An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Satellite Earth Station Licences

Amazon Kuiper Services Europe SARL and Starlink Internet Services Limited

Information Notice

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An Coimisiún um Rialáil Cumarsáide
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1 Background Information

1.1 ComReg published two Information Notices (the "Information Notices") on the 27 May 2025 (ComReg Document 25/31) [1] and 20 June 2025 (ComReg Document 25/36R)[2] regarding applications (the "Applications") from Starlink Internet Services Limited ("Starlink") and Amazon Kuiper Services Europe SARL ("Amazon") (the "Applicants") for satellite earth stations ("SES") licences.

1.2 These Information Notices set out the views of the Applicants as to how the proposed SES would co-exist with other networks and services which have a co-primary allocation in certain frequency ranges. ComReg also set out its preliminary views that the proposed SES would not cause harmful interference to existing SES and fixed radio links operating in the relevant frequency bands. Therefore, subject to any comments received in response to the Information Notices, ComReg proposed to grant licences to both Amazon and Starlink for their proposed SES.

1.3 This document sets out a summary of the submissions received to the Information Notices and ComReg's assessment of same. The submissions are contained in the Annexes of this document.

2 Submissions to ComReg documents 25/31 and 25/36R

2.1 ViaSat Inc. ("ViaSat") was the only interested party to submit responses to either Information Notice. ViaSat's submissions are set out at Appendix 1 and 2.

2.2 Both ViaSat's submissions are analogous and raise similar matters, which can be summarised as follows:

(a) Article 22 of the of the ITU's Radio Regulations – ViaSat contends that the Applicants have not provided any supporting evidence to substantiate its claim that its system is technically capable of complying with the limits in Article 22 of the International Telecommunication Union's Radio Regulations ("ITU RR")[3] and that it will adhere to these limits; and

Methodology for assessing Equivalent Power Flux Density of Space Stations – ViaSat contends that the ITU's methodology for assessing Equivalent

[1] ComReg Document 25/31 – Starlink Internet Services Limited: application for a satellite earth station licence – published 27 May 2025, https://www.comreg.ie/media/2025/05/ComReg-25_31.pdf
[2] ComReg Document 25/36R – Application for a satellite earth station licence to support Amazon's Kuiper satellite system – published 20 June 2025, https://www.comreg.ie/media/2025/06/comReg-25_36R.pdf
[3] https://www.itu.int/pub/R-REG-RR

Power Flux Density[4] ("EPFD") limits is outdated and significantly flawed and the ITU's software alone cannot effectively check the proposed EPFD limits of Non-Geostationary Orbit ("NGSO") systems. Therefore, an independent EPFD assessment by ComReg is required.

2.1.2 ComReg's assessment of ViaSat's submissions

2.3 ComReg notes that ViaSat's responses to the Information Notices relate to the space element of Amazon's and Starlink's NGSO systems and do not provide any views regarding the substantive matter of co-existence of the proposed SES with other SES or other terrestrial services.

Article 22 of the of the ITU's Radio Regulations

2.4 ComReg notes that Condition 11.1 of the General Authorisation Conditions[5] states that:

> "*the Authorised Person shall have regard to any notices or guidelines issued by the Commission under Regulation 23 of the ECC Regulations which are issued for the purpose of encouraging the use of standards, specifications or recommendations adopted by the International Telecommunication Union, the International Organisation for Standardisation or the International Electrotechnical Commission*"

2.5 ComReg notes that the Applicants are required to comply with the ITU RR and protect GSO networks under the relevant provisions (specifically Article 22 and Resolution 76), with the notifying administration responsible for the NGSO system ultimately responsible for ensuring such compliance.

2.6 ComReg further observes that Section VI of Article 15 of the ITU RR sets out the procedure in case of harmful interference, as well as the conditions for the resolution of a problem of harmful interference. ComReg notes that the initial procedure is based mainly on a direct approach between the administrations concerned. However, cases of harmful interference may also be communicated to the ITU either for information or with a specific request for assistance, where action on a bilateral basis may have been unsuccessful.

2.7 Therefore, if either Amazon or Starlink were not to comply with the relevant ITU RR provisions, then there is an appropriate process in place to address any suspected

[4] Equivalent power-flux density (EPFD) takes into account the aggregate of the emissions from all non-GSO satellites in the direction of any GSO earth station, taking into account the GSO antenna directivity.
[5] ComReg Document 03/81R6 – General Authorisation: Conditions for the provision of Electronic Communications Networks and Services – published 1 june2018, https://www.comreg.ie/media/2025/05/ComReg-0381R6v3.pdf

non-compliance.

