Temporary NGSO gateway access to E band

Proposal to grant temporary licences to Starlink Services LLC to use 71-76 GHz and 81-86 GHz for NGSO gateway earth stations at three sites

Consultation

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For more information on this publication, please visit https://www.ofcom.org.uk/spectrum/space-and-satellites/consultation-proposal-to-grant-temporary-licences-to-starlink-services-llc-to-use-71-76-ghz-and-81-86-ghz-for-ngso-gateway-earth-stations

Contents

Section

Annex

Annex A7 Draft licence is available as a separate document on Ofcom's website.

1. Overview

1.1 Take-up of satellite broadband is increasing in the UK. These services may be particularly valuable for people in poorly served areas where they are less likely to have access to fast and reliable terrestrial connections, as well as increasing choice and enhancing competition in the wider broadband market.

1.2 Non-geostationary orbit (NGSO) satellite systems have the potential to deliver high capacity and low latency satellite-based services to consumers, governments and businesses. Starlink Services, LLC, a subsidiary of SpaceX (hereafter referred to as "Starlink"), currently offers the only direct-to-consumer NGSO service in the UK. Starlink has seen rapid growth, with satellite broadband connections in the UK more than doubling from 42,000 in 2023 to 87,000 in 2024.[1]

1.3 Satellite communication systems rely on gateway earth stations ("gateways"), which connect satellites to the internet or to a private network. The amount of spectrum available for connections between gateways and satellites helps determine the number of customers that can be served.

1.4 In December 2024 we received a request from Starlink for temporary authorisation to use E band (71-76 GHz and 81-86 GHz) at three of its existing gateway sites[2] owing to capacity constraints on its UK operations. E band is currently not available in the UK for use by gateways.

1.5 Having considered Starlink's request, we are minded to grant temporary licences to Starlink to operate gateways in E band at these three sites, subject to requirements and conditions to protect existing services in and adjacent to the band. We consider that granting these licences would enable Starlink to increase the capacity of its services, benefiting people and businesses who use these services in the UK. This should encourage investment, foster innovation and bolster growth of satellite services in the UK.

What we are proposing – in brief

This document sets out our proposal to issue temporary fixed-term licences to Starlink authorising it to use E band frequencies to provide NGSO gateways at three sites in the UK:

- Morn Hill, Hampshire
- Wherstead, Suffolk
- Woodwalton, Cambridgeshire

These temporary authorisations would be subject to technical conditions for the protection of the Fixed Service and the Earth Exploration Satellite Service (passive) ("EESS (passive)"). We consider that, subject to these conditions, issuing these licences on a temporary basis should not unduly affect other services using E band and adjacent frequencies.

We propose that these licences expire on 31 December 2028.

[1] See page 20 of Connected Nations UK report 2024.

[2] There are seven existing NGSO gateway earth stations which all connect to the Starlink NGSO constellation: five licences are held by Starlink Internet Services Limited (for Morn Hill, Fawley, Wherstead, Woodwalton, and the Isle of Man), one licence is held by Arqiva Ltd (for Chalfont), and one licence is held by Goonhilly Earth Station Limited (for Goonhilly). These licences are available on our website.

1.6 In December 2024, we indicated our intention to consult on proposals to significantly increase the amount of spectrum available for satellite gateways in Q, V and E bands.[3] Given our consideration of demand for these bands and the request from Starlink, we have decided to phase this work. We are now consulting on the grant of temporary E band licences for Starlink at the three requested sites, including the conditions that would apply to such licences. We plan to consult on the longer-term authorisation of gateways in E band in 2028 following the next World Radiocommunication Conference in 2027 (WRC-27).[4] We still intend to make Q/V band available for satellite gateways and we expect to consult on this in Q2 2025/6.

1.7 We are open to considering requests from other satellite gateways for temporary use of E band frequencies, if there is evidence of demand for this spectrum as well as evidence on the capability to roll out services in the short term. If any such request were made, we would consider that request by applying the same approach we are applying to Starlink's request for these three sites. This would include consideration of the specific details of the request, including the potential impact on in-band and adjacent-band users. We may also re-evaluate technical conditions for Starlink and any new operator to ensure coexistence continues to be possible with other users of the spectrum.

1.8 This proposal for temporary authorisations does not prejudge the outcome of our future consultation process on proposals for longer-term access to E band for satellite gateways. Accordingly, granting the three temporary licences as proposed would not provide any assurance that Starlink would be able to access this spectrum at these sites, or on these terms, beyond the end date of the temporary licences.

Protecting other services

1.9 E band is used by the Fixed Service in the UK, with both Ofcom-coordinated and self-coordinated fixed links.[5] The adjacent band 86-92 GHz is a passive band[6] allocated to, amongst other services, EESS (passive) on a primary basis.

1.10 Limits for the protection of terrestrial services and the adjacent EESS (passive) band from satellite services are still to be defined in the International Telecommunication Union (ITU) Radio Regulations. WRC-27 will examine how satellite and terrestrial services (fixed and mobile), can share the 71 – 76 GHz and 81 – 86 GHz bands. In addition, WRC-27 will address the protection of EESS (passive) in the adjacent 86 – 92 GHz band from satellites in the 81 – 86 GHz band.[7] However, some other administrations, including in Europe and the USA, have already authorised Starlink gateways in E band.[8]

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[3] Q/V bands here are defined as 37.5 - 43.5 GHz, 47.2 - 50.2 GHz and 50.4 - 52.4 GHz. E band is defined as 71-76 GHz and 81-86 GHz

[4] The World Radiocommunication Conference (WRC) occurs every four years and is a process through which international standards and rules are designed and approved for radio spectrum use. International coordination is important for satellite transmissions to ensure satellite activity in one country does not unduly disrupt services elsewhere.

[5] Fixed Terrestrial Links

[6] Radio Regulations Article 5, No. 5.340 applies i.e. all emissions are prohibited in this band.

[7] See WRC-27 Agenda Item 1.10 and Resolution 775 for ITU-R Preparatory Studies for WRC-27

[8] FCC authorised a partial grant to SpaceX Partial Grant of SpaceX Gen2 Application to Allow E-Band Operations | Federal Communications Commission.

1.11 The proposals in this consultation include a number of interim provisions to facilitate sharing ahead of WRC-27, including applying:

- power flux density (pfd) limits given for Q/V band (42-42.5 GHz) in Article 21 of the Radio Regulations to NGSO space stations in the 71-76 GHz band;[9] and
- unwanted emission power limits to protect EESS (passive) in the 86 – 92 GHz band.

1.12 To mitigate the risk of harmful interference between gateways and UK fixed links, we propose the following:

- We will coordinate the three gateway sites with any new Ofcom-coordinated fixed links applications from today.
- Starlink would be required to protect existing self-coordinated fixed links in E band registered on the 70/80 GHz section of the wireless telegraphy register.[10] For any new fixed link registration requests that are currently in process or received from today onward, we will coordinate new self-coordinated fixed links planned to be located within 25 km of the Starlink gateway[11] with the new gateway earth stations in the 73.375-75.875 GHz and the 83.375-85.875 GHz bands.

1.13 This coordination approach would remain in effect for the duration of the temporary licences, if we decide to grant these following this consultation.

