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ITUEvents

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3 - 5 December 2025
Geneva, Switzerland

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#ITUWRC

Session 2 on MSS
WRC-27 agenda item
1.11, 1.12 and 1.14

Mr Paul DEEDMAN (vice-chair WP 4C)
Ms Xochitl HERNANDEZ (chair, WP 4C SWG ai 1.11)
Mr Nick SPINA (chair, WP 4C SWG ai 1.12)
Ms Jennifer MANNER (chair, WP 4C SWG ai 1.14)

Plan for the session

1. Opening remarks, introduction of panelists, overview of agenda items
2. WRC-27 agenda item 1.11
   - Description of studies and issues
   - Positions of regional groups and other international bodies
3. WRC-27 agenda item 1.12
   - Description of studies and issues
   - Positions of regional groups and other international bodies
4. WRC-27 agenda item 1.14
   - Description of studies and issues
   - Positions of regional groups and other international bodies
5. Common elements between these agenda items
6. Q & A and Closing remarks

Panelists of the session

- Ms Xochitl HERNANDEZ (Chair, ITU-R WP 4C SWG ai 1.11)
- Mr Nickolas SPINA (Chair, ITU-R WP 4C SWG ai 1.12)
- Ms Jennifer MANNER (Chair, ITU-R WP 4C SWG ai 1.14)
- APT: Dr Daesub OH (APG WP 3 Co-Chair)
- ASMG: Dr Mohamed EL-MOGHAZI (Chair WG on Satellite technologies)
- ATU: Abd Elhamid HUISSEN (ATU WG 3 Chair)
- CEPT: Ms Nadia KATSANOU (CPG PT C Chair & CPG Vice Chair).
- CITEL: Mr Mike RAZI (CITEL MSS SWG Coordinator)
- RCC: Sergey UVAROV (AI 1.11 and AI 1.12) + Olga MIRONOVA (AI 1.14)

ITU-R WP 4C study activity

	AI 1.11	AI 1.12	AI 1.14
Subject	**Satellite-satellite links in existing MSS bands around 1.5/1.6/2.4 GHz**	**New MSS allocations to support NGSO low data rate applications**	**New MSS allocations around 2 GHz**
SWG Chair	Ms Xochitl Hernandez	Mr Nick Spina	Ms Jennifer Manner
Responsible group	WP4C	WP4C	WP4C
Contributing groups	WP 3L; WP 3M; WP 4A; WP 4B; WP 5A; WP 5B; WP 5C; WP 5D; WP 7B; WP 7C; WP 7D	WP 3L; WP3M; WP 4B*; WP 5A; WP 5B; WP 5C; WP 5D; WP 7B; WP 7C; WP 7D	WP 3L; WP 3M; WP 4B; WP 5A; WP 5C; WP 5D; WP 7B
Expected deliverables	• Draft CPM text • Supporting studies, currently a "working document", including "enabling tables".	• Draft CPM text • Supporting studies, currently a "working document", including "enabling tables".	• Draft CPM text • Supporting studies, currently a "working document", including "enabling tables".

"Enabling tables" developed partly in response to the "best practices" developed by WRC-23 (see 4C/2)

*WP 4B is requested to provide information on future development of low-data-rate non-GSO MSS systems

Next WP 4C meetings

- April/May 2026
- [July 2026] – TBC
- October 2026 *(delivery of draft CPM text)*
- April/May 2027 - TBC

WRC-27 agenda item 1.11

Ms Xochitl Hernandez

Overview

- To consider the technical and operational issues, and regulatory provisions, for space-to-space links among non-geostationary and geostationary satellites in the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz allocated to the mobile-satellite service, in accordance with Resolution **249 (Rev. WRC-23)**.

- Inter-satellite links enable continuous or near-continuous communications for satellite networks and systems, overcoming gaps in ground connectivity, improving low-latency data delivery, and expanding opportunities for real-time applications and efficient data relay.

- In the current RR, MSS allocations in 1-3 GHz do not include a space-to-space directional indicator. Consequently, such operations may be conducted only on a non-interference basis. Consequently, several satellite networks and systems operate space-to-space transmissions under RR No. 4.4.

