space Weather):
  - Working document towards a preliminary draft new Recommendation ITU-R RS.[RXSW_PROTECT_CRITERIA] - Protection criteria of receive-only space weather sensors in the meteorological aids (MetAids) service (space weather) (Doc 7C/317, Annex 9);
  - Working document towards a preliminary draft new Report ITU-R RS[SW_STUDIES] - Studies on possible primary allocations to the MetAids service (space weather) for receive-only space weather sensors (Doc 7C/317, Annex 10);
  - Draft CPM text for WRC-27 agenda item 1.17 (Doc 7C/317, Annex 11)
  - Working document towards preliminary draft revised Report ITU-R RS.2456-2 - Space weather sensor systems using radio spectrum (Doc 7C/317, Annex 12)
- Leading group for WRC-27 agenda item 1.18, resolves 1 (EESS (passive) protection >86 GHz):
  - Working document towards preliminary draft new Report ITU-R RS.[1.18 - EESS] (Doc 7C/317, Annex 13);
  - Working document on draft CPM text for WRC-27 agenda item 1.18 resolves 1 (Doc 7C/317, Annex 14);
  - Status of issues related to EESS (passive) above 86 GHZ (as of 25 Sept 2025) (Doc 7C/317, Annex 15);
    - This overview helps to keep track on ITU-R activities related to bands above 86 GHz, i.e. under WRC-27 Agenda Items 1.8 and 1.18, WRC-31 AI 2.6, and studies under Resolution 731 and works in WP5C/SG5.

WP 7C topics (2/2) (non-exhaustive)

- Leading group for WRC-27 agenda item 1.19 (Sea Surface Temperature (SST)):
  - Working document towards a preliminary draft new Report on WRC-27 agenda item 1.19 - Studies on possible allocations to the Earth exploration-satellite service (passive) in the bands 4 200-4 400 MHz and 8 400-8 500 MHz (Doc 7C/317, Annex 16);
  - Draft CPM text for WRC-27 agenda item 1.19 (Doc 7C/317, Annex 17);
- Working document towards a preliminary draft new Report ITU-R RS.[EESS(PASSIVE)6-7 GHZ] - Use of EESS (passive) in the 6 425-7 250 MHz range (Doc 7C/317, Annex 19);
- Work on several other topics:
  - Sharing studies of active sensors with other services in L-Band;
  - Analysis of RFI and impact assessment to passive sensors in the band 18.6-18.8 GHz;
  - Technical characteristics of active and passive remote sensing systems;
- Contributing to WRC-27 AIs 1.1, 1.2, 1.3, 1.4, 1.6, 1.7, 1.8, 1.10, 1.11, 1.12, 1.13, 1.15.

WP 7C important documentation (1/2) (non-exhaustive)

- General:
  - Report ITU-R RS.2178 - The essential role and global importance of radio spectrum use for Earth observations and for related applications
  - Recommendation ITU-R RS.1859 - Use of remote sensing systems for data collection to be used in the event of natural disasters and similar emergencies
  - Recommendation ITU-R RS.1883 - Use of remote sensing systems in the study of climate change and the effects thereof
  - Recommendation ITU-R RS.2106 - Detection and resolution of radio frequency interference to EESS (passive) sensors
- Characteristics:
  - Report ITU-R RS.2431 - Technical and operational characteristics of EESS (passive) systems in the frequency range 275-450 GHz
  - Report ITU-R RS.2456 - Space weather sensor systems using radio spectrum
  - Report ITU-R RS.2489 - Technical and operational characteristics of ground-based passive radiometers for meteorological and climatology applications operating in the 22-32 GHz and 51-58 GHz frequency ranges
  - Recommendation ITU-R RS.515 - Frequency bands and bandwidths used for satellite passive remote sensing
  - Recommendation ITU-R RS.577 - Frequency bands and required bandwidths used for spaceborne active sensors operating in the EESS (active) and space research (active) services
  - Recommendation ITU-R RS.1861 - Typical technical and operational characteristics of EESS (passive) systems using allocations between 1.4 and 275 GHz
  - Recommendation ITU-R RS.2105 - Typical technical and operational characteristics of EESS (active) systems using allocations between 40 MHz and 238 GHz

WP 7C important documentation (2/2) (non-exhaustive)

- Handbooks:
  - Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction
  - Earth Exploration-Satellite Service
- Sharing/Performance/Protection Criteria:
  - Recommendation ITU-R RS.1166 - Performance and interference criteria for active spaceborne sensors
  - Recommendation ITU-R RS.2017 - Performance and interference criteria for satellite passive remote sensing
- Radio Regulations:
  - RR Footnote 5.340 - …all emissions are prohibited!!!
  - Resolution 750 - Compatibility between the Earth exploration-satellite service (passive) and relevant active services
  - Resolution 673 - The importance of Earth observation radiocommunication applications
  - Resolution 675 - Importance of meteorological aids service (space weather) applications

