Your response

Question	Your response
Question 1: Do you agree with our proposal to update the Earth Station Network Licence to include a new provision authorising NGSO maritime services in the territorial seas of the UK and the Crown Dependencies? If you do not agree, please explain your reasons.	Confidential? – N Viasat supports Ofcom's proposal to include NGSO maritime terminals in the territorial seas; such inclusion will align GSO and NGSO regulations and should ensure that evaluation of NGSO-GSO coexistence issues (non-geostationary-satellite systems shall not cause unacceptable interference into GSO systems) takes account of NGSO maritime terminals located outside of UK mainland; Inmarsat has recently sent Ofcom information on its GSO maritime terminals in support of this policy effort.

Question 2: Do you agree with our proposal to introduce a licence condition in relation to NGSO downlinks to protect GSO satellites, and earth stations communicating with GSO satellites? If you do not agree, please explain your reasons.	Confidential? –N Viasat supports Ofcom's proposal to introduce a license condition for non-geostationary orbit (NGSO) downlinks to protect earth stations of geostationary orbit (GSO) networks from unacceptable interference. The additional condition can facilitate Ofcom taking an action to address potential interference cases from NGSO systems into GSO networks. More importantly, it could mitigate the risk of interference in the first place if further actions, as described below, are taken by Ofcom *before* granting authorizations to NGSO systems to serve the United Kingdom (UK). The International Telecommunications Union (ITU) Radio Regulations Article 22 equivalent power flux density (EPFD) framework is a long established and clear method for managing spectrum between Ku- and Ka- band GSO networks and NGSO systems. It provides continued certainty to both GSO and NGSO operators for their operations and is relied upon worldwide. It allows for ongoing innovation of new designs and deployment of next generation networks and services that are all based on current Article 22 EPFD limits. As Viasat demonstrated in our response[1] to Ofcom's recent consultation regarding space spectrum strategy, certain

[1] *See* Annex A in Viasat comments on space spectrum strategy consultation - https://www.ofcom.org.uk/__data/assets/pdf_file/0021/240195/Viasat.pdf.

NGSO systems have been found to exceed the "single-entry" EPFD limits and, in some cases, the "aggregate" EPFD limits. Unless prevented at the market access stage, such operations will generate excessive interference and can:

- Degrade service levels and cause capacity losses to broadband GSO networks as well as direct-tohome video (DTH) services, and
- Constrain continued technological innovation by GSO networks.

In addition, NGSO operations that exceed the Article 22 NGSO EPFD limits, including in the UK, are not tested by the limited examination conducted by the ITU. Ofcom must carry out its own examinations.

Violations can result from NGSO operators' attempts to ignore the actual way in which an NGSO system would operate and instead:

- Artificially separate an NGSO system into constituent components, and
- Impermissibly evaluate each of those constituent components (instead of the NGSO system as a whole) against the "single entry" EPFD limits.

Therefore, prior to authorising a new NGSO system, Ofcom must perform single-entry and aggregate EPFD limit compliance analysis for NGSO systems seeking to provide services in the UK. Specifically,

- Ofcom should conduct single-entry EPFD examination and verification of compliance against Article 22 EPFD limits on the *entire NGSO system irrespective of the number of ITU filings* that makes up that system, and
- Ofcom should also conduct its own analysis of the aggregate EPFD levels from all NGSO systems seeking to serve the UK to ensure that the aggregate EPFD levels do not exceed any of the EPFD limits in Resolution 76 (Rev. WRC-15)[2].

We strongly encourage the authorisation of NGSO systems to be as complete as possible to enable both NGSO systems and GSO networks to operate and innovate without causing interference to other systems. It would be practically impossible in the future to directly measure the NGSO-generated EPFD levels into GSO networks. Among

[2] Resolution 76 (REV. WRC-15), https://www.itu.int/dms_pub/itu-r/oth/0C/0A/R0C0A00000F0026PDFE.pdf.

	other things, EPFD statistics include a percentage-of-time element, such that EPFD levels would need to be measured over and against time and then processed to check against the Article 22 NGSO EPFD limits. Furthermore, where multiple NGSO systems operate in the same band, it is not practical to differentiate between the contributions of each NGSO system given all the main-beam and sidelobe transmissions of numerous satellites of those multiple NGSO systems and identifying the source of interference will be a challenge. Therefore, NGSO system license grants will require more clarity and Ofcom should impose further suitable conditions on both NGSO spectrum authorizations and grants of market access: • Require an NGSO system to comply with single-entry EPFD limits across the entirety of the system, with the national regulator viewing all NGSO system filings under which an NGSO system operates as a collective • NGSO systems not to cause unacceptable interference into GSO networks and not to claim interference protection from GSO networks; • Require NGSO systems to have an operational feature that allows them to immediately interrupt radio frequency emissions to ensure satisfaction of this non-interference requirement, and to cease emissions upon notice of unacceptable interference; • If interference into a GSO network occurs, require NGSO systems to cease operations and not recommence operations until they address the cause of such interference by, among other things, increasing angular separation, reducing power, shaping antenna beams differently; and • If aggregate interference to a GSO network from signals transmitted by multiple NGSO systems is detected, and it is not possible to identify the NGSO system generating the interference, require that NGSO system operators cooperate with each other and take the technical measures necessary to eliminate the interference. Viasat urges Ofcom to further improve the process of assessing NGSO system license application and, at a minimum prior to issuing a license: (iI) calculate the minimum GSO arc avoidance angle that will ensure that NGSO systems protect GSO networks from interference