ITU studies

- Development of technical conditions and regulatory provisions for the operation of space-to-space links, including MSS (space-to-space) allocations or the addition of inter-satellite service (ISS) allocations, in all or parts of the frequency bands identified in this agenda item, with the condition that stations operating in an MSS (space-to-space) or ISS allocation shall not cause harmful interference to, or claim protection from, the MSS (space-to-Earth) or MSS (Earth-to-space), while ensuring protection of other services allocated in those and adjacent frequency bands.

- Studies are examining the technical, operational, and regulatory aspects of non-GSO and GSO *service provider space stations* operating space-to-space links with non-GSO *user space stations*, ensuring these links only operate in the same direction as existing MSS allocations.

Main concepts

- “MSS service provider space station” is considered to be a space station transmitting in a band allocated to the MSS (space-to-Earth) towards user space stations which receive within the framework of the MSS (space-to-space) or inter-satellite service (ISS) at lower altitudes, and receiving in a band allocated to the MSS (Earth-to-space) from user space stations at lower altitudes, all within the notified beams of the MSS service provider network or system.”

- A “user space station” is considered to be a space station transmitting within the framework of the MSS (s-s) or ISS in a band allocated to the MSS (Earth-to-space) towards MSS service provider space stations at higher altitudes, and receiving in a band allocated to the MSS (space-to-Earth) from MSS service provider space stations at higher altitudes, all within the notified beams of the MSS service provider network or system.

Working document

- Working document
  - Satellite-to-satellite technical characteristics and operational parameters (GSO, non-GSO)
    - MSS service providers
    - User space stations
  - Incumbent services parameters for study (in-band, adjacent band)
  - Space-to-space link compatibility with incumbent services (technical studies)
  - Preliminary results

Draft CPM text

- Draft CPM text
  - Method A (NOC)
  - Method B (as general method)
    - Method B1

    1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660 MHz.
    NOC
    1 518-1 525 MHz, 1 610-1 626.5 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz.
    [TBD]
    - Method B2

    Add a space-to-space directional indicator for existing MSS allocations in the 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]

Open issues

- Definition of the cone of coverage of the MSS service provider space station.
- Which services are the incumbents?
- Possible revision of current technical studies due to the information provided in the enabler table
- Would studies be required for the MSS frequency bands in space-to-Earth direction?

Positions of regional groups and international organisations on AI 1.11

Source	AI 1.11
SFCG	X
ICAO	X
WMO	X
IMO	X
RCC	X
ASMG	X
CEPT	X
WBU	X
APT	X
CITEL	X
ATU	X

WRC-27 agenda item 1.12

Mr Nick Spina

Overview

- To consider possible allocations to the MSS and possible regulatory actions in the frequency bands 1 427 - 1 432 MHz (space-to-Earth), 1 645.5 - 1 646.5 MHz (space-to-Earth)(Earth-to-space), 1 880 - 1 920 MHz (space-to-Earth)(Earth-to-space) and 2 010 - 2 025 MHz (space-to-Earth)(Earth-to-space) required for future development of low-date-rate non-GSO MSS, in accordance with Resolution **252 (Rev. WRC-23)**.

- Core idea: non-GSO systems not delivering telephony that transmit data in bursts (Machine to Machine or IoT type). Targeted to facilitate MSS below 5 GHz given he inherent size, weight and power restrictions of small satellites as described in ITU-R SA.2312. These MSS systems should employ interference-mitigating measures to facilitate spectrum sharing and compatibility between systems and other services.

- Access to existing MSS spectrum is heavily encumbered, making coordination challenging. Low-data-rate MSS systems may require significantly less spectrum than typical MSS, and a clean sheet allocation with technical limitations to ease coordination is being studied.

Main concepts

- The demand for low-data-rate MSS systems has grown with the expansion of the Internet of Things and the increasing deployment of small satellites. Such systems provide intermittent, burst-mode connectivity that can potentially operate with packet loss, serving applications such as asset tracking, sensor networks, data collection, and remote monitoring.

- Coordination of generic MSS services can be complex and time-intensive, establishing a new allocation accompanied by clearly defined coexistence mechanisms could help streamline deployment and provide greater predictability for all stakeholders.