1.14 With these conditions, we consider that issuing temporary licences should not unduly affect other services using E band and adjacent frequencies. Conditions to protect other services will be reviewed as part of our future consultation process to make E band available on a permanent basis, following WRC-27.

Next steps

1.15 We are publishing this document to invite comments on our proposal to grant temporary fixed-term licences to Starlink to enable the use of E band for satellite gateways at three sites, and the proposed licence conditions. We will take into account all responses and evidence submitted as part of this process before reaching our final decision.

1.16 The closing date for submission of responses is 27 June 2025, after which we will consider responses and publish a statement outlining our decision. Subject to the responses we receive, we expect to publish the statement in Q2 2025/6.

The overview section in this document is a simplified high-level summary only. The proposals we are consulting on and our reasoning are set out in the full document.

[9] Limits are set out in Table A1.1 of Annex A1

[10] Available at https://www.ofcom.org.uk/siteassets/resources/documents/manage-your-licence/fixed-links/70-80-ghz-section-of-the-wireless-telegraphy-register-4-april.xlsx or on our Fixed Terrestrial Links page.

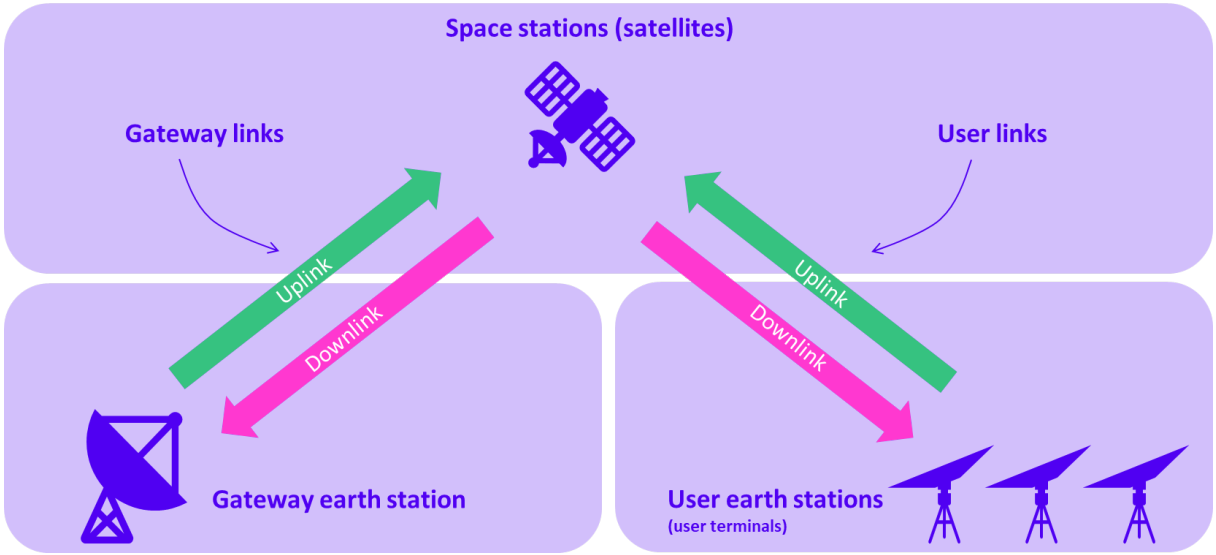
[11] Based on the centrally located antenna at the gateway site.

2. Introduction

Background

2.1 Satellite gateways are hubs, typically large antennas, that connect a satellite network to the internet and/or to private networks and cloud services. They are integral to Fixed Satellite Services (FSS), which are provided by geostationary orbit (GSO) and NGSO satellite systems. In the UK, gateways are authorised to use spectrum under "Permanent Earth Station" (for GSO gateways) and "Non-geostationary Earth Station" (for NGSO gateways) licences.

Figure 1: Key elements of a satellite communication system



2.2 In March 2024, we published a Call for Input (CFI) on making additional spectrum available for GSO and NGSO satellite gateway use in Q/V (37.5 - 43.5 GHz, 47.2 - 50.2 GHz and 50.4 - 52.4 GHz) and E band (71 – 76 and 81 – 86 GHz). In general, enabling gateways to access more spectrum should enable better satellite connectivity services, with higher backhaul capacity to serve more end user customers, offer new services or deliver broadband with faster speeds. The purpose of this CFI was to understand when stakeholders anticipated that they would need to use this spectrum for gateways in the UK and what benefits they might provide to people and businesses in the UK. It also sought stakeholder views on technical coexistence of satellite gateways using this spectrum with other services.

2.3 In the CFI, we noted the different situations of the bands with respect to the international framework for managing the interference environment between satellite and other services. In most of Q/V band, limits are set out in the Radio Regulations; for E band, limits for the protection of terrestrial services are still to be defined at the 2027 World Radiocommunication Conference (WRC-27). We asked for stakeholders' views on considering enabling gateways to use E band before WRC-27 concludes.

2.4 We received 10 responses. Of these, all satellite operators indicated plans to use Q/V bands in the future - some in the near-term - while plans to use E band were in the earlier stage for all except SpaceX, which asserted it was ready to use E band in its UK gateways.

2.5 Respondents also highlighted issues to consider, particularly the possible risk of interference from or into terrestrial fixed links, earth exploration satellite service (EESS), and GSO satellite networks.

2.6 Having taken account of these responses, on 17 December 2024 we issued an Update that we planned to consult in 2025 on proposals for making both Q/V and E bands available for satellite gateway use.

Starlink's request for authorisation to use E band

2.7 On 17 December 2024, Starlink wrote to Ofcom requesting temporary authorisation to use E band frequencies 71 – 76 GHz (space to Earth) and 81 – 86 GHz (Earth to space) at three of its existing gateway sites. These gateways would connect to its NGSO satellite constellation. Starlink subsequently submitted a request for temporary E band use at Morn Hill, Wherstead, and Woodwalton – available on our website.

2.8 In support of its request, Starlink stated that it was facing capacity constraints in the UK due to increased demand. Given that Starlink was already capable of enabling use of E band at its gateway sites, it asserted that access to this spectrum should help to quickly meet this demand and alleviate these capacity constraints.

2.9 Starlink outlined several benefits of obtaining access to E band for its UK gateways, including:

- Promoting competition and benefitting consumers and businesses without raising coexistence concerns.
- Improving latency and service quality.
- Providing redundancy for fibre-based broadband connections.
- Potentially lowering costs for customers, as temporary E band access offers a more cost-effective way to expand capacity compared to deploying additional Ka-band gateways.

2.10 Starlink also outlined potential broader benefits to the UK, such as investment in local infrastructure, supporting economic growth. We discuss these benefits further in the competition assessment (Section 5).

Revised approach to consulting on proposals for gateway access to Q, V and E bands

2.11 Following our initial appraisal of the request, and taking account of (i) the lack of urgent demand for access to E band from other satellite operators in their responses to our CFI; and (ii) the indicated timelines for planned Q/V band deployments, we decided to phase our proposals to maximise the likely benefits to UK citizens and consumers as follows:

i) first, to consult on a temporary authorisation for Starlink to use E band now;
ii) second, to consult on access to Q/V bands in Q2 2025/6, as set out in our Plan of Work. This should enable us to take a decision on opening up the use of those bands for satellite gateways before the end of 2025.
iii) after WRC-27, consult on adding E band to our standard satellite gateway spectrum licences. Conditions to protect other services will be reviewed as part of this process.