Summary table of allocations & identifications to EESS (passive) vs. WRC-27/31 AIs

EESS (passive) primary allocations either RR FN. 5.340 or shared				EESS (passive) identifications above 275 GHz			
Frequency band	WRC AI	Frequency band	WRC AI	Frequency band	WRC AI	Frequency band	WRC AI
1400-1427 MHz (5.340)	1.12, 1.13	100-102 GHz (5.340)	2.6	275-286 GHz (shared 5.564A, 5.565)	1.8, 2.1	634-654 GHz (5.565)	1.8
2690-2700 MHz (5.340)		109.5-111.8 GHz (5.340)	2.6	296-306 GHz (5.565)	1.8, 2.1	657-692 GHz (5.565)	1.8
10.6-10.68 GHz (shared)		114.25-116 GHz (5.340)	1.18	313-318 GHz (5.565)	1.8, 2.1	713-718 GHz (5.565)	1.8
10.68-10.7 GHz (5.340)		116-122.25 GHz (shared)		318-333 GHz (shared 5.564A, 5.565)	1.8, 2.1	729-733 GHz (5.565)	1.8
15.35-15.4 GHz (5.340)	1.7	148.5-151.5 GHz (5.340)	2.6	313-356 GHz (5.565)	1.8, 2.1	750-754 GHz (5.565)	1.8
18.6-18.8 GHz (shared)		164-167 GHz (5.340)	1.18, 2.6	361-365 GHz (shared 5.564A, 5.565)	1.8	771-776 GHz (5.565)	1.8
21.2-21.4 GHz (shared)		174.8-182 GHz (shared)	2.6	369-392 GHz (shared 5.564A, 5.565)	1.8	823-846 GHz (5.565)	1.8
22.21-22.5 GHz (shared)		182-185 GHz (5.340)	2.6	397-399 GHz (shared 5.564A, 5.565)	1.8	850-854 GHz (5.565)	1.8
23.6-24 GHz (5.340)		185-190 GHz (shared)	2.6	409-411 GHz (shared 5.564A, 5.565)	1.8	857-862 GHz (5.565)	1.8
31.3-31.5 GHz (5.340)		190-191.8 GHz (5.340)	2.6	416-434 GHz (shared 5.564A, 5.565)	1.8	866-882 GHz (5.565)	1.8
31.5-31.8 GHz (5.340 R2) (shared R1,R3)		200-209 GHz (5.340)	1.18	439-450 GHz (shared 5.564A, 5.565)	1.8	905-928 GHz (5.565)	1.8
36-37 GHz (shared)		226-231.5 GHz (5.340)	1.8, 2.6	450-467 GHz (5.565)	1.8	951-956 GHz (5.565)	1.8
50.2-50.4 GHz (5.340)	1.1	235-238 GHz (shared)	1.8	477-502 GHz (5.565)	1.8	968-973 GHz (5.565)	1.8
52.6-54.25 GHz (5.340)	1.3	239.2-242.2 GHz (shared)	1.8	523-527 GHz (5.565)	1.8	985-990 GHz (5.565)	1.8
54.25-59.3 GHz (shared)		244.2-247.2 GHz (shared)	1.8	538-581 GHz (5.565)	1.8		
86-92 GHz (5.340)	1.18	250-252 GHz (5.340)	1.8, 2.6	611-630 GHz (5.565)	1.8		

WP 7D (Chair: Mr. Balthasar Indermuehle (Australia)

WP 7D covers the radio astronomy service. Its scope includes radio astronomy and radar astronomy sensors, both Earth-based and space-based, including space very long baseline interferometry (VLBI).