- For the emerging development of satellite-based Internet of Things (IoT) applications global access to harmonized spectrum for use by non-GSO LDR MSS systems may facilitate deployment. Such harmonization can support consistent service availability, reduce regulatory complexity for operators, and encourage broader international adoption of low-data-rate satellite solutions.

ITU studies

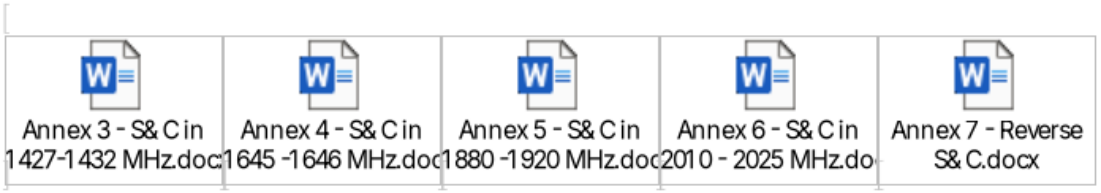
- Description Definition of low-data-rate MSS
  - Currently in development as work progresses
- Studies on spectrum requirements
  - Currently varies greatly between different systems
- Technical and operational characteristics and conditions
  - Currently relatively stable, minor updates being made through contributions
- Mitigation techniques, that allow coexistence of these systems in the same frequency bands
  - Currently in development and heavily dependent on each systems characteristics
- Studies on sharing and compatibility between the non-GSO low-data-rate MSS systems
- and the existing primary services operating in the frequency band and in the relevant adjacent frequency bands, in order to ensure protection of existing services
  - Currently in development with good progress being made

Working document

- 4C Chair Report – Document R23-WP4C 528 Annex 5
- Section 4: Description/Definition of low-data-rate MSS
- Section 5: Spectrum Requirement methodologies and assessments
- Section 6: Technical and operational characteristics 7 Systems
- Section 7: Operational conditions (including sharing of the band)
- Section 8: Current use of the bands under study
- Section 9 & 10: Sharing and compatibility studies
  - Note that studies are broken out into separate documents based on frequency bands

ANNEX OF STUDIES

[Editor's note: The sharing and compatibility studies are separated into separate annexes by frequency band and attached below]



Draft CPM text

- Method A - Frequency band 1 427-1 432 MHz
  - TBD
- Method A - Frequency band 1 645.5-1 646.5 MHz
  - TBD
- Method A - Frequency band 1 880-1 920 MHz
  - ADD Earth-to-space and space-to-Earth with PFD Limits

$$\begin{array}{ll} -149+0.85*\theta^2 & dB(W/(m^2*MHz)) \quad for\ 0° \le \theta < 2° \\ -153.4+22.5*log\theta & dB(W/(m^2*MHz)) \quad for\ 2° \le \theta \le 90° \end{array}$$

- Method A - Frequency band 2 010 – 2 025 MHz
  - ADD Earth-to-space and space-to-Earth with PFD Limits

$$\begin{array}{ll} -148.5+0.85*\theta^2 & dB(W/(m^2*MHz)) \quad for\ 0° \le \theta < 4° \\ -154.0+24.0*log\theta & dB(W/(m^2*MHz)) \quad for\ 4° \le \theta \le 90° \end{array}$$

document is only a compilation of input contributions received

Open issues

- Description of Low Data Rate requires further clarification.
  - Ongoing discussion on whether studies should guide description or visa versa.
- Transmissions in the opposite direction in 2 GHz within Region 2
  - MSS is already allocated in R2 in the uplink. Note 2 020 – 2 025 MHz not allocated to MSS in some adm.
- Use of the 1.6 GHz band and appropriate parameters to use
  - IMO noted EPIRB no longer used and advised that 5B may provide appropriate technical characteristics.
- Sharing among Low Data Rate systems
  - Further work is required on identifying and codifying the methods by which various LDR-MSS will coexist
- Overlapping frequency bands with other agendas
  - As with most agendas, overlapping bands pose additional work. Further clarity on how potential allocations in other agendas should be treated with respect to being protected or not.

