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IAFI[1]

PROPOSAL FOR AN ADDITIONAL METHOD TOWARDS DRAFT CPM TEXT FOR WRC-27 AGENDA ITEM 1.2

1 Background

WRC-27 agenda item 1.2 addresses possible revisions to the sharing conditions in the frequency band 13.75-14 GHz to enable the operation of fixed-satellite service (FSS) uplink earth stations with smaller antenna sizes, in accordance with Resolution **129 (WRC-23)**.

The working document towards the draft CPM text for WRC-27 agenda item 1.2 was revised during the Working Party (WP) 4A meeting in May 2025 and included as Annex 4 to Document 4A/830. The document identifies three methods to satisfy the agenda item:

– Method A: No changes to the Radio Regulations and suppression of Resolution **129 (WRC-23)**.

– Method B: Modification to footnotes RR Nos. **5.502**, **5.503** introducing new technical limits for the FSS earth stations in the frequency band 13.75-14 GHz.

– Method C: Modification and suppression of footnotes RR Nos. **5.502** and **5.503**, thereby removing technical limits for the FSS earth stations in the frequency band 13.75-14 GHz.

2 Discussion

Based on a review of various sharing studies submitted to ITU-R under WRC-27 agenda item 1.2, it is noted that the probability of aggregate interference into the radio location service (RLS) from the deployment of FSS earth stations in the GSO networks or in the smaller constellations of non-GSO satellites deploying a limited number of terminals and using small antennas, is extremely low. However, for some large-scale terminal deployments, the aggregate interference threshold into RLS could be exceeded.

Consequently, defining an equivalent isotropically radiated power (EIRP) density level, tied to the number of terminals of a non-GSO constellation, can thus technically help manage the predicted interference levels. For GSO networks and small non-GSO systems operating at relatively high

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orbital altitudes, the number of simultaneously transmitting earth stations remains intrinsically low. In such cases, aggregate interference levels are likely to remain well below harmful interference thresholds, even when smaller antennas are employed. Further, non-GSO systems operating at higher orbital altitudes (e.g. MEO or high-altitude non-GSO) exhibit significantly fewer satellites simultaneously visible above the horizon. These characteristics materially reduce time-varying and aggregate interference compared to low-altitude mega-constellations. Applying identical antenna constraints to all non-GSO systems fails to reflect these fundamental operational differences.

Therefore, antenna diameter alone is not a reliable metric for interference potential, particularly for low-density earth station deployments. Maintaining rigid minimum antenna sizes without considering additional metric therefore imposes unnecessary regulatory constraints that are not directly linked to actual interference risk.

A differentiated regulatory approach improves spectrum efficiency while preserving incumbent protection. Therefore, introducing regulatory flexibility for GSO FSS networks and non-GSO systems with limited constellation size and higher orbital altitudes, while maintaining stricter constraints for large-scale low-altitude constellations, enables more efficient use of spectrum, accommodation of new system architectures and continued protection of radiolocation and radionavigation services.

Further, as regards the protection of the SRS under footnote RR No. **5.503**, studies have demonstrated large margins for the protection of SRS, supporting the proposal to supress footnote RR No. **5.503**.

3 Proposal

To enable the operation of FSS earth station with diameters smaller than 1.2 m for GSO networks and diameters smaller than 4.5 m for non-GSO networks with controlled deployments of earth stations, we propose an alternative option under Method B, as an additional method B3. This new method should define a maximum EIRP density level depending on the altitude and the size of the non-GSO constellation, while maintaining the suppression of the current power flux-density (pfd) limits in RR No. **5.502** and the removal of the limits in RR No. **5.503**, as proposed in Methods B1.

This proposed new / additional approach in method B3 is inspired by the existing provisions in Article **21** of the Radio Regulations for the frequency band 17.7-19.3 GHz. Specifically, RR No. **21.16.6** contains a scaling factor formula for the pfd limits in the downlink direction for non-GSO systems, which depends on both the number of visible satellites and the total number of satellites in the non-GSO system, as shown below:

21.16.6 *The function X is defined as a function of the number, N, of satellites in the non-geostationary satellite constellation in the fixed-satellite service and* N_v*, as follows:*

$$X = 0 \quad \text{dB for} \quad N \leq 50$$

$$X = \frac{5}{119}(N - 50) \quad \text{dB for } 50 < N \leq 288$$

$$X = \frac{1}{69}(N + 402) \quad \text{dB for } 288 < N \leq 999$$

$$X = \max\{20.3;\ 10\log_{10}(N_v)\}\ \text{dB} \quad \text{for} \quad 1\,000 \leq N \leq 6\,000$$

$$X = 10 \log_{10}(N_v) + 1 \quad dB \quad for \quad N > 6\,000$$

where:

N_v^* *is the maximum number of visible space stations – considering a minimum elevation angle equal to 0 degrees – from any location on the surface of the Earth and within the service area of the non-GSO system. N_v does not depend on latitude; it encompasses the maximum number of visible satellites across all latitudes within the service area of the relevant non-GSO system.*

This method could incorporate the following three factors:

1 **An altitude factor:** This term would provide compensation for path loss as orbital altitude increases.

2 **A density factor:** This term would introduce a proportional adjustment of the maximum permitted EIRP density depending on the size of the constellation and associated terminal deployment density. As mega- non-GSO constellations may involve very large numbers of terminals, the likelihood of proximity to RLS receivers increases, thereby raising the potential for aggregate interference. This factor therefore provides a mechanism to limit EIRP as the number of terminals increases, helping to manage the overall interference risk.

3 **Two or more constant values** depending on the constellation size, with the aim to ensure adequate protection of RLS systems while still allowing reasonable regulatory flexibility, particularly for lower-density constellations such as smaller LEO and MEO systems.

This proposal would achieve the following objectives:

– Enable the use of smaller FSS earth station antennas by relaxing the current minimum antenna size constraints.

– Address concerns raised by some administrations regarding large-scale non-GSO deployments with very high terminal densities.

– Introduce an EIRP-based approach for non-GSO systems, where permitted maximum EIRP levels depend on key constellation characteristics.

– Avoid imposing additional antenna size limitation for GSO earth stations, recognizing the distinct interference environment and deployment characteristics.

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