Methodology for assessing Equivalent Power Flux Density of Space Stations

2.8 Firstly, ComReg's SES licensing process is focused on the *terrestrial* element of satellite systems as ComReg only has the authority to authorise terrestrial systems. The Department of Culture, Communications and Sport ("DCCS") is the relevant authority in Ireland regarding ITU matters such as the coexistence between satellite filings, and the management and submission of satellite filings to the ITU. Therefore, ViaSat could engage directly DCCS regarding any concerns it may have with ITU satellite filings which may affect networks and services in Ireland.

2.9 Second, ComReg's notification of any proposed earth stations within an NGSO systems is not intended to replace the ITU's processes. ComReg notes that ITU WP4A[6] is reviewing the ITU's current methodology and software used for assessing EPFD limits of NGSO systems.[7]

2.10 ComReg does not consider it appropriate for National Regulatory Authorities to develop a national specific process which may conflict with existing and future international harmonised processes. If individual administrations were to adopt such an approach, it might likely result in interference between GSO and NGSO systems being more probable due to distinct processes with potentially differing parameters. Therefore, ComReg is of the view that the development of methodologies and software for the assessment of EPFD limits of satellite filings best resides with the ITU.

2.11 Finally, ComReg notes that Inmarsat Global Limited was acquired by Viasat[8] in May 2023, and that Inmarsat Global Limited and Space Norway have submitted a joint application to Ofcom for a non-geostationary earth station network licence ("Joint Application").[9] ComReg notes that within the annex[10] to the Join Application it states:

> "*Space Norway has executed ITU coordination agreements covering the GX10 filings with the following operators: Network Access Associates Ltd, Telesat LEO Inc,* ***Starlink Internet Services Limited*** *and* ***Amazon Kuiper Services Europe SARL****. This demonstrates that the network can coexist with*" those operators' networks. [emphasis added]

2.12 ComReg further notes that regarding the protection of geostationary satellite

[6] https://www.itu.int/en/ITU-R/study-groups/rsg4/rwp4a/Pages/default.aspx
[7] https://www.itu.int/md/meetingdoc.asp?lang=en&parent=R19-WP4A-C&PageLB=0
[8] https://investors.viasat.com/news-releases/news-release-details/viasat-completes-acquisition-inmarsat
[9] https://www.ofcom.org.uk/spectrum/space-and-satellites/inmarsat-global-limited-and-space-norways-joint-application-for-a-non-geostationary-earth-station-network-licence
[10] https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-2-6-weeks/inmarsat-and-space-norway/main-docs/annex-to-application.pdf?v=400780

systems, the Joint Application states:

> "*The GX10 satellite system fully complies with the Equivalent Power Flux-Density (EPFD) limits in Article 22 of the ITU Radio Regulations and* ***the Applicants commit to cooperate with all other NGSO systems licensed in the UK (and elsewhere) to evaluate and ensure collective compliance with aggregate EPFD limits***." [emphasis added]

2.13 Therefore, it is unclear as to how one part of Viasat states that it can cooperate with other NGSO system operators on aggregate EPFD limits, while another argues in its submissions that:

"*there is no basis for expecting that SpaceX will comply with the limits in Article 22 of the Radio Regulations*".

and

"*there is no basis for expecting that Amazon will comply with the limits in Article 22 of the Radio Regulations*".

2.14 This incongruity weakens any Viasat argument here regarding the potential impact of the proposed SES.

3 ComReg's final view

3.1 Having carefully considered ViaSat's submissions and the information and technical parameters provided by the Applicants, ComReg remains of the view that it is unlikely that proposed NGSO SES would cause harmful interference to existing licensed SES and fixed radio links. Therefore, ComReg will grant SES licences to Amazon and Starlink licence for their proposed SES and that information will be published on ComReg's Siteviewer portal.[11]

[11] https://siteviewer.comreg.ie/#/satellite/fixed

Annex 1: Viasat's response to ComReg 25/31

Viasat's Submission in Response to Stakeholder Consultation on SpaceX's Application (reference ComReg 25/31) for a Gateway in Ireland

Viasat welcomes the opportunity to provide its views with respect to SpaceX's application[1] to establish a satellite gateway in Killala, Co Mayo. We appreciate the government's efforts to ensure that radiofrequency spectrum is used in a productive manner that aligns with international standards and is *not* used in ways that would pose unacceptable interference risks to other spectrum users.