Positions of regional groups and international organisations on AI 1.12

Source	AI 1.12
SFCG	X
ICAO	X
WMO	X
IMO	X
RCC	X
ASMG	X
CEPT	X
WBU	X
APT	X
CITEL	X
ATU	X

WRC-27 agenda item 1.14

Ms. Jennifer A. Manner

Why AI 1.14 is needed

- Growing demand for access for MSS spectrum below 3 GHz globally
- Demand covers everything from IoT to broadband
- Today only L and S band frequencies globally available under 2.5 GHz and use of these bands is increasing
- Additional MSS spectrum could enable enhanced services, contribute to bridging the digital divide and support global harmonization.

Who Would Be Impacted (1/3)

- 1980-2010 MHz (Region 1 and 3) *(Adjacent band)*
  - Already allocated in Region 2
  - Mobile Service, IMT, European Aviation Network (1980-2005 MHz uplink), MSS (earth-to-space) including NGSO and GSO networks
  - Identified for IMT (including satellite component) under Resolution 212
- 2010-2025 MHz (Region 1, 2, and 3)
  - HAPS as IMT base stations, fixed service (studio transmitter links), SAP/SAB Wireless video links operating in the Mobile Service
  - IMT in adjacent bands (1710-2025 MHz and 2110-2200 MHz)
- 2025-2110 MHz (Region 1, 2, and 3) *(Adjacent band)*
  - EESS, SOS and SRS (Earth-to-space), EESS, SOS and SRS (space-to-space)
  - Used for TT&C (Tracking, Telemetry & Command) for spacecraft
  - Footnotes: 5.391, 5.392 (limit high-density mobile systems; protect space-to-space links)

Who Would Be Impacted (2/3)

- 2110-2120 MHz (Region 1, 2, and 3) *(Adjacent band)*
  - Adjacent band: SRS Deep Space (Earth-to-space)
  - Paired with 1920–1980 MHz for IMT FDD terrestrial systems
- 2120-2160 MHz (Region 1 and 3)
  - Mobile (IMT)
  - Fixed

Who Would Be Impacted (3/3)

- 2160-2170 MHz (Region 1 and 3)
  - Mobile (IMT)
  - Fixed
- 2170-2200 MHz (Region 1, 2, and 3) *(Adjacent band)*
  - Mobile and IMT
  - Adjacent and in-band ACGC terrestrial network characteristics, satellite component of EAN
  - MSS (GSO and non-GSO)
  - Fixed and Mobile services also allocated
  - Identified for IMT satellite component under Resolution 212
  - Used for MSS downlink (complementary to 1980–2010 MHz uplink)

Differences between Res 254 & 256

Aspect	Resolution 254 – Resolves 3	Resolution 256 – Resolves 2
Main Objective	Study measures to protect existing services when considering additional MSS allocations.	Complete studies on IMT use in specific bands for WRC-27.
Scope of Studies	Technical, operational, and regulatory measures for protection and future development.	Technical, operational, and regulatory issues for IMT deployment and spectrum planning.
Protection Requirement	Ensure protection of existing services from harmful interference without extra constraints.	Ensure sharing and compatibility to protect incumbent services without extra constraints.
Target Service	Mobile-Satellite Service (MSS).	Terrestrial IMT systems.
Additional Considerations	Continued operation and future development of existing services.	Evolving IMT needs, technology advances, deployment scenarios, developing countries, timing.

Differences between Res 254 & 252

Aspect	Resolution 254	Resolution 252
Primary Goal	MSS allocations	MSS allocations for low-data-rate
Bands Studied	2010–2025, 2120–2160, 2160–2170 MHz	1.4, 1.6, 1.8 GHz and 2010-2025 MHz
Regions	Global, with emphasis on Regions 1 & 3	2010-2025 MSS primary in R2 2010-2025 HAPS R1 & R3
Direction	Earth-to-space & space-to-Earth	Earth-to-space & space-to-Earth

Structure of Next Meeting

- To help with work, we will establish, if approved, a Drafting Group
- The drafting group purpose will be to support work on the Enabling Table and other issues, as required

