

Reforming the ITU's EPFD framework

GSO and NGSO sharing in Ku and Ka bands

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Executive summary

- 1.1 The international framework which governs spectrum sharing between geostationary orbit (GSO) and non-geostationary orbit (NGSO) satellites in the Ku and Ka bands (the “EPFD¹ framework”) is more than 25 years old. There is an ongoing international debate about whether and how to revise this framework, with potentially significant implications for how GSO and NGSO systems share spectrum and the services they offer.
- 1.2 Stakeholders have varied views on how to approach any update to this framework. In general, GSO operators tend to favour maintaining and extending the existing protections, while NGSO operators would like greater flexibility to support the evolving services they provide to a growing customer base.²
- 1.3 Spectrum management authorities (SMAs) have an important role, working with stakeholders, to establish a reasonable, evidence based and proportionate way forward that supports efficient spectrum sharing and maintains confidence in the international system. We continue to support the International Telecommunications Union (ITU) process and consider that it remains the best way to set rules for managing global satellite systems.
- 1.4 In this paper we set out our view on **how to ensure that the ITU's EPFD framework remains relevant and evolves** to:
 - enable more efficient spectrum sharing and use;
 - account for the increasing scale and importance of NGSO services; and
 - maintain appropriate and proportionate protection for GSO networks.
- 1.5 There is now a window of opportunity, in the run up to WRC-27, to make material progress to ensure the framework better reflects how modern satellites are designed, deployed and used. Our view is that this work should be approached in two phases:
 - a) **targeted updates to the existing EPFD framework at or by WRC-27³** - we expect such changes can be achieved without material impact on GSO protection, but they do not preclude the need for longer-term reforms. Sharing could be improved by:
 - **aligning Ka band rules** to harmonise the different downlink EPFD limits in the upper and lower Ka band⁴ to reflect the least restrictive limits already used in each band.

¹ Equivalent power flux density – a measure of the unwanted power directed by NGSO satellites towards GSO networks, defined in Article 22 of the Radio Regulations. Here we are focussed on the ‘downlink’ EPFD framework impacting GSO terminals.

² We are also seeing a trend towards operators with hybrid GSO and NGSO capabilities, with potential interests on both sides of this debate.

³ World Radio Conference – held approximately every four years. The next WRCs will be WRC-27 and WRC-31.

⁴ We refer here to the lower and upper downlink bands of 17.8-18.6 GHz and 19.7-20.2 GHz.

- **updates to assessing compliance (under ITU-R Rec. S.1503)** to revise the parameters it uses (i.e. the worst-case assumptions, and including more realistic satellite tracking strategies, interference power calculations and antenna patterns).
- b) **a more fundamental review at WRC-31** - through a new Agenda Item to consider longer-term reforms.⁵ We suggest a set of principles to inform that work and future studies.
- 1.6 We are open to further feedback and evidence from stakeholders as our thinking evolves. We welcome the opportunity to discuss the phased route we see to reform and the priorities for WRC-27 with interested parties, including industry and fellow SMAs.

Background

Why we consider this issue needs addressing

- 1.7 Satellite connectivity is becoming an increasingly important part of national and international communications infrastructure, for consumers, business, and government services. Large scale NGSO constellations are delivering lower latency broadband, resilience, mobility and emerging direct-to-device (D2D) services, while GSO networks continue to support broadcasting, enterprise connectivity, government and defence requirements, and wider network resilience.
- 1.8 The current EPFD framework, established under Article 22 of the ITU Radio Regulations, sets limits on the interference allowed from NGSO satellites towards GSO earth stations and satellites. It considers factors such as satellite movement, antenna discrimination, and power levels that help to protect GSO networks operating in the Ku and Ka bands from interference. Although now decades old, it has enabled both types of satellite systems to share these spectrum bands, removing the need for routine bilateral coordination between every GSO and NGSO system by predefining internationally harmonised limits for protecting GSO networks. It has also helped establish a common set of interference expectations for global satellite systems, which informs network planning and investment.
- 1.9 However, the EPFD framework is coming under increasing pressure, particularly from NGSO operators, who argue that the current limits are overly conservative and constrain NGSO capacity, efficiency, and competition.⁶ There is a view that the rules do not reflect how satellite services now operate and have not kept pace with recent technological advances and updated engineering assumptions. In general, GSO operators wish to maintain the existing EPFD framework and protections.
- 1.10 Following discussion at WRC-23, further studies were commissioned to explore this issue and inform future international discussions.⁷ More recently, other SMAs are considering whether to exercise their judgement on balancing protections between GSO and NGSO systems and make national exceptions under Article 22.5CA of the Radio Regulations. For example, the US has already taken steps to adopt their own national framework⁸.