In its application dated March 2025, SpaceX proposes to operate a non-geostationary orbit (NGSO) satellite earth station (SES) in Killala using spectrum in the Ka band. The Ka band is shared by other spectrum users—including geostationary orbit (GSO) satellite operators. ComReg's Review of the Satellite Earth Station Licensing Regime (ComReg 23/96)[2], Annex 2- A 2.4 describes the requirements on the applicant to demonstrate how coexistence is possible. Additionally, ComReg's *Satellite Earth Station Licensing Guidelines, ("the Guidelines")*[3] appropriately recognize that proposed SES operations *must* be capable of coexisting with these spectrum users without posing unacceptable interference risks. Thus, *the Guidelines* provide that, as part of the application process, ComReg will evaluate whether proposed SES operations would satisfy various technical requirements designed to cabin NGSO interference risks—including the equivalent power flux density (EPFD) limits established in Article 22 of the International Telecommunication Union (ITU) Radio Regulations as described in the Satellite Earth Station Licensing Guidelines (ComReg 24/48).These longstanding EPFD limits offer a clear framework for coexistence between GSO networks and NGSO systems, enabling operators to develop, innovate user devices, including the same small and phased array antennas as NGSO systems are offering today, and evolve without unduly constraining the other.

ComReg[4] reports that, in its application, SpaceX asserts that its system is technically capable of complying with the limits in Article 22 and that it will adhere to these limits. However, no supporting evidence is presented to substantiate this claim. Indeed, there is no indication that SpaceX has provided critical information about its NGSO system, which is necessary to evaluate compliance with the applicable EPFD limits.

Under *the Guidelines,* it is appropriate and *imperative* for ComReg to evaluate compliance with the EPFD limits as part of the application process. Without an independent EPFD assessment from ComReg, there is no basis for expecting that SpaceX will comply with the limits in Article 22 of the Radio Regulations. Notably, *the Guidelines* explicitly empower ComReg to request additional information and perform additional analysis for this purpose.

[1] https://www.comreg.ie/media/2025/05/ComReg-25_31.pdf
[2] https://www.comreg.ie/media/2023/10/ComReg-2396.pdf
[3] https://www.comreg.ie/media/2024/06/ComReg-2448.pdf
[4] https://www.comreg.ie/media/2025/05/ComReg-25_31.pdf (Paragraph 2.3)

Exceedance of EPFD limits by NGSO systems can (i) degrade and disrupt GSO service; (ii) reduce GSO network capacity; (iii) constrain the deployment of more advanced, higher capacity GSO networks, offering more and better services at a lower cost per bit; and (iv) prevent the deployment by GSO operators of the same types of small user terminals that NGSO operators already can deploy today, such as for mobility applications.

ComReg cannot and should not rely on the ITU to perform this critical analysis because the current methodology used by the ITU, particularly under ITU Recommendation S.1503, has notable known limitations. The analysis provided by the ITU is limited to assessing EPFD levels based on the data supplied in a specific filing, which often only considers a narrow set of scenarios—such as a single earth station location and a GSO satellite position. This approach is inherently limited and does not capture the full range of operational conditions.

The ITU's software alone cannot effectively check all of the ways an NGSO system operator may try to "game" the system, by contriving EPFD inputs in a way designed to "pass" the ITU's spot checks regarding EPFD without regard to the actual operation of the NGSO system that affects every nation. Notably, that responsibility falls on individual administrations and regulators that consider authorising, or granting market access to, non-GSO system operations. Furthermore, the ITU's EPFD software ignores many contributions to EPFD, including the sidelobes from the large number of beams of thousands of NGSO satellites, potentially leading to significant underestimation of expected EPFD levels.

The methodology employed in ITU-R S.1503 is considered outdated and significantly flawed, thus potentially misrepresenting the actual EPFD levels and capabilities of NGSO systems to not cause unacceptable interference to GSO networks. Relying solely on this flawed and limited analysis could lead to licensing decisions that do not adequately protect other satellite or terrestrial services and fail to account for all representative scenarios.

The limited assessment based on ITU's software has little bearing on the interference that a NGSO system can be expected to produce at various locations within Ireland. Therefore, a more comprehensive, up-to-date, and methodologically sound analysis is necessary for accurate assessment, which is something ComReg should conduct independently or require from operators, rather than relying solely on the ITU's limited and outdated assessments. These limitations are particularly pronounced in the case of evaluation of EPFD levels from SpaceX' NGSO systems. Significant issues have already been raised about SpaceX's Gen2 system filing – 'USASAT-NGSO-3X' at the ITU, most recently in a document submitted to Working Party 4A (4A/94).

