



NATIONAL PREPARATORY COMMITTEE TOWARDS WRC-27 AGENDA ITEM BRIEF

Chapter: 3

Service: Mobile-satellite issues

Agenda Item: 1.13

Description of Agenda Item: *Studies on possible new allocations to the mobile-satellite service (MSS) for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment (UE) to complement terrestrial IMT network coverage (Resolution 253 (WRC-23))*

Focus: *Direct Connectivity between Space Stations and IMT User Equipment (DC-MSS-IMT).*

Status of Studies

The ITU-R studies for WRC-27 Agenda Item 1.13, established under Resolution 253 (WRC-23), are being conducted primarily by Working Party 4C (WP 4C) in close collaboration with Working Party 5D (WP 5D) and other relevant groups.

The studies have progressed through consolidated working documents incorporating contributions from multiple administrations. These studies address spectrum requirements, technical and operational characteristics, and sharing and compatibility with incumbent services, including terrestrial IMT and services in adjacent bands.

Particular emphasis has been placed on developing a comprehensive regulatory and technical framework to enable DC-MSS-IMT while ensuring the protection of existing services.

Objective of the Studies

The objective is to evaluate possible new allocations to the mobile-satellite service within the frequency range 694/698 MHz to 2.7 GHz, taking into account IMT frequency arrangements already deployed.

The studies aim to:

- i.* Enable direct connectivity between MSS space stations and standard IMT user equipment;
- ii.* Complement terrestrial IMT networks, particularly in underserved, rural, and remote areas;
- iii.* Enhance service continuity, network resilience, and coverage extension;
- iv.* Ensure coexistence with incumbent services through appropriate technical and regulatory measures.

Unlike traditional mobile satellite services (MSS) systems, DC-MSS-IMT systems are designed to operate within frequency bands identified for IMT and to communicate directly with conventional IMT user devices (e.g., smartphones), introducing new coexistence and regulatory considerations.

Studied Frequency Bands

The scope of the study covers the frequency range between 694/698 MHz and 2.7 GHz, that is aligned with IMT frequency arrangements as contained in Recommendation ITU-R M.1036. The candidate frequency arrangements under consideration include:

Direction	
Uplink (MHz)	Downlink (MHz)
[807-849]	[852-894]
880-915	925-960
832-862	791-821
698-716/776-798	716-746/746-768
698-748	753-803
1 427-1 470	1 475-1 518
1 920-1 980	2 110-2 170
1 710-1 785	1 805-1 880
1 850-1 920	1 930-2 000
1 710-1 780	2 110-2 180
2 000-2 020	2 180-2 200
2 010-2 025	1 880-1 920
2 305-2 320	2 345-2 360
2 500-2 570	2 620-2 690

Studies have primarily focused on downlink sharing scenarios, recognizing that uplink interference conditions remain largely unchanged due to the use of standard IMT user equipment.

Methods to Satisfy the Agenda Item

Several methods have been identified and are generally structured across frequency “issues” (A–E) to enhance clarity. These include (in summary):

- i. **Method A (No Change – NOC):**
No modification to the Radio Regulations, with possible suppression of Resolution 253 (WRC-23).
- ii. **Method B / Secondary Allocation:**
Introduction of new MSS allocations on a secondary basis, limited to DC-MSS-IMT operations, subject to strict technical and regulatory provisions to ensure protection of primary services.
- iii. **Method X1 / Primary Allocation:**
Introduction of MSS allocations on a primary basis, accompanied by strict regulatory conditions (*via footnotes and a new Resolution*) aimed at ensuring that MSS:
 - a) do not cause harmful interference to the mobile service (including IMT);
 - b) do not claim protection from existing or future terrestrial IMT deployments.

In most cases, methods propose:

- i. Modifications to Article 5 of the Radio Regulations;
- ii. New regulatory footnotes;
- iii. Adoption of a new WRC Resolution defining operational, technical, and administrative conditions.

Regulatory and Technical Framework

The emerging framework integrates both technical constraints and administrative responsibilities, including:

- i. Clear definition of roles of Satellite Network Operators (SNOs) and Mobile Network Operators (MNOs);
- ii. Requirement for operation under national authorization and licensing frameworks;
- iii. Coordination between administrations, particularly for cross-border scenarios;
- iv. Implementation of enforceable regulatory obligations and compliance mechanisms.

Interference Protection Mechanisms

To ensure protection of incumbent services, the following measures are under consideration:

- i.* Power Flux-Density (pfd) Limits:
Establishment of strict pfd limits to protect terrestrial IMT systems and other services, including those in neighbouring countries.
- ii.* Advanced Beam Management:
Application of techniques such as beam shaping, sidelobe suppression, power control, and elevation angle constraints to minimize interference and signal spillover.
- iii.* Operational Control and Access Procedures:
Mandatory implementation of user identification, authentication, and authorization mechanisms (e.g., IMEI, IMSI, AKA protocols) to ensure secure and authorized access.
- iv.* Selective Beam and Cell Activation:
Dynamic control of satellite beams, particularly near borders, to prevent interference and unauthorized access.
- v.* Spectrum Coordination and Sharing Conditions:
Use of technical constraints and coordination procedures to ensure coexistence with terrestrial IMT and other incumbent services.

Technical and Regulatory Challenges

- i.* Cross-Border Operations: Satellite beam spillover into neighboring countries may result in harmful interference or unauthorized access, requiring strict coordination and control measures.
- ii.* Protection of Critical Services: Studies indicate potential harmful interference to services such as the Space Research Service (SRS), particularly in bands such as 2 110–2 120 MHz, as well as to non-IMT mobile services.
- iii.* Directional Compatibility Issues: Differences in uplink and downlink arrangements across ITU Regions may create incompatibility when adjacent regions use opposite transmission directions.
- iv.* Complex Regulatory Responsibilities: Clear delineation of responsibilities between SNOs, MNOs, and their respective administrations is required, particularly regarding interference mitigation, compliance, and enforcement.
- v.* Verification and Compliance Mechanisms: Development of robust methodologies for verifying compliance with pfd/epfd limits and ensuring that non-GSO satellite systems meet regulatory requirements.
- vi.* Coexistence with Terrestrial IMT: Ensuring that DC-MSS-IMT does not constrain the current and future development of terrestrial IMT networks remains a central regulatory requirement.

Conclusion

The studies under Agenda Item 1.13 demonstrate significant potential for integrating satellite and terrestrial IMT systems to expand connectivity. However, successful implementation depends on establishing a balanced regulatory framework that enables innovation while ensuring robust protection of incumbent services and maintaining the integrity of terrestrial IMT networks.