Structure:

- Working Group 7D-1: WRC-27 agenda item 1.16
  - Chair: Mr Jonathan Williams (USA)
- Working Group 7D-2: WRC-27 agenda item 1.18
  - Chair: Mr Yvan Thomas (France)
- Working Group 7D-3: WRC-23 Resolutions, ITU-R Questions & AOB
  - Chair: Mr. Balthasar Indermuehle (Australia)

WP 7D topics (1/2) (non-exhaustive)

- Leading group for WRC-27 agenda item 1.16 (Radio Quit Zones & aggregate interference):
  - Working document towards a preliminary draft new Report ITU-R RA.[NGSO-RAS-RQZ] - [Mitigation techniques that could be taken by the concerned administration in their bilateral and multilateral negotiations to improve data collection quality at Radioastronomy Observatory in the Radio Quiet Zones supporting the Square Kilometre Array (SKA) and the Atacama Large Millimeter/submillimeter Array (ALMA) in presence of non-GSO satellite systems (Doc 7D/235, Annex 1);
  - Working document towards draft CPM text for WRC-27 agenda item 1.16 (Doc 7D/235, Annex 25);
  - Elements document regarding WRC-27 agenda item 1.16 with the EPFD calculation method and a compatibility study between non-GSO FSS systems and RAS Earth stations at 10.7 GHz (Doc 7D/235, Annex 3);
- Leading group for WRC-27 agenda item 1.18, resolves 2 (RAS protection > 76 GHz):
  - Working document towards a preliminary draft new Report ITU-R RA.[RAS-SAT 71-235 GHZ] - Compatibility between RAS operating in the 76-81, 130-134, 164-167 and 226-231.5 GHz and adjacent active satellite services (Doc 7D/235, Annex 7);
  - Considerations on draft CPM text for WRC-27 agenda item 1.18 (Doc 7D/235, Annex 8);
  - Draft revision of Tables 1 and 2 of the Annex to Resolution 739 (WRC-19) - WRC-27 agenda item 1.18 (Doc 7D/235, Annex 6);

WP 7D topics (2/2) (non-exhaustive)

- Work on other topics:
  - Shielded zone of the Moon (several Working documents towards preliminary draft new Reports (Doc 7D/235, Annexes 9 to 13);
  - RAS receiver resilience,
  - RAS vs. IMT at 6-7 GHz and 43 GHz,
  - Geodetic Very Long Baseline Interferometry (GEOVLBI),
  - Unintended electromagnetic radiation (UEMR) from space systems,
  - Revisions to Recommendation ITU-R RA.1513 and Reports ITU-R RA.2188-1 and ITU-R RA.2126.
- Contributing to WRC-27 AIs 1.1, 1.3, 1.6, 1.7, 1.8, 1.10, 1.11, 1.12, 1.13, 1.15 and 1.17.

WP 7D important documentation (non-exhaustive)

- Characteristics:
  - Report ITU-R RA.2259 - Characteristics of radio quiet zones
  - Report ITU-R RA.2507 - Technical and operational characteristics of the existing and planned Geodetic Very Long Baseline Interferometry
  - Report ITU-R RA.2509 - Technical and operational characteristics of radio astronomy systems operating below 350 MHz (85 cm)
  - Report ITU-R RA.2510 - Technical and operational characteristics of radio astronomy systems in the 67-116 GHz (3-4 mm) range
  - Report ITU-R RA.2512 - Technical and operational characteristics of broadband, background-limited detectors operating in the millimetre-wave regime
  - Recommendation ITU-R RA.314 - Preferred frequency bands for radio astronomical measurements below 1 THz
- Handbooks:
  - Radio Astronomy
- Sharing/Performance/Protection Criteria:
  - Recommendation ITU-R RA.769 - Protection criteria used for radio astronomical measurements
  - Recommendation ITU-R RA.1031 - Protection of the radio astronomy service in frequency bands shared with active services
  - Recommendation ITU-R RA.1513 - Levels of data loss to radio astronomy observations and percentage-of-time criteria resulting from degradation by interference for frequency bands allocated to the radio astronomy service on a primary basis

Summary of hot topics of concern to the SG 7 community

- Large (mega) constellations of non-geostationary satellite systems and in general the huge increase in NGSO satellites already today and in the coming years bear significant challenges and RFI (related to WRC-27 AI 1.16).
- Expansion of use and applications of satellite services within existing satellite allocations require appropriate regulations to avoid RFI (WRC-27 AIs 1.1 and 1.3).
- General trend by active services to also use higher frequency bands require appropriate regulation to avoid RFI (WRC-27 AIs 1.8 and 1.18, WRC-31 AIs 2.1 (275-325 GHz allocations) and 2.6 (IMT >102 GHz)).
- For future Sea Surface Temperature (SST) measurements, there is a chance to compensate for the degraded usability in the 6/7 GHz range by adding allocations in the bands 4.2-4.4 GHz and 8.4-8.5 GHz (WRC-27 AI 1.19).
- Potential negative impacts particularly on MetSat and EESS Earth stations, if WRC-27 would agree on an IMT identification in the band 7125-8400 MHz (WRC-27 Agenda Item 1.7).
- New Mobile Satellite Service (MSS) allocations/applications, particularly direct connectivity between space stations and IMT User Equipment in the frequency range 694-2700 MHz (WRC-27 Agenda Item 1.13), could cause some issues.
- The race to the Moon requires
  - new SRS allocations to achieve advance science objectives (WRC-27 Agenda Item 1.15);
  - development of the appropriate regulatory environment to ensure the protection of RAS on the SZM (WRC-27 agenda item 1.15);
  - long-term viability of existing SRS allocations (WRC-27 AIs 1.7, 1.11, 1.12, 1.13).