	while serving the UK; (ii) allow interested parties to evaluate the efficacy of the proposed value; and (iii) require NGSO systems to maintain a suitable GSO arc avoidance angle as a condition of any authorization that ultimately may be granted. To assist in that analysis, Ofcom should require all NGSO applicants to provide the following information: • The number of satellite beams used for transmissions on the same frequency in the same or overlapping areas at any given time, and • How the NGSO system will avoid interference to GSO networks created by NGSO earth station and satellite antenna sidelobes, and NGSO earth station antenna back lobes, particularly when phased array antennas are employed. This information is relevant for assessing an NGSO system's potential interference into GSO networks, the potential for spectrum sharing with other NGSO systems, and, more broadly, the impact of the NGSO system on the spectrum and competitive environment in the UK.
Question 3: Do you agree with our proposal to introduce a licence condition setting out requirements for the protection of radio astronomy from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.	Confidential? –N Viasat supports the proposed approach of introducing specific license conditions, in this case for protection of radio astronomy from NGSO systems, that will enable Ofcom to take swift and direct enforcement action in any cases of harmful interference from NGSO systems.
Question 4: Do you agree with our proposal to introduce licence conditions setting out requirements for the protection of fixed links from harmful interference in relation to NGSO downlinks? If you do not agree, please explain your reasons.	Confidential? –N Viasat agrees with Ofcom's proposal to introduce licensing conditions for NGSO systems to protect other users of the spectrum, including terrestrial fixed service links, to protect them from harmful interference.
Question 5: Do you have any additional comments regarding any of our proposals?	Confidential? –N Viasat notes that discussions are ongoing at the ITU regarding multilateral administration consultation meetings, including the relevant technical material needed, to evaluate aggregate NGSO EPFD limits compliance and to take appropriate action if the aggregate NGSO EPFD limits are exceeded. As Ofcom has acknowledged in the Consultation, the ITU processes can be slow, and the outcomes can be uncertain.

Importantly, ITU Radio Regulations Resolution 76 (WRC-15) provides:

- that administrations operating or planning to operate non-GSO FSS systems[..], individually or in collaboration, shall take all possible steps, including, if necessary, by means of appropriate modifications to their systems, to ensure that the aggregate interference into GSO FSS and GSO BSS networks caused by such systems operating cofrequency in these frequency bands does not cause the aggregate power levels given in Tables 1A to 1D to be exceeded (see No. 22.5K);
- that, in the event that the aggregate interference levels in Tables 1A to 1D are exceeded, administrations operating non-GSO FSS systems in these frequency bands shall take all necessary measures expeditiously to reduce the aggregate epfd levels to those given in Tables 1A to 1D, or to higher levels where those levels are acceptable to the affected GSO administration (see No. 22.5K)

As part of the process to authorise NGSO systems to serve the UK, Viasat urges Ofcom to conduct aggregate NGSO EPFD limits compliance evaluations utilising the existing methodology to calculate aggregate downlink EPFD from NGSO systems provided in the latest version of ITU-R Recommendation S.1588 while the work in the ITU continues to progress.

Furthermore, Ofcom has already submitted proposals to ITU WP 4A[3] on how the NGSO EPFD limits levels of multiple NGSO systems can be reduced in the event of exceedance of the aggregate NGSO EPFD limits. Viasat invites Ofcom to implement a similar approach nationally to ensure that aggregate interference from NGSO systems into GSO networks are under the 'acceptable' NGSO EPFD limits.

Additionally, we would like to invite Ofcom to reconsider the characterization of some issues raised in the consultation document:

Para 1.2 Ofcom refers to "next generation satellite constellations" as NGSO systems. Viasat recommends that Ofcom identify that GSO systems that needing protection are also innovatively providing high-speed throughput services, through new generations NGSO systems.

[3] UK contribution to WP4A, document 4A/656 – *management of aggregate epfd by selective modification of Nsys; https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0656!!MSW-E.docx*

	This statement could mislead the consumer and citizens and could be misused again. This had been requested in responses to previous consultations. Throughout the document Ofcom refers to harmful interference and only by a footnote reference provides a key definition of interference: “Interference is referred to as “harmful” in ITU Radio Regulations and as “undue” in UK Wireless Telegraphy Act UK 2006. “ . ITU art 22 indicates that Non-geostationary-satellite systems shall not cause unacceptable interference. This is a very important point.