The analysis in document 4A/94 for the SpaceX Gen2 ITU filing demonstrates that the PFD mask, which is one the most critical input parameters for EPFD examination, has been artificially designed, to force the current ITU-R S.1503 algorithm to select a specific and favourable, but non-representative interference geometry for the entire NGSO system. This artificial design of one particular PFD mask for a single orbital shell (604 km) conceals the interference produced in the other orbital shells of that

Gen2 filing. Notably, SpaceX is not authorised by the FCC to operate at any orbital altitudes above 580 km, meaning that it is not authorised for the 604 km shell. An analysis that addresses the orbital shells that SpaceX is authorised to use demonstrates that the Gen 2 system is expected to significantly exceed the EPFD limits.

Furthermore, Radio Regulations Resolution 76 (Rev. WRC-23) defines the aggregate EPFD limits that must be met by all NGSO systems, collectively, and calls for administrations to take all possible steps, to ensure that the aggregate interference into GSO FSS and GSO BSS networks caused by NGSO systems does not exceed those limits. In the event that the aggregate EPFD limits are exceeded, it further calls for administrations, to take all necessary measures to expeditiously reduce the aggregate EPFD levels to the limits given in Tables 1A to 1D of Res. 76.

Viasat notes that ComReg has recently published a consultation on a new Amazon Kuiper Gateway in Ireland[5] which is only around 50 km away from the Starlink proposed gateway. It is not clear that the requisite data has yet been provided to enable an assessment of Resolution 76 compliance.

A critical component of the aggregate EPFD compliance is to define the means by which multiple NGSO operators would reduce EPFD levels in case of any exceedance. Such a reduction in EPFD level must be proportional to the contribution of each NGSO system towards the aggregate EPFD. Unequitable sharing of the aggregate EPFD budget amongst NGSO systems would hinder opportunities for other parties and new entrants. If, for example, SpaceX is allowed to operate with EPFD allowances for two NGSO systems (e.g., Generation 1 and Generation 2) and each one has a separate "share" of that aggregate budget, SpaceX can consume almost 60% of the total aggregate EPFD budget, which must be shared amongst all NGSO operators. To avoid disproportionate allocation to a single NGSO operator of aggregate EPFD interference budget amongst all NGSO operators, it is critical to treat all the NGSO satellites (Gen1 + Gen2) of SpaceX as a whole.

For all the reasons above, Viasat encourages ComReg to conduct an independent assessment of potential for interference, from a single non-GSO system and all non-GSO systems collectively, within Ireland's national territory that are not covered by the limited assessments performed by the BR regarding ITU filings for the NGSO system. Such assessment should require from NGSO operators to demonstrate compliance with the single-entry and aggregate equivalent power flux density (EPFD) limits prescribed in the ITU Radio Regulations Article 22 (Art. 22) and ITU Resolution 76, respectively. This should include:

a. A demonstration for the NGSO constellation as a whole.
b. A demonstration for the specific portions of the NGSO constellation proposed to serve Ireland (including the exact satellite altitudes and inclinations proposed to be used).
c. A demonstration for a suitable number of representative geographic locations within Ireland, including at and around the proposed gateway locations, and for all GSO satellite networks serving, or proposed to serve Ireland.

[5] https://www.comreg.ie/media/2025/06/comReg-25_36R.pdf

d. A demonstration of how the NGSO system avoids interference to GSO networks created by numerous NGSO satellite antenna sidelobes, particularly when phased array antennas are employed.
e. A demonstration for the operation of the NGSO constellation alongside the operation of all other co-frequency NGSO constellations serving Ireland.
f. Information on the ITU filing under which the each of the NGSO systems seek to operate in Ireland and where the NGSO system operate under multiple filings, each application should contain EPFD input files (e.g. SRS and mask database) that represent their system as a whole and that are consistent with their ITU submission.

The results of this assessment should be published to promote transparency and confidence in spectrum management. To ensure that the expected interference evaluated based on the above assessment is not exceeded during NGSO operations, the following licensing conditions are necessary:

1. Each individual non-GSO system shall comply with the single-entry EPFD limits in Art. 22 and all NGSO systems, collectively, shall comply with aggregate EPFD limits in Resolution 76 (Rev. WRC-23).
2. The NGSO operator shall operate its system as a single constellation for purposes of the EPFD limits, no matter how many ITU filings it may seek to operate under.
3. The NGSO operator shall confirm that its deployed NGSO system is fully consistent with its ITU filings.
4. The NGSO operator shall comply with all the parameters provided in its ITU filing, specifically:
    - Maximum number of co-frequency beams serving a specific location in Ireland, commonly known as “Nco”.
    - Minimum GSO arc avoidance angle, commonly known as “alpha angle.”
    - The downlink power flux density mask (PFD mask), taking into account the actual characteristics of NGSO system as deployed, including the radiation pattern of its satellite antenna.