2.12 We explain our approach to the proposed temporary authorisation in the Section 3.

Relevant legal framework

2.13 Ofcom's statutory powers and duties in relation to spectrum management are set out primarily in the Communications Act 2003 (the "2003 Act" and the Wireless Telegraphy Act 2006 (the "WT Act").

Communications Act 2003

2.14 Our principal duties under the 2003 Act are to further the interests of citizens and consumers in respect to communications matters, where appropriate by promoting competition. In doing so, we are also required (among other things) to secure the optimal use of spectrum and the availability throughout the United Kingdom of a wide range of electronic communications services.

2.15 Our spectrum management duties require us to have regard to:

a) the desirability of promoting competition in relevant markets;
b) the desirability of encouraging investment and innovation in relevant markets;
c) the different needs and interests, so far as the use of the electro-magnetic spectrum for wireless telegraphy is concerned, of all persons who may wish to make use of it; and
d) the different interests of persons in the different parts of the United Kingdom, of the different ethnic communities within the United Kingdom and of persons living in rural and in urban areas.

Wireless Telegraphy Act 2006

2.16 We permit the use of the radio spectrum by granting wireless telegraphy licences under the WT Act. It is unlawful and an offence to install or use wireless telegraphy apparatus without holding a licence granted by Ofcom, unless the use of such equipment is exempted.

2.17 In carrying out our spectrum functions we have a duty under section 3 of the Act to have regard in particular to:

a) the extent to which the spectrum is available for use, or further use, for wireless telegraphy;
b) the demand for use of that spectrum for wireless telegraphy; and
c) the demand that is likely to arise in future for such use.

2.18 We also have a duty to have regard to the desirability of promoting:

a) the efficient management and use of the spectrum for wireless telegraphy;
b) the economic and other benefits that may arise from the use of wireless telegraphy;
c) the development of innovative services; and
d) competition in the provision of electronic communications services.

2.19 Section 8(3B) of the WT Act says the terms, provisions and limitations specified in the licences must be:

a) objectively justifiable in relation to the wireless telegraphy stations or wireless telegraphy apparatus to which they relate;
b) not such as to discriminate unduly against particular persons or against a particular description of persons;
c) proportionate to what they are intended to achieve; and

d) transparent in relation to what they are intended to achieve.

The desirability of promoting economic growth

2.20 In exercising our regulatory functions, we are also required to have regard to the desirability of promoting economic growth (the "growth duty").[12] In particular, we must consider the importance for the promotion of economic growth of exercising the regulatory function in a way which ensures that regulatory action is taken only when it is needed, and any action taken is proportionate. Section 110(3) of the Deregulation Act 2015 requires us to have regard to the "Growth Duty: Statutory Guidance" (revised by Government in May 2024).

Structure of this document

2.21 The rest of this document is set out as follows:

- Section 3 provides an overview of existing users in E band and explains our approach to considering the temporary authorisation request.
- Section 4 sets out our assessment of the impact of granting the licences on coexistence with other services.
- Section 5 sets out our assessment of the impact of granting the licences on competition.
- Section 6 explains the proposed conditions that would apply to the temporary licences.
- Section 7 explains our next steps.
- Annex A1 sets out our detailed analysis of coexistence with existing services in the 71 – 76 and 81 – 86 GHz and adjacent bands.
- Annex A2 is our impact assessment.
- Annexes A3 to A6 explain how to respond to our consultation and our consultation principles.

2.22 Annex A7 is a draft licence and is available as a separate document on Ofcom's website.

2.23 We have also published documents provided by Starlink to support its request on our website. These comprise:

- Forms for the three sites requested.[13]
- Spreadsheets with the technical parameters for the central earth station deployment for each of the sites requested.
- Supplementary deployment information about the other antenna deployments for each site. Starlink confirms that all other parameters are the same as those of the central deployment antenna for each site.
- A Supporting Submission.

[12] Section 108 of the Deregulation Act 2015, which was extended to Ofcom's regulatory functions by The Economic Growth (Regulatory Functions) (Amendment) Order 2024.
[13] As we do not currently authorise E band gateways, there is not an existing application form for this band. We asked Starlink to submit the information normally included on the "Satellite (non-geostationary earth station) radio licence application form – OfW564".

- A report “Dynamic Simulation Methodology for EESS (passive) interference from NGSO Earth-to-Space Links”.

3. About E band and our approach to assessing Starlink's request

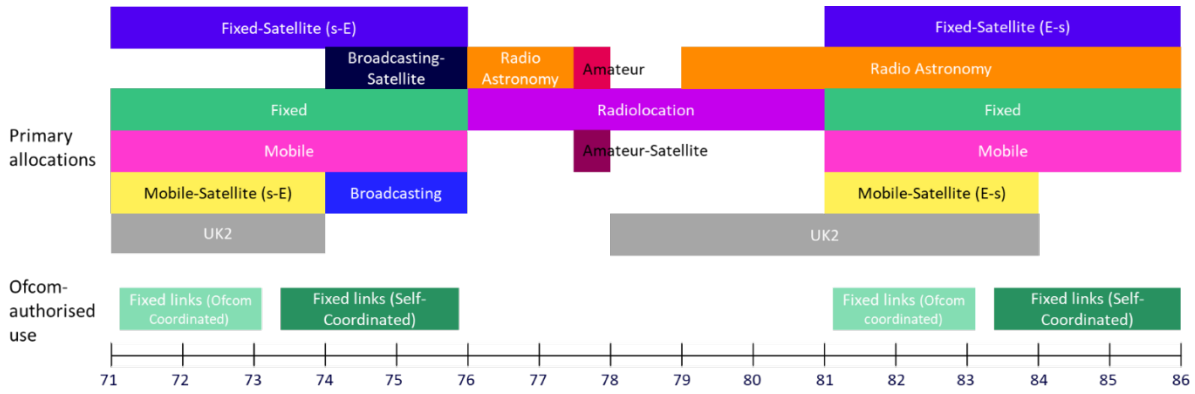
3.1 In this section, we provide an overview of existing users in E band and explain our approach to considering the temporary authorisation request.

Existing users in E band

3.2 E band is used by the Fixed Service in the UK, with both Ofcom-coordinated fixed links (in 71.125 – 73.125 GHz and 81.125 – 83.125 GHz) and self-coordinated fixed links (in 73.375 – 75.785 GHz and 83.375 – 85.785 GHz). There are currently around 6200 fixed links in E band.

3.3 The adjacent band 86 – 92 GHz is a passive band allocated to, amongst other services, the Earth Exploration Satellite Service (passive) ("EESS (passive)") on a primary basis.