⁵ Our [Call for Input on UK preparations for WRC-27](#) is seeking feedback on future conference agenda items (under Agenda Item 10), which we will consider as we further develop our position.

⁶ The current focus in international discussions is on downlink constraints, and that is our focus for this paper.

⁷ Although WRC agreed to these studies 'without regulatory consequence', it is our view that the purpose of such studies must be to inform thinking and thereby potentially influence future decisions.

⁸ FCC, [Modernizing Spectrum Sharing for Satellite Broadband, Report and Order – SB Docket No. 25-157](#)

- 1.11 We recognise that making national exceptions to the EPFD framework is one route for SMAs to address this issue. However, this approach risks diluting the benefits⁹ that come from having a consistent global ruleset - for both GSO and NGSO operators and for global service provision. We therefore prefer to seek progress internationally through the ITU, to ensure the global framework better reflects how modern satellites are designed, deployed and used. Spectrum management authorities (SMAs) have an important role working with stakeholders to establish a reasonable, evidence based and proportionate way forward that supports efficient spectrum sharing and maintains confidence in the international system.
- 1.12 We consider that there is now a window of opportunity, in the run up to WRC-27 and before further fragmentation materialises, to work on updating and strengthening the EPFD framework.¹⁰ Through this paper, we are seeking to initiate debate and encourage a consensus that maintains support for a global framework, and which evolves to meet the challenges of today. We recognise this process (and associated benefits from its review) will take time, and consensus may not be easy to achieve, so it is important to progress these discussions, with a view to securing the targeted improvements for 2027 and to prepare for what will be required into the 2030s and beyond.

Drivers for updating the EPFD framework

- 1.13 While both GSO and NGSO operators continue to invest in new satellites and services, the NGSO sector is seeing an unprecedented phase of growth.¹¹ This is significantly affecting (and reshaping) the satellite sector and communications' markets more broadly.
- 1.14 The development and growth of larger NGSO constellations have enabled NGSO operators to provide services with low latency, high reliability, and more continuous coverage across much of the globe. Many services traditionally provided by GSO systems are being displaced by NGSO, with NGSOs continuing to gain market share in many sectors. NGSO constellations are also creating new markets for satellite connectivity, the most high-profile example of which is the D2D market for mobile connectivity.
- 1.15 As NGSO services have grown and expanded, they have become more important to consumers and citizens in the UK. Ensuring these services are not subject to unnecessary spectrum constraints will help to maximise their benefits. This is particularly important in underserved areas of the UK, where NGSO services have helped to improve connectivity, and similar transformative benefits could be realised globally. These services have also improved aeronautical and maritime connectivity, benefitting crew and passengers in the UK and worldwide.

⁹ These include satellite operators and consumers capturing the benefits of harmonisation and predictability. It avoids additional compliance costs from meeting rules under different SMAs, as well as inefficiencies from operators having to design their systems around the most restrictive jurisdiction.

¹⁰ We consider that a logjam in discussions that leads to SMA fragmentation of the rules is unlikely to be helpful for any side of the debate, or optimal for societal outcomes. Many GSO services are valuable precisely because they can be used in similar ways across the globe. And though some NGSOs may be flexible enough to enjoy the benefits of different regimes across large territories, this is likely to be more complex where alternative regimes proliferate in close proximity to each other.

¹¹ The number of payloads launched into low Earth orbit increased from fewer than 100 in 2010 to more than 4000 in 2025. (see European Space Agency, [ESA Space Environment Report 2026](#) [accessed 18 September 2026]). Similarly, today there are over 15,000 active NGSO satellites in orbit, compared to around 2000 in 2019 (see [ESA's Space Debris User Portal](#) and [Orbital Radar](#)).