Furthermore, SpaceX’s claim that no interference has been reported thus far is based on current deployed NGSO satellites, and not the intended full constellation--which is about 5x larger.

In summary, we call upon ComReg to:

1. Require SpaceX to provide the relevant systems parameters mentioned above, including the number and configuration of satellite beams operating concurrently within overlapping geographic regions, to allow EPFD compliance to be confirmed and publish these parameters.
2. Conduct thorough assessments of minimum GSO arc avoidance angles needed to protect GSO networks while enabling NGSO systems to serve Ireland effectively.
3. Provide opportunities for industry and stakeholders to review and validate these parameters before licensing decisions are finalised.

Annex 2: Viasat's response to ComReg 25/36

Viasat's Submission in Response to Stakeholder Consultation on Amazon's Application (reference ComReg 25/36) for Authority to Operate a Non-Geostationary Orbit Gateway in Ireland

Viasat welcomes the opportunity to provide its views with respect to Amazon's application[1] to establish a non-geostationary orbit (NGSO) satellite gateway in Elfordstown, Midleton, Co. Cork (Ireland). We appreciate the government's efforts to ensure that radiofrequency spectrum is used in a productive manner that aligns with international standards and is *not* used in ways that would pose unacceptable interference risks to other spectrum users.

In its application dated June 2025, Amazon proposes to operate a NGSO satellite earth station (SES) in Elfordstown, Midleton, Co. Cork using spectrum in the Ka band. The Ka band is shared by other spectrum users—including geostationary orbit (GSO) satellite operators. ComReg's Review of the Satellite Earth Station Licensing Regime (ComReg 23/96)[2], Annex 2- A 2.4 describes the requirements that an applicant must satisfy to demonstrate how coexistence with other spectrum users would be possible. Additionally, ComReg's *Satellite Earth Station Licensing Guidelines,* (*"the Guidelines"*)[3] appropriately recognize that proposed SES operations *must* be capable of coexisting with these spectrum users without posing unacceptable interference risks. Thus, *the Guidelines* provide that, as part of the application process, ComReg will evaluate whether proposed SES operations would satisfy various technical requirements designed to mitigate NGSO interference risks—including the equivalent power flux density (EPFD) limits established in Article 22 of the International Telecommunication Union (ITU) Radio Regulations. These longstanding EPFD limits offer a clear framework for coexistence between GSO networks and NGSO systems, enabling both types of operators to develop innovative user devices and evolve without unduly constraining the other.

Recently, ComReg consulted on Starlink's application[4] for a gateway authorization and that gateway's potential to cause interference to other users of spectrum in Ireland. In its response to the Starlink application consultation, Viasat highlighted the potential for proposed Starlink operations to cause interference to GSO networks and the lack of any demonstration of compliance with the ITU Article 22 and Resolution 76 (Rev.WRC-23) EPFD limits in Ireland, as well as the impact that proposed Starlink operations would have on NGSO-NGSO sharing.

Amazon's application raises the same concerns. Moreover, it is important to ascertain whether and how multiple NGSO systems (Amazon, Starlink, and others) could coexist in the same spectrum under the requirement to collectively comply with aggregate EPFD limits in Resolution 76 (rev. WRC-23). Viasat would like to emphasize the need for appropriate procedures, evaluation and development of license conditions before ComReg authorises these NGSO

[1] *See* https://www.comreg.ie/media/2025/06/comReg-25_36R.pdf.
[2] *See* https://www.comreg.ie/media/2023/10/ComReg-2396.pdf.
[3] *See* https://www.comreg.ie/media/2024/06/ComReg-2448.pdf.
[4] *See* https://www.comreg.ie/media/2025/05/ComReg-25_31.pdf.

systems to operate in Ireland. In order to mitigate the risk of interference to GSO networks, Viasat urges ComReg to address the interference potential at the authorisation stage, rather than after commencement of NGSO operations.

NGSO – GSO coexistence

Amazon has failed to provide any demonstration of its ability to comply with the Article 22 EPFD limits in Ireland. Amazon merely states that "*the Kuiper System has been designed with the capability to protect GSO systems*". ComReg cannot and should not accept Amazon's conclusory assertion. Indeed, as explained below, an analysis demonstrates that its system *would not* comply. Therefore, Viasat recommends that ComReg conduct an independent assessment of EPFD compliance taking into account the proposed operating parameters of Amazon Kuiper NGSO system.