Large (mega) constellations of non-geostationary satellite systems

- Skyrocketing number of filings for large constellations of non-geostationary satellite systems;
  - Recent Space Sustainability Forum (7-8 Oct, Geneva) talked about 1.8 million satellites in ITU filings by 2030;
  - RFI challenges related to intended emissions, unwanted emissions and unintended electromagnetic radiation from satellites (UEMR).
- Huge issue for RAS in numerous frequency bands (even in much larger frequency ranges than those currently allocated to the RAS);
  - WRC-27 Agenda Item 1.16 attempts finding mechanisms to protect RAS;
  - Assessing the single-entry and aggregate impact of NGSO FSS in the several bands listed in Annex 1 to Resolution 681 (WRC-23);
  - Recognition of Radio Quiet Zones (RQZ)
    - Discussion: Recognition/protection strictly within the bands allocated to RAS vs. larger bandwidths RAS is critically dependent on;
    - Res 681 explicitly only mentions two RAS facilities in considering k) for a possible RQZ recognition in the RR, leaving no room for extending the scope to other sites.

Expansion of use & applications within existing satellite allocations

- WRC-27 Agenda Items 1.1 (FSS aeronautical and maritime ESIMs in the 47.2-50.2 GHz and 50.4-51.4 GHz bands) & 1.3 (FSS gateways in the 51.4-52.4 GHz band transmitting to non-GSO systems;
  - Are the already established unwanted emission limits in the RR Resolution 750 still appropriate to protect the 50.3 GHz and 52.7 GHz passive sensing bands from these additional applications?

- Studies in WP7C regarding the possible impact of NGSO FSS (with an apogee lower than 20 000 km) on EESS (passive) sensors in the band 18.6-18.8 GHz;
  - Radio Regulations footnote 5.522B (WRC-2000) limits the use of the band 18.6-18.8 GHz by the FSS to geostationary systems and systems with an orbit of apogee greater than 20 000 km.
    - Will the satellite industry attempt to initiate a future WRC agenda item with the aim to modify the Radio Regulations to allow such use?

  - Regarding the band 18.6-18.8 GHz there is still an ongoing assessment of the RFI potential from GSO FSS due to reflections from large bodies of water into EESS (passive) sensors.

General trend by active service to also use higher bands (> 71 GHz)

- Opportunity: WRC-27 Agenda Item 1.18 attempts at implementing relevant unwanted emission limits to protect RAS and EESS (passive) in a number of bands subject to RR footnote 5.340 (all emissions are prohibited) or subject to RR footnote 5.149 (RAS) (76-81 GHz, 130-134 GHz), ahead of the deployment by allocated active services;
  - First temporary licenses for a satellite constellation using the bands 71-76 GHz and 81-86 GHz for NGSO gateway earth stations already issued in individual countries, requiring the establishment of appropriate unwanted emission limits in the RR Res 750 to protect the RR footnote 5.340 band 86-92 GHz and also measures to protect RAS in the bands 76-86 GHz and 92-94 GHz, both subject to RR footnote 5.149.
- Radiolocation services in bands above 231.5 GHz (WRC-27 Agenda Item 1.8);
  - So far, potential applications avoid frequency overlap with EESS (passive);
  - Nevertheless, some potential automotive applications in adjacent bands, due to their high number of devices, could cause aggregated unwanted emissions that would exceed the protection criteria for EESS (passive) and thus would require the establishment of appropriate limits in the Radio Regulations.
- Preliminary WRC-31 agenda item 2.1 (Extension of the frequency allocation table from 275 GHz to 325 GHz) and agenda item 2.6 (IMT (6G) in bands between 102 and 275 GHz).

Compensatory spectrum for Sea Surface Temperature (SST)

- Opportunity: WRC-27 Agenda Item 1.19 aims at new frequency allocations for EESS (passive) in the bands 4.2-4.4 GHz and 8.4-8.5 GHz (on a non-protection basis);
  - Compensation for the degraded usability and quality of the SST measurement data in the 6/7 GHz range due to the IMT identification in that range at WRC-23;
    - Vision: Future multichannel instruments utilising all three bands for SST measurements.
- Some potential negative impacts on these potential new allocations to EESS (passive) for SST measurements in the bands 4200-4400 MHz and 8400-8500 MHz from potential IMT identification under WRC-27 agenda item 1.7.