Figure 2: Current allocations and use in E band (based on UK FAT)



3.4 Some E band allocations in the frequencies 71 – 74 GHz and 81 – 84 GHz, including the allocation to the Fixed Satellite Service, are designated "UK2.1" in the UK Frequency Allocation Table (UK FAT). This states that "Responsibility for granting permissions to use frequencies in this Allocation rests with Defence. All frequency permissions are reserved exclusively for Defence use except where assignments for Civil use are agreed with Ofcom". We have discussed these proposals with the Ministry of Defence (MOD). In addition, we will work with MOD when we consider the scope for sharing with satellite gateways in these bands on a permanent basis following WRC-27.

How we have assessed Starlink's request

Our Standard NGSO Gateway Licensing Process

3.5 NGSO gateways are normally authorised using the Satellite (non-geostationary earth station) licence (which we refer to as the "NGSO Gateway" licence), which is a licence that is currently available for parts of Ku and Ka bands.

3.6 Before we grant licences for NGSO gateways in the Ku and Ka bands, we follow a process that involves:[14]

a) a 'coexistence check', for which applicants must demonstrate:

i) how coexistence is possible between their proposed NGSO gateway and existing NGSO satellite systems licensed in the UK, NGSO satellite systems for which an application has been made, and other specific co-frequency earth stations registered with the ITU – as published on our NGSO licensing website.

ii) what flexibility their gateway has to coexist with future co-frequency NGSO systems, and the measures future NGSO systems could reasonably put in place to coexist with their gateways.

b) a competition check, focused on the impact of approving the licence application on consumers, customers and citizens in the UK.

3.7 We then invite comments on the NGSO gateway application before deciding whether to grant an NGSO gateway licence.

Consideration of Starlink's Request

3.8 We have considered elements of our standard NGSO Gateway licencing process authorisation process in our assessment of Starlink's request, where we find it to be a relevant and useful factor in our evaluation for example in our consideration of coexistence and competition.

3.9 The NGSO gateway licence places a number of conditions on licensees. For example, we require that NGSO gateways are only operated in connection with a NGSO system licensed under a Satellite (earth station network) licence – for NGSO use. Starlink's NGSO network licence was issued on 16 November 2020.

3.10 The issues we are considering in this request are broader than those considered by our usual NGSO gateway application process. This includes determining appropriate protections for other services using E band or adjacent frequencies, as well as the terms of the proposed licence. To ensure stakeholders have the information they need to comment on Starlink's request, we asked Starlink to provide the information they would normally have to submit for a gateway application. The documents provided by Starlink include completed forms (based on the NGSO Gateway licence application form OfW564), details of the technical parameters for earth station deployment, and a supporting narrative – these are available on our website.

3.11 We have structured this document around our assessment as follows:

[14] This process is set out more fully in our licensing guidance.

- Section 4 addresses coexistence between new E band gateways and incumbent fixed links and adjacent EESS (passive) services, and sets out our proposed measures to manage the risk of harmful interference with these services, in addition to coexistence with future NGSO networks.
- Section 5 assesses the impact of granting these licences on competition.

3.12 We further note that there are no agreed international spectrum sharing conditions to manage the coexistence between gateway links and other services in E band, though some other countries have authorised its use for gateways.

3.13 Having considered the evidence submitted by Starlink and our own analysis, our assessment is that, provided we implement the conditions for the protection of other services – which we set out in Section 4 – authorising Starlink to use E band for gateway links is likely to benefit citizens and consumers by enabling Starlink with the infrastructure to serve more customers. This could support both users in urban areas where there is currently constrained capacity, as well as those in hard-to-reach areas.

3.14 Furthermore, by taking action to temporarily authorise use of this spectrum for gateways, we would be encouraging growth and innovation in the UK by supporting growth of the satellite sector as well as businesses and technologies that make use of satellite broadband services.

We are proposing to create a temporary authorisation to last until after WRC-27

3.15 We are not proposing to add E band frequencies to the existing NGSO Gateway licence at this time, as future conditions for the use of the band are currently uncertain. Limits for the protection of terrestrial services from satellite services are still to be defined in the Radio Regulations for E band, as are conditions for the protection of adjacent band 86 – 92 GHz EESS (passive) operations. Several elements of this framework are expected to be established at WRC-27.[15]

3.16 As such, for the period before WRC-27 we have needed to develop interim technical conditions for satellite gateway links in the UK (set out in Section 6). In doing so, we have considered:

- our own analysis on coordination and pfd limits for protection of fixed links;
- analysis provided by Starlink on coexistence with EESS (passive); and
- technical conditions adopted by other administrations that have issued E band licences to Starlink, in particular on protection of EESS (passive), notably in the USA.[16]

3.17 We expect there will be differences between the interim technical conditions we propose here and those that will emerge from WRC-27. It is also uncertain how systems using E band will be designed in the future. While we are currently only aware of Starlink's proposed system, other networks may operate in a different way.

3.18 If we were to add E band frequencies to the NGSO Gateway licence now, these licences would need to be varied in the future to account for these changes. As such, we consider it

[15] See Section 4, paras 4.12 and 4.20 for additional detail.

[16] Partial Grant of SpaceX Gen2 Application to Allow E-Band Operations | Federal Communications Commission

is most appropriate to create temporary licences with these interim conditions: the "Satellite (temporary E band non-geostationary earth station)" licence (referred to as the "Temporary E Band Gateway" licence). This also provides scope for more bespoke licence conditions, to enable us to quickly respond to developments.

3.19 We will consult on a permanent authorisation for use of satellite gateways in E band after WRC-27. We propose that the Temporary E Band Gateway licences would expire on 31 December 2028, to allow time for that consultation process to complete and for Temporary E band Gateway licensees to transition to using the permanent licence product.

3.20 The proposed temporary authorisation does not prejudge the outcome of that consultation process, and granting these temporary licences would not provide any assurance that Starlink (or any other future licensee) would be able to access this spectrum at these sites, or on these terms, beyond the end date of the temporary licences.

Potential for further applications

3.21 While it is our understanding that Starlink is currently unique in its readiness to use these frequencies in the UK, we would be open to requests for E Band temporary Gateway licences from other satellite gateway operators if they also have evidence of demand for this spectrum as well as evidence of the capability to roll out services using these frequencies in the short term. We would consider any future applications on a case by case basis, applying the same approach as we are applying to Starlink's application.

3.22 Our technical analysis has been carried out with reference to Starlink's NGSO system and these three specific gateway sites, and therefore additional future systems and sites would need to be considered on a case by case basis. We may also need to reconsider technical conditions for both Starlink and new applicant(s) to ensure coexistence is still possible with other users of the spectrum.

4. Coexistence with other services

4.1 In this section, we consider how we would manage the risk of harmful interference into and from other users of spectrum from Starlink's use of E band at the proposed gateway sites.

Managing the risk of interference to other services

4.2 As noted in Section 3, there are several incumbent users of E band and adjacent bands in the UK. The detailed coexistence analysis we have considered to assess the impact of the three requested gateway sites on existing services in the 71 – 76 GHz and 81 – 86 GHz bands and the adjacent 86 – 92 GHz band are set out in Annex A1. Taking into account the results of this analysis and the coexistence measures we are proposing, our assessment is that coexistence with other services is feasible.