- 1.16 These developments suggest there are potential benefits from a shift in the overall balance between GSO protection measures and enabling NGSO systems to operate more flexibly and improve sharing. Any decision to enable this shift would need to be mindful that (a) GSO operators continue to provide important services and have significant market shares in many sectors, and (b) important characteristics of GSO networks mean that they are likely to continue to play a valuable role.¹² However, we also recognise that GSO operating characteristics have evolved since the EPFD framework was created.
- 1.17 In the near term, we see opportunities for targeted updates to the EPFD framework that could improve sharing without significant negative impact to GSO services. These include taking better account of improvements in satellite technologies, modern antenna performance, and NGSO design architecture. Longer term, there may be further opportunities to ensure the efficient use of this spectrum. A proportionate approach that maximises the overall benefits from both types of services will be needed.

Suggested approach for updating the EPFD framework

Opportunities for near term improvement – WRC-27

- 1.18 We favour a phased approach to a review of the EPFD framework, which reflects the complexity and importance of the regime. We consider it more likely for progress to be made incrementally, since studies investigating new approaches remain incomplete, with insufficient consensus on how to translate measured or modelled effects into a globally enforceable alternative. We therefore aim to unlock capacity and welfare gains in the short term, while alternative approaches can continue to be studied over the longer term. We see this as an important step towards maintaining confidence in the international process.
- 1.19 We have identified several areas which WRC-27 (or ITU-R in the runup to the conference) could examine and resolve. Opportunities we support exploring, informed by ongoing international work in Working Party 4A (WP4A) and stakeholder engagement, include:
- a) **Aligning Ka band limits:** the upper Ka band (19.7-20.2 GHz) currently imposes more stringent long-term protection limits and more relaxed short-term protection limits for GSOs compared with the lower Ka band (17.8-18.6 GHz). We can see no enduring technical justification for the different limits. Given that GSO operators have been able to manage with varying protection levels across the band in practice, it seems reasonable that the least restrictive limits in each sub-band could be applied across the whole band without significant negative impacts to GSO services.¹³
 - b) **More realistic inputs into S.1503 algorithm¹⁴:** updating the S.1503 verification procedure to better reflect current satellite systems and avoid unnecessarily pessimistic modelling assumptions. Priority areas for review could include:

¹² GSO networks are particularly suited to multicast services provided to areas with more limited ground infrastructure, or to provide resilience in multi-orbit networks. This can be particularly useful for broadcast services, and providing military links, for example. There may also be circumstances where GSO networks offer a more economic route to sovereign capabilities.

¹³ ITU Radio Regulations (2024), Article 22, Tables 22-1B and 22-1C: for a 5 m reference GSO earth station antenna, at the 0% mark (long-term), the applicable Ka-band EPFD $\downarrow$ limits are -185.4 dB(W/m²/40 kHz) and -200.4 dB(W/m²/40 kHz) respectively, i.e. 14.9 dB more stringent in the Upper Ka band.

¹⁴ Although S.1503-2 is the algorithm currently specified by the ITU to assess compliance with Article 22, work to improve the current version (S.1503-4) is ongoing in WP4A. See [Working document towards a preliminary](#)

- i) improving worst case geometry assumptions;
 - ii) more realistic satellite tracking strategies, traffic and terminal distributions;
 - iii) updating reference antenna patterns for greater selectivity and discrimination; and
 - iv) updating propagation assumptions in light of current best practice models.
- c) **Managing aggregation effects:** an updated approach to managing real aggregation effects which provides a mechanism for taking action where existing rule breaches have the potential to cause harmful interference. We note work is underway in WP4A under Resolution 76¹⁵ to assess aggregate limits (currently determined based on the modelled impact of 3.5 NGSO systems).