Under the *Guidelines,* it is *imperative* for ComReg to evaluate compliance with the EPFD limits as part of the application process. Without an independent EPFD assessment from ComReg that is specific to Ireland, there is no valid basis for assuming that Amazon will comply with the Article 22 single-entry and Resolution 76 (Rev. WRC-23) aggregate EPFD limits of the Radio Regulations. EPFD analyses are entirely dependent on the underlying technical assumptions, and it is widely understood that unrealistic assumptions, or assumptions based on operations in other countries, can significantly skew the analysis, as discussed below[5]. The *Guidelines* explicitly empower ComReg to request additional information and perform additional analysis for this purpose.

This analysis is vital. Exceedance of EPFD limits by NGSO systems can (i) degrade and disrupt GSO service; (ii) reduce GSO network capacity; (iii) constrain the deployment of more advanced, higher capacity GSO networks, offering more and better services at a lower cost per bit; and (iv) prevent the deployment by GSO operators of the same types of small user terminals that NGSO operators already can deploy today, such as for mobility applications.

ComReg cannot and should not rely on the ITU to perform this critical analysis because the current methodology used by the ITU, particularly under ITU-R Recommendation S.1503, has notable known limitations. The analysis provided by the ITU is limited to assessing EPFD levels based on the data supplied in a specific filing, which often only considers a narrow set of scenarios—such as a single earth station location and a GSO satellite position. This approach is inherently limited and does not capture the full range of operational conditions. It is noted that Amazon has submitted three filings to the ITU that make up their NGSO system and these three filings have been evaluated for EPFD compliance individually. Such evaluation is not representative of the actual operation of the Kuiper

[5] *See (i) Viasat contribution to WP4A*, 4A/94, dated 18.04.2024, "*Working document towards a preliminary draft revision of Recommendation ITU-R S.1503-4 - Underestimation of non-GSO interference arising from the use of worst-case geometry in S.1503 and necessity to supplement it with grid-based epfd analysis*" *and (ii) Viasat contribution to WP4A, 4A/488, dated 23.04.2025*, "*Inconsistency of non-GSO epfd input parameters and impacts related to Recommendation ITU-R S.1503*".

NGSO system, which would “combine” the EPFD levels of all three ITU filings and generate higher interference towards GSO networks as a single system.

The ITU’s software alone cannot effectively check all of the ways an NGSO system operator may try to “game” the system, by contriving EPFD inputs in a way designed to “pass” the ITU’s spot checks regarding EPFD without regard to the actual operation of the NGSO system that affects every nation. Notably, that responsibility falls on individual administrations and regulators that consider authorising, or granting market access to, NGSO system operations. Furthermore, the ITU’s EPFD software ignores many contributions to EPFD, including the sidelobes from the large number of beams of thousands of NGSO satellites, potentially leading to significant underestimation of expected EPFD levels.

The methodology employed in ITU-R Recommendation S.1503 is considered outdated and significantly flawed, thus failing to capture the actual EPFD levels and the risk of unacceptable interference to GSO networks. Relying solely on this flawed and limited analysis could lead to licensing decisions that do not adequately protect other satellite or terrestrial services and fail to account for all representative scenarios.

The limited assessment based on ITU’s software has little bearing on the interference that a NGSO system can be expected to produce at various locations within Ireland. Therefore, a more comprehensive, up-to-date, and methodologically sound analysis is necessary for accurate assessment, which is something ComReg should conduct independently or require from operators, rather than relying solely on the ITU’s limited and outdated assessments.

For the case at hand. Viasat conducted an initial evaluation of uplink EPFD in the Ka-band using an aggregate database based on the combined filings from Amazon’s NGSO system (USASAT-NGSO-8A, USASAT-NGSO-8B, USASAT-NGSO-8C). This was done using the ITU EPFD approved software without making any changes to the input parameters for the EPFD calculation, such as the number of co-frequency satellites, minimum elevation, and GSO arc avoidance. The results of this evaluation indicate that the EPFD limits would be exceeded, as illustrated in the Figure 1.