4.3 In its request, Starlink asserts that its gateways "use high-gain, narrow, directional beams with high minimum elevation angles and low sidelobes, which create small, predictable coordination zones and links that makes them especially well-suited for efficient spectrum sharing. This design facilitates coexistence with incumbent and future fixed links through minimal angular or physical separation."[17]

4.4 Below we discuss the technical conditions we propose to minimise the risk of harmful interference to incumbents for the duration of the temporary licences.

Ofcom coordinated fixed links

Existing links

4.5 In the Ofcom coordinated bands (71.125 – 73.125 GHz and 81.125 – 83.125 GHz), Ofcom is responsible for coordination with existing licensees before granting new fixed link licences.

4.6 Based on the coexistence analysis we have carried out (see Annex A1), we do not expect that the proposed gateways would cause harmful interference to existing Ofcom coordinated links and vice versa.

Managing interference risk to new links

4.7 To manage the risk of interference between any new fixed links and the proposed gateways, we propose to apply the same coordination approach that we currently use for NGSO gateways and fixed links in other frequency bands taking into account the technical parameters for fixed links and gateway earth stations for E band. This coordination approach includes applying the same protection criteria and propagation models that we currently use for other bands as given in Annex A1.

4.8 From today, we will account for the proposed gateway sites when coordinating any new fixed link applications. This is to manage the risk that a new fixed link could prevent the deployment of the proposed gateway sites before we have made a final decision on Starlink's application for the temporary licences. Subject to the outcome of this

[17] See Starlink's Supporting Submission.

consultation, we would continue to coordinate any further fixed link applications with the gateway sites while the temporary licences are in force.

Self-coordinated fixed links

Existing links

4.9 The self-coordinated bands (73.375 – 75.785 GHz and 83.375 – 85.785 GHz) are available under a light licensed, self-coordinated process. These are national licences which authorise the use of fixed links, through a link registration process administered by Ofcom. These links are registered in the 70/80 GHz section of Ofcom's Wireless Telegraphy Register. Licensees are responsible for assessing the impact of any new links with existing registered fixed links; if a new link is likely to cause interference to an existing link, the licensee of the new link should coordinate with the existing licensee to avoid interference.

4.10 Based on the coexistence analysis we have carried out (see Annex A1), we do not expect that the proposed gateways would cause harmful interference to existing self-coordinated links and vice versa.

Managing interference risk to new links

4.11 From today, Ofcom will coordinate any new fixed link registration requests with the proposed gateway sites (fixed link licensees will remain responsible for coordinating any new fixed links with existing fixed links registered in the 70/80 GHz section of Ofcom's Wireless Telegraphy Register). This is to manage the risk that a new self-coordinated fixed link could prevent the deployment of the proposed gateway sites before we have made a final decision on Starlink's application for the temporary licences. This coordination will apply to self-coordinated fixed links located within 25km of each nominated NGSO gateway's centrally located antenna and will be carried out using the approach as given in paragraphs A1.17 to A1.26 in Annex A1. Subject to the outcome of this consultation, we would continue to coordinate any further self-coordinated fixed link registration requests with the gateway sites while the temporary licences are in force.

Fixed links and NGSO gateway space station downlink transmissions in 71 – 76 GHz

4.12 Article 21 of the ITU Radio Regulations at present does not include sharing conditions between fixed and satellite services in the 71 – 76 GHz and 81 – 86 GHz bands. WRC-27 agenda item 1.10 was established to address this, including establishing appropriate pfd limits which would also account for aggregate interference from multiple satellite systems. Studies in ITU-R are currently underway.

4.13 Given the lack of internationally agreed sharing conditions, we propose to apply the pfd limits given in Article 21 for the nearest band (42 – 42.5 GHz band) for NGSO space station down link transmissions. We consider that these limits are adequate to minimise the risk of harmful interference to fixed links until WRC-27 makes long term decisions. These pfd limits are given in Table 1 below.

Table 1: Article 21 power flux density limits for NGSO space station transmissions in the 42 - 42.5 GHz band

Reference Bandwidth 1 MHz				
Angle of arrival, δ, above the horizontal plane (°)	**0-5**	**5-15**	**15-25**	**25-90**
pfd limit in dB(W/m^2)	**-120**	**-120+(δ-5)**	**-110+0.5(δ-15)**	**-105**

4.14 Our technical analysis (see Annex A1) indicates that, assuming a worst-case scenario for the maximum number of satellites filed (around 30,000) in the Starlink constellation, there is a risk that the fixed link protection criteria could be exceeded by up to 13 dB.

4.15 Starlink has informed us that the current number of operational satellites in their constellation is much lower than the 30,000 filed and in our view, this is likely to be the case for the period of the temporary licences. Therefore, we do not expect that the fixed link protection criteria are likely to be exceeded in practice.

4.16 To further manage the risk of harmful interference to fixed links we propose that transmissions from satellites in the 71 – 76 MHz band should be on a non-interference basis. Starlink would be required to resolve any reported interference events or stop transmissions.

4.17 Given the above, we expect the risk of harmful interference to fixed links from NGSO space stations to be minimal in practice and manageable.

Earth exploration satellite service

4.18 The 86 – 92 GHz band is used for the passive remote sensing of several atmospheric, cloud and precipitation parameters, and contributes to land surface characterisation (e.g. for snow and sea ice). Data from these measurements is used for operational weather forecasts and form part of global climate records of these variables.

4.19 There is potential for the uplink from NGSO gateways operating in the 81 – 86 GHz band to interfere with the passive EESS (passive) in the adjacent 86 – 92 GHz band. Limits on out-of-band emissions in conjunction with other operational characteristics such as the maximum number of simultaneous uplink beams and gateway density are required to protect the EESS (passive).

4.20 Resolution 750 of the Radio Regulations at present does not include unwanted emission power limits for satellite earth stations in the 81 – 86 GHz bands to protect EESS (passive) operations in the adjacent 86 – 92 GHz band. WRC-27 agenda item 1.18 was established to address this, including establishing unwanted emission power limits which would also account for aggregate interference. Studies in ITU-R are currently underway. Therefore, WRC-27 is expected to develop conditions for protection of EESS (passive) in the 86 – 92 GHz band.

4.21 Starlink has provided a dynamic analysis on the interference levels at EESS (passive) receivers due to NGSO gateway transmissions. We are publishing this analysis with this consultation, see "Dynamic Simulation Methodology for EESS (passive) interference from NGSO Earth-to-Space Links" the summary of parameters and assumptions that Starlink used

can be found in Annex A1. Results from Starlink's analysis in Figure A1.2 highlight that there is approximately a 2 dB margin for the most susceptible EESS (passive) sensor.

4.22 To minimise the risk of harmful interference to EESS (passive) in the adjacent band, we propose a set of technical conditions (see Section 6) including unwanted emission power limits for the earth stations in the 81 – 86 GHz band. In addition, we are proposing that transmissions from earth stations in the 81 – 86 GHz band should be on a non-interference basis with respect to EESS (passive). Starlink would be required to resolve any reported interference events or stop transmissions.

4.23 Given the above, we expect the risk of interference from the NGSO gateway sites to EESS (passive) to be minimal and that coexistence would be manageable for the duration of the temporary licences.

4.24 We invite comments on the proposed approach for protecting other services.

Consultation question 1:

Do you agree that the proposed NGSO gateways are able to coexist with fixed links and EESS (passive) under our proposed approach, for the duration of these temporary licences? If not, please provide supporting evidence with your comments.