Open issues

- List of open issues/clarifications still required on the studies
- List of Q/A included in the working document on sharing and compatibility studies
- Protection criteria, technical and operational characteristics, deployment scenarios, simulation duration, etc.
  - IMT DL studies
  - PMSE
  - IMT UL (inc. HIBS)
  - FS
  - MS DL
  - SOS

Positions of regional groups and international organisations on AI 1.14

Source	AI 1.14
SFCG	X
WMO	X
RCC	X
ASMG	X
CEPT	X
WBU	X
APT	X
CITEL	X
ATU	X

Common Elements

Mr Paul Deedman

Two issues:

1. MSS protection criterion
2. Overlapping frequency bands

MSS protection criterion

1. AIs 1.11, 1.12, 1.13 and 1.14 all include in their scope their studies, potential interference to incumbent MSS systems
2. ITU-R Recommendations on MSS protection criteria have some shortcomings:
    1. Recommendation ITU-R M.1183 applies to GSO MSS systems. No equivalent for non-GSO MSS systems.
    2. Some administrations consider Rec. ITU-R M.1183 to be outdated, others consider it to be applicable to current systems.
    3. Some uncertainty in application on ITU-R M.1183 for time-varying interference.
3. Consequently, some co-existence studies may be conducted with different protection criteria.

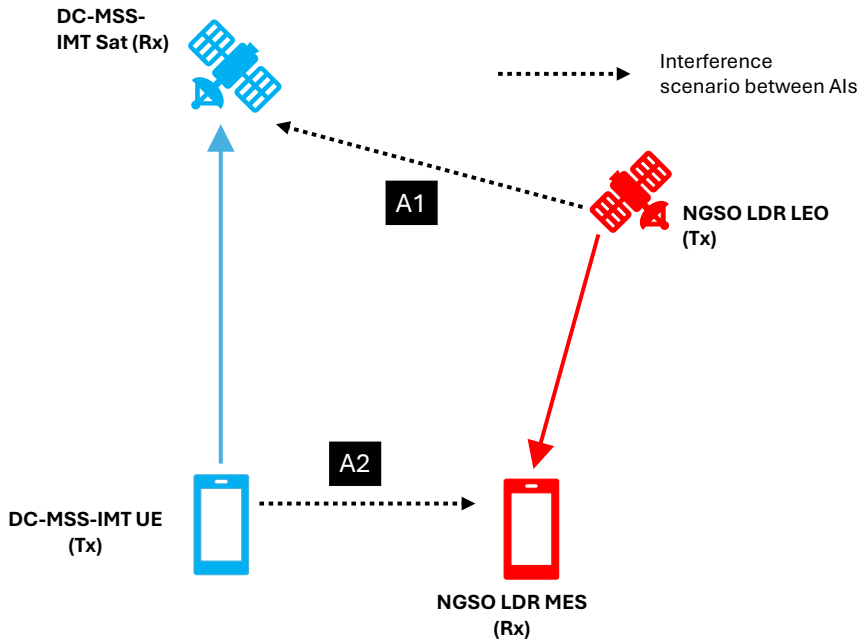
Overlapping frequency bands (1/4)

1. Some frequency bands are considered simultaneously by two or three of the following agenda items: 1.12, 1.13 and 1.14.