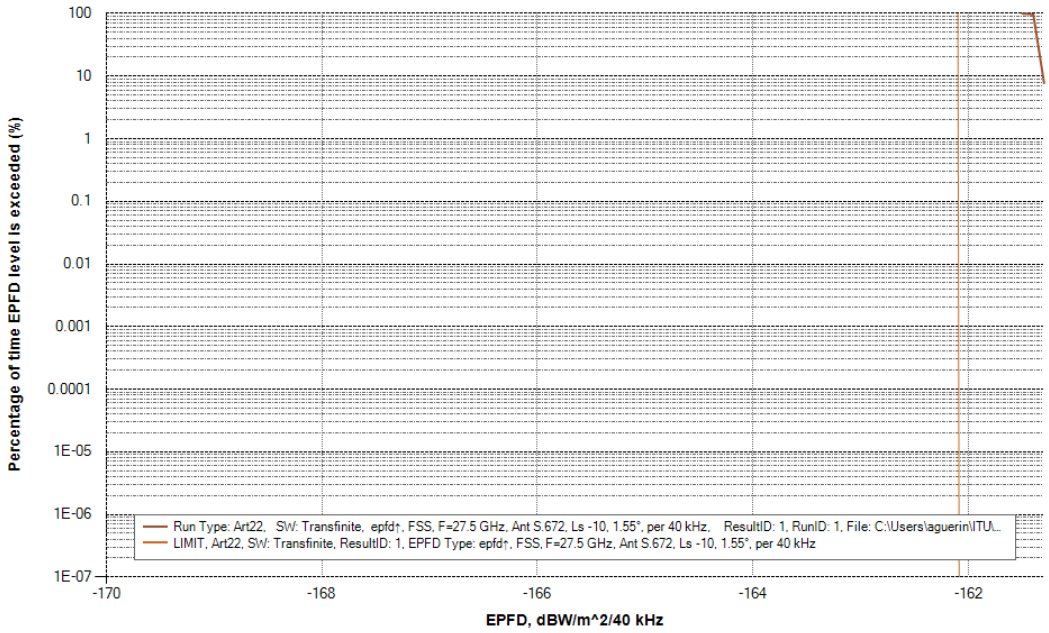

Figure 1. Results of the evaluation of the uplink EPFD in the Ka-band using an aggregate database based on the combined filings from Amazon's NGSO system.

Given these preliminary results, which indicate that the Kuiper NGSO system would *not* comply with applicable EPFD limits, it is appropriate and imperative for ComReg to evaluate compliance with the EPFD limits as part of the application process. Without an independent EPFD assessment from ComReg, there is no basis for expecting that Amazon will comply with the limits in Article 22 of the Radio Regulations in Ireland.

ComReg also must factor in the collective impact on Amazon's proposed operations, along with all other NGSO systems seeking to serve Ireland. ITU Radio Regulations Resolution 76 (Rev. WRC-23) defines the aggregate EPFD limits that must be met by all NGSO systems, collectively, and calls for administrations to take all possible steps, to ensure that the aggregate interference into GSO FSS and GSO BSS networks caused by NGSO systems does not exceed those limits. In the event that the aggregate EPFD limits are exceeded, Resolution 76 (Rev. WRC-27) further calls for administrations, to take all necessary measures to expeditiously reduce the aggregate EPFD levels to the limits given in Tables 1A to 1D of Resolution 76 (Rev. WRC-23). ComReg must not wait for the multilateral administration consultation meetings, which are scheduled to begin after 2027, to assess the potential of NGSO systems, collectively, to exceed the aggregate ITU EPFD limits in Ireland. Should interference issues arise, isolating and identifying individual EPFD contributions of every NGSO system toward the aggregate EPFD will be an impossible task.

A critical component of the aggregate EPFD compliance is to define the means by which multiple NGSO operators would reduce EPFD levels in case of any exceedance. Such a reduction in EPFD level must be proportional to the contribution of each NGSO system towards the aggregate EPFD. Notably, SpaceX Gen1 and Gen2 NGSO systems have been treated by the US FCC as two separate systems. Hence, SpaceX, as a single operator, may be allowed to contribute towards aggregate EPFD with two separate NGSO systems. There is a major risk of unequitable sharing of the aggregate EPFD budget amongst NGSO systems that would hinder opportunities for other parties including new entrants. These underlying issues can only come to the fore if an assessment on the aggregate EPFD is conducted.

ComReg should define a methodology for how the aggregate EPFD budget can be shared amongst all NGSO systems and how the NGSO systems will reduce the NGSO system EPFD levels, in case of exceedances. It is unreasonable to expect that NGSO licensees will adapt their operations if the aggregate EPFD exceedance is evaluated in the Ireland at a later time, especially when there is no methodology defined upfront at the time of license grant. At the very least, it will be a long process that will cause harm to GSO operations throughout the time of the aggregate EPFD exceedances by the NGSO systems.