Coexistence with future NGSO and GSO systems

NSGO systems

4.25 As these are the first NGSO E band gateways that we are proposing to grant temporary authorisation to in the UK, and there is uncertainty regarding future use of the band by other NGSO systems, we also consider that any conditions we set for these temporary licences would need to be reviewed when we introduce a permanent licence product for E band in the future. Given this, we recognise that it is not possible to anticipate the future plans of other operators. Our consideration has therefore been based on the evidence Starlink has provided in its supporting submission, to demonstrate that their system has the flexibility to accommodate new entrants, if required.

4.26 Starlink states in its NGSO temporary licence request the following: "Due to its pencil-thin beams and very narrow side-lobes, E band allows co-existence with other services. In addition, Starlink uses narrow and steerable beams with high minimum elevation angles, which facilitates sharing with other services, reducing the risk of harmful interference."

4.27 Furthermore, Starlink stresses that it "routinely coordinates with other operators" and "will continue to do so". It states that it "undertakes a coordination assessment with each operator, typically based on the specific locations and respective operating parameters of each system, to ensure that spectrum is used efficiently and to reduce the possibility of harmful interference."

4.28 Our initial view is that the measures described in Starlink's request appear to be sufficient to ensure its NGSO system would be capable of coexisting with future NGSO systems (including gateways and terminal operators).

GSO networks

4.29 Similarly to NGSO systems, to our knowledge no GSO networks currently use E band frequencies to provide UK services. Starlink stresses in its request that it complies with international obligations to protect services, including GSO networks, and will continue to do so, as GSO networks may use E band in the future.

4.30 We would require that all the applicable provisions of the Article 22 of the Radio Regulations, including No. 22.2,[18] shall be respected.

4.31 We invite comments from stakeholders on the following question:

Consultation question 2:

Do you agree that the measures set out above to enable coexistence of Starlink's proposed gateways with future NGSO and GSO systems are reasonable? If not, please provide supporting evidence with your comments.

[18] 22.2 § 2 1) Non-geostationary-satellite systems shall not cause unacceptable interference to and, unless otherwise specified in these Regulations, shall not claim protection from geostationary-satellite networks in the fixed-satellite service and the broadcasting-satellite service operating in accordance with these Regulations. No. 5.43A does not apply in this case. (WRC-07)

5. Assessing the impact on competition

5.1 This section sets out our assessment of the impact of granting the temporary licences on competition.

5.2 Our NGSO licensing process explains that our starting position for assessing competition is to authorise licence applications where possible. This reflects the extent of the likely risks to competition, and our view that, because the NGSO industry is still emerging and characterised by uncertainty, the benefits of enabling systems is in general likely to exceed the risks.

5.3 The assessment in this section takes account of our proposed approach to any further requests for temporary E band access, as set out in Section 3.

Risks to competition

5.4 In our 2022 statement "Starlink Internet Services Limited: Decision on applications for six non-geostationary earth station gateway licences" (the "2022 NGSO gateway statement") we considered a range of potential impacts on competition, and our overall assessment was that there was a low risk to competition from approving the NGSO gateway licences.

5.5 Subsequently, in 2024 Starlink applied to vary four of its NGSO gateway licences. Our 2024 statement "Starlink's request to vary four non-geostationary gateway licences" (the "2024 NGSO gateway statement") compared the facts of Starlink's licence variation request against the facts in the 2022 NGSO gateway statement. That assessment considered six potential competition risks:

- **Potential risk 1**: Starlink occupying all or most of the available gateway sites, potentially blocking future entrants from accessing the market.
- **Potential risk 2**: Starlink occupying preferential sites, raising the cost of entry to subsequent entrants.
- **Potential risk 3**: Starlink's potential requirement for large separation distances between its gateway(s) and that of others, thereby blocking potential sites to future entrants.
- **Potential risk 4**: Strategic licence application for gateway sites which an operator does not plan to use, in order to deliberately block future entrants.
- **Potential risk 5**: Planned global expansion of the Starlink NGSO system preventing potential entrants deploying constellations in space in the future.
- **Potential risk 6**: Starlink's vertical integration affecting competition in the supply of satellite broadband to UK customers given its parent company's (SpaceX) involvement in satellite launch services.

5.6 For this consultation, we apply the same conceptual approach used in the 2024 NGSO gateway statement. Specifically, we compare the facts of this temporary E band licence request against the facts in the 2024 NGSO gateway statement, and consider each of the six competition risks against these facts. In short, the facts are that, should this E band licence

application be granted, Starlink would additionally use 71-76 GHz (space-to-Earth) and 81-86 GHz (Earth-to-space) frequencies at three of its existing gateways in the UK.

5.7 We now consider whether Starlink's E band temporary licence request changes our assessment of the competition risks outlined in our 2024 NGSO gateway statement.

Potential risk 1: Starlink occupying all or most of the available gateway sites, potentially blocking future entrants from accessing the market

5.8 There is no change to this risk assessment since Starlink is not proposing to occupy any new sites in this variation request.

Potential risk 2: Starlink occupying preferential sites, raising the cost of entry to subsequent entrants

5.9 There is no change to this risk assessment since Starlink is not proposing to occupy any new sites in this variation request.

Potential risk 3: Starlink's potential requirement for large separation distances between its gateway(s) and that of others, thereby blocking potential sites to future entrants

5.10 Starlink has previously informed us that its system does not require a standard geographic separation between its gateways and the gateways of other operators operating to their NGSO systems at the same frequencies. Instead, it undertakes a coordination assessment with each operator. This ensures the shared spectrum is used efficiently and the possibility of harmful interference is reduced.

5.11 For this temporary E band licence request, Starlink would be the first NGSO gateway operator using E band spectrum. Therefore, Starlink would not be at risk of blocking existing gateway operators linked to these proposed temporary licences.

5.12 As regards blocking future operators, our initial view is that the measures described in Starlink's temporary E band licence request should be sufficient to ensure its NGSO system is capable of coexisting with future NGSO systems (including gateways and terminal operators).

5.13 Nonetheless, we are open to considering requests for other satellite gateways to use E band frequencies on a temporary basis. Should this scenario arise, we would assess the request using the same framework we apply here to Starlink's temporary licence request, examining both coexistence and competition considerations. We may also re-evaluate technical conditions for both Starlink and any new applicant to ensure coexistence continues to be possible with each other and with other users of the spectrum. Therefore, we consider that the risk to competition from this scenario is low.

5.14 Whether or not another applicant requests temporary access to E band ahead of the WRC-27, Ofcom will consult on permanent authorisation for use of satellite gateways in E band, and Temporary E band Gateway licensees would transition to using the permanent licence product at the end of their temporary licence.

Potential risk 4: Strategic licence application for gateway sites which an operator does not plan to use, in order to deliberately block future entrants

5.15 There is no change to this risk assessment since Starlink is not proposing to occupy any new sites in this variation request.

Potential risk 5: Planned global expansion of the Starlink NGSO system preventing potential entrants deploying constellations in space in the future

5.16 In the 2024 assessment, we considered that for Starlink's gateway licence variation request to raise competition concerns in the UK:

- approving the request would need to drive the deployment of a sufficient proportion of satellites in Starlink's NGSO system; and
- this deployment of satellites would need to harm competition in the UK.