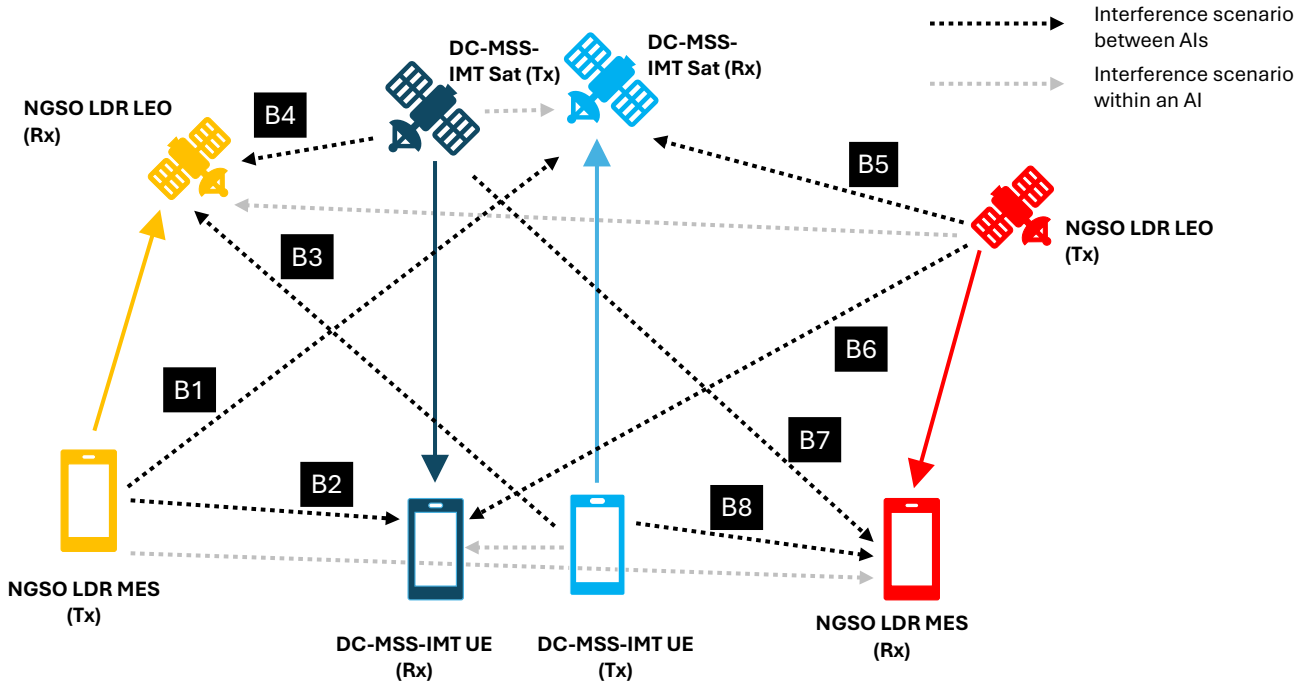
	Band	Existing MSS	AI 1.12	AI 1.13	AI 1.14
(a)	**1 427-1 432 MHz**	none	MSS↓	MSS↑	-
(b)	**1 880-1 920 MHz**	none	MSS↓↑	MSS↓↑	-
(c)	**2 010-2 025 MHz**	MSS↑ (R2)	MSS↓↑	MSS↑	MSS↑ (R1, R3)
(d)	**2 120-2 160 MHz**	mss↓ (R2)	-	MSS↓	MSS↓
	2 160-2 170 MHz	MSS↓ (R2)	-	MSS↓	MSS↓ (R1, R3)

(No overlap of AI 1.11 with other MSS agenda items)

Overlapping frequency bands (2/4)