Principles to guide longer term reform – WRC-31

- 1.20 Irrespective of short-term outcomes (e.g. at WRC-27) we see a strong case for exploring longer term reforms to ensure that the GSO/NGSO sharing framework is fit for purpose for today's (and tomorrow's) satellite operators.
- 1.21 Given the complexity of the EPFD framework and ambition to achieve international consensus, this fuller review will take time. We also note that even where change is agreed, it may not be appropriate to introduce all changes immediately, and that there could be benefits to setting out a glide path to introducing changes over time.¹⁶
- 1.22 Therefore, we support a second phase of work under a new Agenda Item for WRC-31 (agreed at WRC-27) to explore more fundamental reform of the EPFD framework. We are openminded about what this might look like and whether alternative approaches are more appropriate, though we consider that further studies should be guided by principles supporting the outcomes we are seeking to achieve. These principles could include:
- a) **Proportionate protection:** GSO satellites provide important services and should continue to be provided with an appropriate level of protection. However, an updated framework should be based on realistic service assumptions, balancing the protections given to more niche use cases with their impacts on optimal use of spectrum.
 - b) **Measurable and enforceable:** the updated framework will need to be sufficiently clear and measurable to ensure the rules are being met and that action can be taken, including when thinking about enforcing aggregate impacts across multiple NGSOs.
 - c) **Innovation enabling:** the framework should not unduly constrain new or other systems in a way that limits capacity, service quality, competition or efficient spectrum use.
 - d) **Predictable:** an updated framework should enable stakeholders to make an interference assessment upfront, rather than building a regime that tries to capture interference impacts as they occur and offers mitigations only after the event.

[draft revision of Recommendation ITU-R S.1503](#) (requires ITU login). We note S.1503 uses coexistence assessments established more than 20 years ago by Transfinite and Agenium.

¹⁵ [Resolution 76 \(Rev.WRC-15\)](#)

¹⁶ For example, establishing a new framework where existing EPFD protections are amended in increasing portions of the spectrum over time might give stakeholders time to plan and adjust to the new environment.

- e) **Updatable:** a new framework should provide confidence in sharing rules over a reasonable investment horizon, however there should be inbuilt mechanisms to update assumptions over time, as and when there is relevant innovation.
 - f) **Internationally consistent:** the updated framework should enable the benefits of global harmonisation and aim to avoid embedding national approaches which fragment international consistency, with the operational complexities this could entail.
- 1.23 The EPFD framework already offers some of these features, emphasising the important role it has played over the last 25 years. However, the world in which it was designed - where more conservative sharing assumptions made sense - has changed significantly. We also recognise that GSO operating characteristics have evolved since it was developed.¹⁷
- 1.24 As such, we believe a more fundamental review of the EPFD framework at WRC-31 is needed. To reflect the greater role that NGSO systems play today, future studies should seek to take account of the ongoing performance needs of current GSO networks (including taking a realistic view of future reference link requirements), as well as the increased prevalence and sophistication of NGSO systems.¹⁸ We consider a proportionate approach maximising the benefits across both types of services will be needed.

Next steps

- 1.25 We are keen to play our part in this global debate and will continue to engage through a range of international forums, including WP4A, discussions in CEPT¹⁹ and WRC-27 itself.
- 1.26 To support this ongoing engagement, we have commenced a mix of measurement and modelling work to further inform our analysis, with a focus on the sensitivity of GSO systems to interference and the key variables in the S.1503 algorithm that have the most sensitive impact on NGSO constraints. We anticipate providing inputs from these studies into international fora in the coming months.
- 1.27 Given the importance of enabling innovation, competition and supporting efficient spectrum use, we envisage that significant progress is needed in the coming months to establish a clear path towards modernising the EPFD framework. Our overarching goal is to find outcomes that balance proportionate protections for modern GSO networks with the increased prominence and sophistication of modern NGSO systems.
- 1.28 Failure to reach consensus on reform could result in inefficient outcomes for consumers and lead to fragmentation of the international framework. Our proposed phased approach provides extra flexibility to NGSO operators where it is needed in the near term, while allowing more time for fresh thinking and detailed studies on more fundamental change.
- 1.29 We are open to further feedback and evidence from stakeholders as our thinking evolves. If you would like to discuss the issues or positions set out in this paper, or to provide us with further evidence, you can contact the EPFD project team at EPFD@ofcom.org.uk.

¹⁷ For example, many modern GSO ESIM systems operate with much smaller antenna apertures than those which were actively included in development of the current framework.

¹⁸ This should include examining if NGSO sharing arrangements mean that the aggregate interference emitted towards GSO terminals is substantively lower than the current EPFD framework suggests, and whether protecting all uses across all of the Ka and Ku bands remains possible without unduly constraining other users.

¹⁹ CEPT is the [European Conference of Postal and Telecommunications Administrations](https://www.cept.org/).