5.17 Our view in 2024 on potential risk 5 was that approving or refusing Starlink's licence variation request was unlikely to materially affect the number of satellites Starlink launches[19] or operates. This is because first, Starlink has already deployed more satellites to meet global demand without requesting additional antennas or gateways in the UK. Given that, and other evidence submitted by Starlink as part of the 2024 assessment, our view at the time was that satellite constellations drive the demand for gateways, rather than the other way around.

5.18 Second, our view in 2024 was that if we declined that licence variation request, Starlink could deliver additional capacity on the ground by deploying gateways in neighbouring countries. As above, in this counterfactual the number of satellites Starlink operates is unlikely to materially change. However, it could preclude UK consumers from realising some benefits associated with having ground capacity on NGSO gateways in the UK, such as improved latency.

5.19 Accordingly, our conclusion in the 2024 assessment was that potential risk 5 was low risk in the UK because the first condition was unlikely to apply. Given this, we did not need to consider the second of these conditions, i.e. whether such a deployment would lead to harm to competition in the UK. Nonetheless, we noted at the time that a larger deployment of satellites would not necessarily lead to harm to competition in the UK.

5.20 We consider there is no change to this risk assessment for this current temporary E band licence request, for the same reasons described above.

Potential risk 6: Starlink's vertical integration affecting competition in the supply of satellite broadband to UK

[19] In the case of launches it would be the upstream activities of SpaceX, Starlink's parent company.

customers given its parent company's (SpaceX) involvement in satellite launch services

5.21 In relation to potential risk 6, in the 2024 assessment we considered a hypothetical concern that Starlink might have an increased incentive to engage in input foreclosure.[20] The standard test for input foreclosure asks whether:

a) a firm would have the ability to use its control of inputs to harm the competitiveness of its downstream rivals;
b) a firm would have the incentive to actually do so, i.e. it would be profitable; and
c) the foreclosure of these rivals substantially lessens overall competition.

5.22 These are cumulative conditions - all must be met for there to be a competition concern.

5.23 In the 2024 assessment we considered that for Starlink to have the ability to foreclose rivals it would need to have upstream market power, and the input (satellite launches) in this market must be important to downstream rivals' (satellite broadband providers) ability to provide services to its customers. While satellite launches are important for commercial satellite operators (i.e. rivals to Starlink), our view was that SpaceX has already provided (or is contracted to provide) launch services for a number of its competitors – including NGSO operators wishing to provide a service in the UK – and that other launch operators such as Arianespace, Indian Space Research Organisation's Polar Satellite Launch Vehicle and Rocket Lab are credible alternative launch providers for third parties.[21]

5.24 On the potential incentive for Starlink to engage in input foreclosure, in the 2024 assessment we did not consider this incentive would materially change if we approved the licence variation requests, compared to the counterfactual of not approving these requests. First, in the counterfactual of denying the variation request we considered that Starlink could take alternative steps to meet its capacity needs, such as by building gateways in neighbouring countries. As a result, the incentive was unlikely to change depending on our UK licencing decision. Second, we considered that the additional incentive from a larger presence in the UK – due to the application being approved – is likely to be small when compared against the potential 'cost' of such a strategy. Here, the cost would be lost global sales of satellite launches to downstream rivals by attempting to either increase launch prices or deny launches to downstream rivals.

5.25 In the 2024 assessment we did not conclude on whether Starlink does or does not currently have the ability to engage in input foreclosure. However, our view was that approving the variation request would not materially change SpaceX's incentive to engage in input foreclosure, compared to the counterfactual of not granting the licence. Therefore, our conclusion was that there is a low competition risk in relation to changes in the ability or incentive for potential input foreclosure arising from our decision.

5.26 For this current temporary E band licence request, our view is that there is no change to this risk assessment, for the same reasons set out above.

5.27 In the 2024 assessment we also considered a related hypothetical concern, that SpaceX's presence in the satellite launch market might give Starlink bargaining power in its

[20] Input foreclosure refers to a situation where an upstream division (i.e. satellite launches) of a vertically integrated firm either stops supplying inputs to rivals of its own downstream division (i.e. provider of satellite broadband) or continues to supply the inputs but at higher prices.
[21] Though we understand that none currently have a launch frequency comparable with that of SpaceX.

coordination discussions with other NGSO operators, to the detriment of Starlink's satellite broadband competitors. As part of that assessment, we considered whether approving the 2024 licence variation request would affect Starlink's ability or incentive to negotiate better terms during coordination discussions. For the same reasoning as above, we concluded that approving Starlink's licence variation request was unlikely to change SpaceX's position in the satellite launch market or its incentives to negotiate better terms during coordination discussions, compared to the counterfactual of not approving the 2024 variation request. Our view is that there is no change to this risk assessment for the current E band temporary licence request, for the same reasons set out above.

Ofcom's assessment

5.28 Having considered the competition risks above, we have not identified harm to competition from granting the temporary licences.

Benefits

Starlink's submission

5.29 Starlink has submitted that granting temporary E band licences would benefit consumers and citizens in the UK in the following ways:

a) Promote competition and benefit consumers and businesses in the UK, without raising any coexistence concerns.
b) Meet growing customer demand by expanding capacity at three of its existing gateway sites.
c) Access to E band would lead to immediate benefits by alleviating its ongoing spectrum capacity constraints in the UK, and especially in high demand areas such as London.
d) In addition to capacity benefits, E band access would improve Starlink's latency and service quality, and would also act as a redundancy for fibre-based connections for broadband access.
e) Improved latency would occur because the three sites are already low latency gateways.
f) The benefits could be delivered immediately because Starlink is already capable of enabling use of E band at its gateway sites and satellites.
g) Temporary E band access represents a lower cost option to expand capacity compared to other alternatives, such as more Ka-band gateways in the UK.

Ofcom's assessment

5.30 As we have not identified likely harm to competition, we do not need to weigh the benefits against any competition concerns. Nonetheless, we consider that it is reasonable to expect benefits to be realised from granting these temporary licences to Starlink, including:

- the spectrum would be immediately used because Starlink is already capable of enabling use of E band, at its gateway sites and satellites;
- we expect that additional capacity resulting from granting the licences would lead to consumer benefits because it would likely enable Starlink to serve more customers; and

- it is likely that E band represents a lower cost option to Starlink compared to building more Ka-band gateways in the UK because Starlink is already capable of enabling use of E band at the three gateway sites in question.

Consultation question 3:

Do you agree with our assessment that granting these temporary licences would not be likely to harm competition? If not, please explain why.

6. Proposed licence conditions

6.1 We are proposing to grant Starlink temporary access to E band under a new "Satellite (temporary E band non-geostationary earth station)" licence (referred to as the "Temporary E Band Gateway" licence). While similar to the "Satellite (Non-Geostationary Earth Station)" licence under which we authorise NGSO gateways in other bands (which we refer to as the "NGSO Gateway" licence), the proposed new licence would have some significant differences in its conditions, in particular to reflect that access to E band is currently on a temporary basis and for the protection of other services.

