

NATIONAL PREPARATORY COMMITTEE TOWARDS WRC-27 AGENDA ITEM 1.10 BRIEF

Chapter: 2

Service: *Fixed, mobile and satellite issues*

Agenda Item: 1.10

Description of Agenda Item: *To consider developing power flux-density (pfd) and equivalent isotropically radiated power (e.i.r.p.) 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, in accordance with Resolution 775 (Rev.WRC-23).*

Focus: *Development of pfd and e.i.r.p. limits for satellite services in the 71-76 GHz and 81-86 GHz bands, with emphasis on protection of fixed and mobile services, including fixed wireless systems and aeronautical mobile systems.*

Status of Studies

The ITU-R studies for WRC-27 Agenda Item 1.10 are being led by Working Party 5C (WP 5C), with close collaboration from WP 3J, WP 3M, WP 4A, WP 4B, WP 4C, WP 5A, WP 5B, WP 6A, WP 7C and WP 7D. Within WP 5C, the work is being handled under Working Group 5C-2 on sharing, compatibility aspects and WRC issues.

The draft CPM text and sharing studies are still at work in progress. Further contributions are invited, particularly to complete the study results, reconcile technical assumptions and finalise the draft CPM text.

Objective of the Studies

The objective is to determine appropriate pfd limits for satellite downlinks in 71-76 GHz and e.i.r.p. limits for satellite uplinks in 81-86 GHz, for inclusion in Article 21 of the Radio Regulations, in order to protect existing and planned fixed and mobile services.

The studies aim to:

- i. Protect fixed service and mobile service deployments in the 71-76 GHz and 81-86 GHz bands;
- ii. Assess sharing between satellite services and terrestrial services under realistic technical assumptions;
- iii. Develop pfd limits for FSS, MSS and BSS space stations operating in 71-76 GHz;
- iv. Develop e.i.r.p. limits for FSS and MSS earth stations operating in 81-86 GHz.

Studied Frequency Bands

The studies cover the paired E-band ranges 71-76 GHz and 81-86 GHz. In the 71-76 GHz band, the relevant satellite allocations are space-to-Earth, and the required regulatory outcome is pfd limits to protect fixed and mobile services. In the 81-86 GHz band, the relevant satellite allocations are Earth-to-space, and the required regulatory outcome is e.i.r.p. limits to protect fixed and mobile services.

- i. 71-76 GHz: pfd limits for FSS (space-to-Earth), MSS (space-to-Earth) and BSS, where applicable, to protect fixed and mobile services.

- ii. 81-86 GHz: e.i.r.p. limits for FSS (Earth-to-space) and MSS (Earth-to-space), where applicable, to protect fixed and mobile services.
- iii. The studies also consider the current RR Article 5 allocations, including fixed, mobile, fixed-satellite, mobile-satellite, broadcasting-satellite, radio astronomy and space research allocations in parts of the bands.

Methods to Satisfy the Agenda Item

The draft CPM text remains under development. At this stage, the method section is still to be completed based on the results of sharing and compatibility studies. In general, the methods are expected to involve:

- i. modification of Article 21 of the Radio Regulations to include new or revised pfd limits for relevant satellite services in 71-76 GHz;
- ii. development of e.i.r.p. limits for FSS and MSS earth stations in 81-86 GHz to protect fixed and mobile services;
- iii. possible differentiation of limits by satellite service, orbit type, angle of arrival and reference bandwidth;
- iv. consideration of consequential regulatory actions, including whether Appendix 7 requires updating for coordination information in the 81-86 GHz band.

Regulatory and Technical Framework

The emerging framework is centred on Article 21 limits and technical sharing assumptions. The studies address the relationship between satellite pfd/e.i.r.p. limits and the protection of terrestrial receivers, taking into account fixed service antenna patterns, elevation angles, propagation assumptions, satellite constellation modelling and aggregate interference.

For fixed service protection, relevant ITU-R Recommendations include F.758 for sharing criteria, F.699 and F.1245 for fixed wireless antenna reference patterns, F.2006 for radio-frequency arrangements in 71-76/81-86 GHz, and F.2086 for deployment parameters such as elevation angles. For propagation, the work considers P.452, P.619, P.676 and P.2108, including how to treat atmospheric attenuation and clutter loss.

Interference Protection Mechanisms

The main protection mechanism is the establishment of enforceable pfd and e.i.r.p. limits. The following technical elements are being considered in the studies:

- i. pfd masks for space stations in 71-76 GHz, including possible separate treatment for GSO and non-GSO systems;
- ii. e.i.r.p. limits for earth stations in 81-86 GHz to protect fixed and mobile receivers;
- iii. Fixed Service protection criteria, including long-term I/N of -10 dB for more than 20% of the time and short-term I/N of +11 dB for more than 0.00128% of the time;
- iv. Mobile Service protection criteria, including protection of aeronautical mobile receivers using an I/N criterion of about -6 dB;
- v. Study assumptions for satellite aggregation, non-GSO constellation modelling, number of co-frequency satellites, satellite selection methodology, antenna patterns and atmospheric attenuation.

Technical and Regulatory Challenges

- i. Atmospheric attenuation: administrations have different views on how gaseous atmospheric loss should be considered when deriving Article 21 limits.
- ii. Non-GSO modelling: further work is required on how to model large non-GSO constellations, including the number of satellites, co-frequency beams and aggregation with GSO systems.
- iii. Fixed service assumptions: consensus is still needed on antenna radiation patterns, elevation angles and the treatment of modern fixed wireless deployments.
- iv. Mobile service protection: mobile receivers, including aeronautical mobile systems, may point above the horizon and therefore require careful treatment in both bands.

- v. Coordination and Appendix 7: AI 1.10 is limited to pfd/e.i.r.p. limits for protecting fixed and mobile services, but coordination between terrestrial stations and earth stations, including possible Appendix 7 updates for 81-86 GHz, remains an important consequential issue.

Conclusion

Agenda Item 1.10 is important for enabling orderly development of satellite and terrestrial systems in the 71-76 GHz and 81-86 GHz bands. The studies have progressed, but further work is required to reconcile key technical assumptions and finalize pfd/e.i.r.p. limits that protect fixed and mobile services without unnecessarily constraining satellite services. Uganda should continue monitoring the development of the Article 21 limits, particularly their impact on future high-capacity fixed wireless links, mobile applications and satellite service deployment in the E-band.