Additional spectrum identification for IMT (WRC-27 Agenda Item 1.7)

- Some potential negative impacts on the potential new allocations to EESS (passive) for SST measurements in the bands 4200-4400 MHz and 8400-8500 MHz from potential IMT identification in neighbouring bands.
- WP 5D: Discussions ongoing in ITU-R whether or not to consider studies on the potential for RFI from the Space Research Service (Earth-to-space) in 7145-7190 MHz (deep space) and 7190-7235 MHz (near-Earth) uplinks into IMT;
  - Uplinks in these frequency bands provide command & control messages to space research stations in deep space (2M km from the Earth) and near-Earth region including the lunar vicinity and Lagrange points;
  - This would result in large separation distances to protect IMT which in turn could result in future negative impacts to the operation of SRS Earth stations, e.g. resulting in restrictions on the operation of space research Earth stations;
    - Experience: Moratorium on licensing by national regulators resulting in a loss of space research Earth station utilisation and potential future deployments.
- Studies on required separation distances to protect EESS and MetSat Earth stations in various bands (7450-7550 MHz, 7750-7900 MHz and 8025-8400 MHz);
  - Numbers currently range from 1-5km to 200km, depending on the assumptions used (and the authors);
    - Regulatory conditions to protect existing services such as RAS, EESS (passive) or receiving Earth stations of data from EESS and MetSat satellites are not very much appreciated as they devalue the spectrum to be auctioned.
      - Result: No protection is granted to EESS and MetSat receiving Earth stations.
- The band 15.35-15.4 GHz is subject to RR footnote 5.340 (all emissions are prohibited) and thus used by RAS worldwide.
  - Mechanism: Unwanted emissions to be limited to comply with RAS protection requirements (Rec. ITU-R RA.769).

New Mobile Satellite Service (MSS) allocations/applications

- Direct connectivity between space stations and IMT User Equipment (UE) in the frequency range 694-2700 MHz (WRC-27 Agenda Item 1.13);
  - Identification of a list of 15 frequency band pairs in the uplink and downlink for MSS direct communication with IMT UE;
  - 5 bands in overlap with other WRC-27 agenda items on MSS (1.12 and 1.14) adding complexity;
  - Impact from direct to cell transmissions on RAS up to 4th and 5th harmonics;
  - One uplink frequency under consideration is at 1427-1470 MHz which is adjacent to the band 1400-1427 MHz, subject to RR footnote 5.340 (all emissions prohibited). The same applies to agenda item 1.12.
    - Mechanism: Protection to be ensured through mandatory unwanted emission limits in Res. 750.

- MSS in the 1427-1432 MHz, 1645.5-1646.5 MHz, 1880-1920 MHz and 2010-2025 MHz bands for low data rate non-GSO systems (WRC-27 Agenda Item 1.12).

- MSS in the bands 2 010-2 025 MHz, 2120-2160 MHz and 2 160-2 170 MHz (WRC-27 Agenda Item 1.14).

Race to the Moon requires dedicated spectrum

- Lunar surface communications and with lunar orbits (WRC-27 Agenda Item 1.15);
  - Resolution 680 (WRC-23) calls for studies on systems in the Space Research Service (SRS) which may operate on the lunar surface, or systems in lunar orbit communicating with systems on the lunar surface, in the following frequency ranges or portions thereof:
    - 390-406.1 MHz, 420-430 MHz and 440-450 MHz, limited to outside the shielded zone of the Moon;
    - 2400-2690 MHz, 3500-3800 MHz, 5150-5570 MHz, 5570-5725 MHz, 5775-5925 MHz, 7190-7235 MHz, 8450-8500 MHz and 25.25-28.35 GHz.
  - The Shielded Zone of the Moon (SZM) is a unique radio quiet environment for radioastronomical research and other passive applications, subject to RR No. 22.22-22.25 (Do these provisions leave room for interpretation?);
    - For RAS: In particular, the frequency range below 2 GHz has to be kept free from interference. In the short term frequency bands below 50 MHz are of interest, since many planned space missions concentrate on that frequency range;
    - Protection of RAS in the Shielded Zone of the Moon (SZM);
      - Mechanism: Implementation of appropriate mechanisms/methodology for protecting RAS and passive space research in the SZM from harmful interference, in frequency bands which are not prohibited by RR No. 22.22-22.24.

Thank you very much for your attention!