For all the reasons above, Viasat encourages ComReg to conduct an independent assessment of potential for interference, from the Kuiper NGSO system and all NGSO systems collectively, within Ireland's national territory that are not covered by the limited assessments performed by the BR regarding ITU filings for the NGSO system. And before doing so, Viasat urges ComReg to require Amazon to demonstrate compliance with the single-entry and aggregate EPFD limits prescribed in the ITU Radio Regulations Article 22 and Resolution 76 (Rev. WRC-23), respectively. This should include:

a. A demonstration of compliance covering the NGSO constellation as a whole.
b. A demonstration of compliance covering the specific portions of the NGSO constellation proposed to serve Ireland (including the exact satellite altitudes and inclinations proposed to be used).
c. A demonstration of compliance at a suitable number of representative geographic locations within Ireland, including at and around the proposed gateway locations, and for all GSO satellite networks serving, or proposed to serve Ireland.
d. A demonstration of how the NGSO system would avoid interference to GSO networks created by numerous NGSO satellite antenna sidelobes, particularly when phased array antennas are employed.
e. A demonstration of how the NGSO system would operate alongside other co-frequency NGSO constellations serving Ireland without causing harmful interference to them.
f. Information on the ITU filing under which the each of the NGSO systems seeks to operate in Ireland (where the NGSO system operates under multiple filings, each application should contain EPFD input files, e.g. SRS and mask database, that represent their system as a whole and that are consistent with their ITU submission).

This additional information, along with ComReg's analysis, should be published to promote transparency and confidence in spectrum management.

Should ComReg, after completing its analyses, decide to grant the application, to ensure that the expected interference evaluated based on the above assessment is not exceeded during NGSO operations, the following licensing conditions would be necessary:

1. Amazon Kuiper NGSO system shall comply with the single-entry EPFD limits in Article 22 and together with all NGSO systems shall comply with aggregate EPFD limits in Resolution 76 (Rev. WRC-23).

2. Amazon as NGSO operator shall operate its system as a single constellation for purposes of the EPFD limits, no matter how many ITU filings it may seek to operate under.

3. Amazon as the NGSO operator shall confirm that its deployed NGSO system is fully consistent with its ITU filings.

4. Amazon as the NGSO operator shall comply with all the parameters provided in its ITU filing, specifically:

- Maximum number of co-frequency beams serving a specific location in Ireland, commonly known as "Nco".
- Minimum GSO arc avoidance angle, commonly known as "alpha angle."
- The downlink power flux density mask (PFD mask) and uplink EIRP density mask, taking into account the actual characteristics of Amazon Kuiper NGSO system and earth stations as deployed, including the radiation pattern of its satellite antenna.

NGSO – NGSO sharing methodology

Viasat urges ComReg not to make any license grant decisions based on the fundamentally flawed "*time average throughput degradation"* and "*degradation of absolute unavailability"* methodologies used by Amazon to claim the ability to coexist with other NGSO systems. There have been no studies conducted on the absolute unavailability degradation methodology in the ITU. Rather, proposals on this methodology have been strongly opposed at ITU WP4A on the basis that it does not adequately protect the "victim" system and caps its availability performance with no room for further improvements[6].

[6] *See Annex 46 attached to Chairman Report 4A/567, dated 15.05.2025, Working document towards a preliminary draft new recommendation on "Maximum allowable aggregate interference levels from time-variant sources from other services into fixed satellite service links*".

Furthermore, according to studies conducted in ITU WP4A[7], the average throughput degradation methodology masks the impact of NGSO to NGSO interference on specific performance objectives and does not address the protection of the Service Level Agreements (SLAs). This methodology is inadequate and incomplete. In addressing this issue in a different context, Resolution 769 (WRC-19) invites the ITU Radiocommunication Sector to study the selection and use of C/N objectives, and the necessity of specifying one or more C/N objective points at various percentages of time. In Amazon's case, the significantly "*higher-than-average*" throughput degradation can be easily noticed in the difference between C/N and C/N+I cumulative distribution function plots at certain percentages of time, provided in Amazon's analysis for existing NGSO licensees. Any authorisation of Amazon's Kuiper NGSO system based on the "*time-weighted average"* throughput degradation methodology, has the potential to cause coexistence issues between NGSO systems.

In the absence of different national regulatory framework, compliance with ITU rules should be demonstrated.

[7] *See Viasat contribution to WP4A, 4A/270, dated 08.10.2024, "Long term interference from NGSO systems into Ka band geostationary networks based on proposed use of average throughput degradation criteria"demonstrates the issues with the methodology in the context of NGSO-GSO coexistence, and is generally applicable to NGSO-NGSO coexistence as well*.