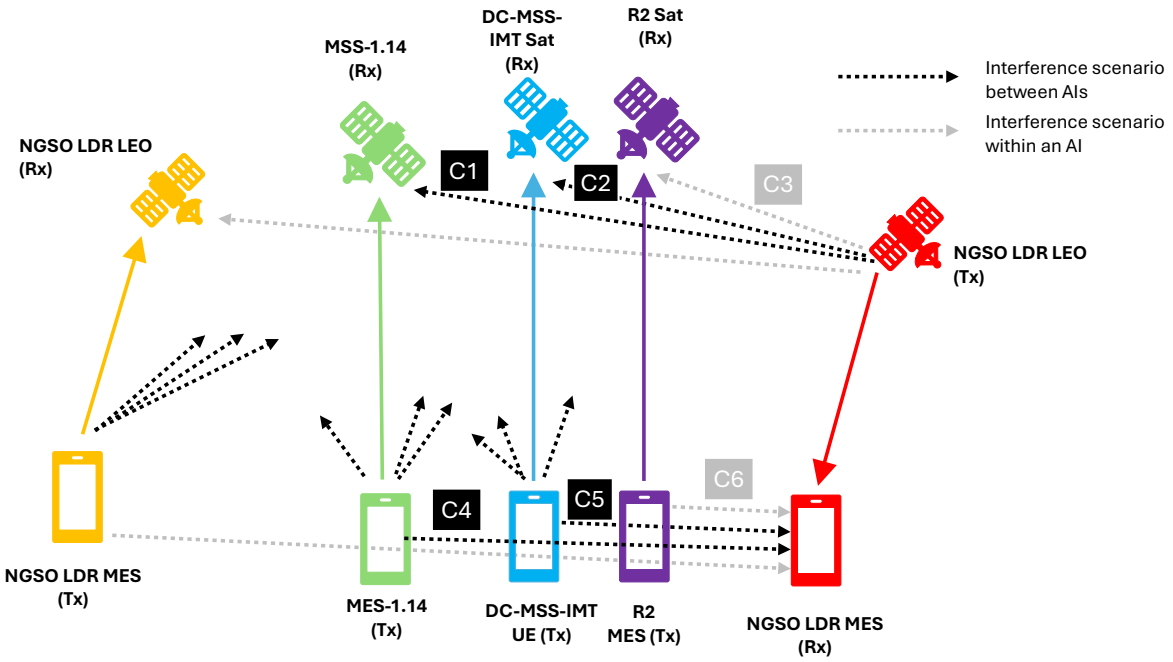


(a) 1 427-1 432 MHz

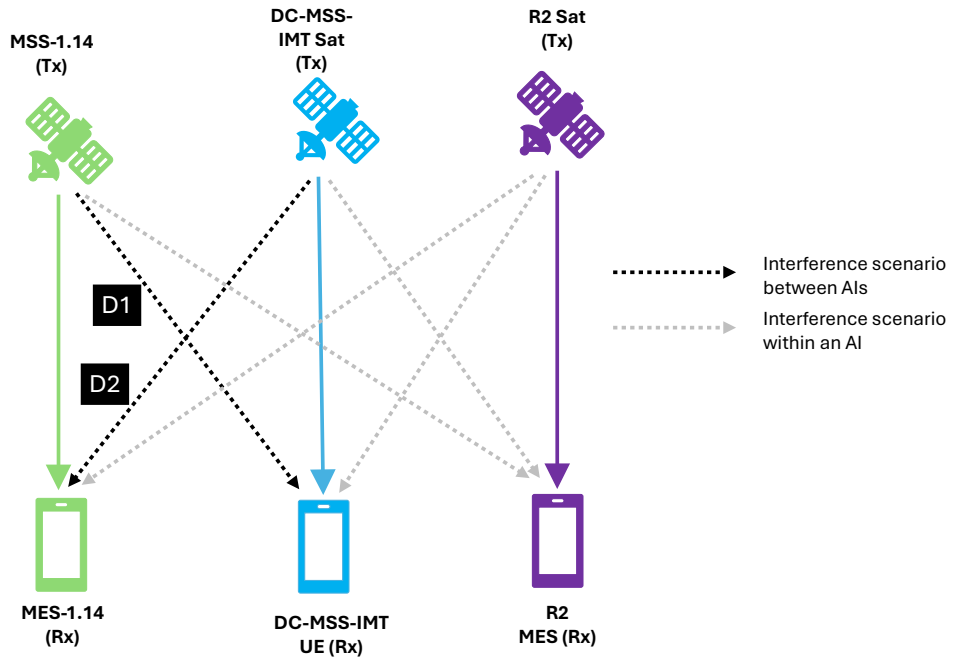


(b) 1 880-1 920 MHz

Overlapping frequency bands (3/4)



(c) 2 010-2 025 MHz



(d) 2 120-2 170 MHz

Overlapping frequency bands (4/4)

Some questions:

1. Do Administrations want the RR to accommodate two (or even three) types of MSS application in the same band?
2. If MSS *uplink and downlink* allocations are desired in the same band, will coexistence between the different MSS applications be feasible? In the same country or in different countries? Under what conditions?
3. Should the same regulatory conditions, e.g. PFD limits, apply to all types of MSS applications equally?
4. Is there a need to ensure controlled/fair access to any band, to accommodate multiple system types?

Note: contributions to address some of these issues will be welcome at the next WP 4C meeting.

Q & A