6.2 In this section we set out our proposals for the licence conditions that would apply to the Temporary E Band Gateway licences, and note the ways in which these are different from, or the same as, those that apply to the NGSO Gateway licences used in other bands.

6.3 Apart from the terms described in this section, the proposed Temporary E Band Gateway licence generally follows the format of the NGSO Gateway licence, with some changes: [22]

- To remove the reference to the terms of the General Licence Conditions booklet (Version OfW597) in paragraph 2. This is because we are using some different terms (relating to licence duration, licence transfer and revocation) than are contained in the booklet. Those we are retaining have been written into the licence.
- To remove licence terms not relevant to E band frequencies, or where they are superseded by the interim licence conditions we propose for the protection of other services.[23]

6.4 A copy of the proposed licence is included as Annex A7.

Non-technical licence conditions

Licence duration

6.5 We propose that the licence has a fixed term until 31 December 2028. Subject to responses when we consult after WRC-27, we expect that by the end of this term we will have added E band to the standard bands available for NGSO Gateway licences. Stakeholders wishing to use E band for NGSO gateways, including licensees with Temporary E Band NGSO Gateway licences that wish to continue to operate in E band, would need to apply for this standard NGSO Gateway product when it becomes available.

6.6 For the avoidance of doubt, should Starlink or any other satellite operator request additional gateway sites in E band in future, these would have the same end date of 31 Dec 2028, irrespective of when the application is made.

[22] NGSO Gateway licences are available on our website.

[23] This applies to paragraph 3.1 parts c, d, e, f, and g of Schedule 1 of the NGSO Gateway licence. We have also replaced a reference to the Radio Equipment Directive (Directive 2014/53/EU) in paragraph 3.1 part h of Schedule 1 of the NGSO Gateway licence with a reference to the Radio Equipment Regulations 2017.

Licence revocation and potential to amend the terms of the licence

6.7 As we are making these licences available ahead of WRC-27, and in the absence of some international rules and regulations for use of these frequencies, we think it is appropriate to maintain discretion and flexibility for Ofcom to deal with unforeseen circumstances.

6.8 We are proposing to include a condition in the licence that would enable us to manage the risk of harmful interference by requiring the licensee to take steps to resolve interference cases (see paragraph 6.17 below). We may also modify the technical conditions of granted Temporary E Band Licences if necessary to prevent harmful interference to other users or facilitate coexistence with other applicants for Temporary E Band Licences (see paragraph 6.18).

6.9 We consider a one-month notice period for revocation of the licence for spectrum management reasons is appropriate to allow us to revoke licences quickly, for example in the event of harmful interference that cannot otherwise be resolved.

Trading

6.10 Given that these licences are for a fixed term until 2028, we consider that trading has limited value and do not propose to make these licences tradable.

Requirement to commence and maintain transmissions within 3 months

6.11 A condition of the existing NGSO Gateway licences is a requirement for gateway licensees to commence and maintain transmissions within 12 months of being issued a licence. This is to mitigate the risk of artificial scarcity if operators apply for licences far in advance of a potential need and never actually deploy.[24]

6.12 As the Temporary E Band Gateway licences are time-limited and intended to address a situation where there is evidence of demand for this spectrum as well as evidence on the capability to roll out services in the short term, we think it is appropriate to have a shorter period to commence transmission. We are therefore proposing that these licences have a requirement to commence and maintain transmissions within 3 months.

Pricing

6.13 For existing NGSO gateway licences we charge a fixed, cost-based fee of £500 per year, payable prior to the grant of the licence, and then annually. In line with this, we propose to apply a £500 annual fee for the Temporary E Band Gateway licences.

6.14 We are currently reviewing the fees for NGSO Gateway licences and expect to consult on new fees in summer 2025. As a result, Starlink and other prospective licensees should be aware that fees for Temporary E Band Gateway licences are subject to change following that consultation process.

[24] See Licensing guidance, paragraph 3.19.

Conditions for the protection of other services

6.15 Below we set out the licence conditions we propose to include in the temporary licences based on our assessment of coexistence with other services, as detailed in Section 4.

General conditions for protection of other services

6.16 Grant of this temporary licence is on the condition that the licensee shall not cause harmful interference to fixed links in the 71-76 GHz band and EESS (passive) in the adjacent 86 – 92 GHz band.

6.17 In the event of any reported harmful interference to fixed links in the 71 - 76 GHz and EESS (passive) in the adjacent 86 – 92 GHz band, the licensee shall cooperate and take all necessary steps to resolve harmful interference cases including immediately ceasing transmissions as necessary.

6.18 Ofcom may modify the technical conditions in this licence, if necessary, to prevent harmful interference to other users in the same or adjacent bands or to facilitate coexistence with additional satellite systems that may apply to use the spectrum during the period of the licence.

6.19 For the bands 71-76 GHz and 81 – 86 GHz, the licensee shall keep a record of the number of operational gateway sites within any 2,000,000 km^2 area that contains one or more of the gateway sites in the UK and number of operational satellites in their constellation and provide this information to Ofcom, when requested.

6.20 The licensee shall comply with all the applicable international regulations and obligations, including ITU Radio Regulation Articles 21 and 22 (including No. 22.2).

General technical conditions

Transmit power

6.21 The maximum transmitter power density at the antenna port of gateway earth station shall be limited to -20.8 dBW/1MHz.

Antenna pattern and elevation

6.22 The Antenna Radiation Pattern Envelope shall meet the minimum performance specified by Recommendation ITU-R S.580.

6.23 The minimum elevation angle of 25 degrees with respect to the local horizontal plane shall apply for all gateway beams.

Conditions for coexistence with fixed links

Power flux density

6.24 The licensee shall ensure that pfd at the Earth's surface produced by emissions from a space station in the 71 – 76 GHz band, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limit given in Table 2. The limit relates to the pfd which would be obtained under assumed free-space propagation conditions:

Table 21: Power flux density limits for NGSO space station in the 71 - 76 GHz band

Reference Bandwidth 1 MHz				
Angle of arrival, δ, above the horizontal plane (°)	**0-5**	**5-15**	**15-25**	**25-90**
pfd limit in dB(W/m^2)	**-120**	**-120+(δ-5)**	**-110+0.5(δ-15)**	**-105**

Conditions for coexistence with EESS (passive)

6.25 For the protection of EESS (passive) operations in the 86-92 GHz band, the received unwanted emission power from all adjacent-band interference sources, including licensee's gateways, shall be limited to –169 dBW per 100 MHz within the 86-92 GHz passive band, as described in Recommendation ITU-R RS.2017-0.

6.26 The unwanted emission power level per gateway uplink beam, as measured at the antenna port, shall not exceed:

$-41.2 - 16.3(f - 86)$ dBW/100 MHz for $86.05 \leq f \leq 87$ GHz
-57.5 dBW/100 MHz for $87 < f \leq 91.95$ GHz

where f is the centre frequency of the 100 MHz reference bandwidth expressed in GHz.

6.27 The licensee shall ensure that the unwanted emission limits provided in 6.25 and 6.26 are met during all gateway transmissions.

6.28 The licensee shall ensure that gateway uplink operations in the 81 – 86 GHz band must comply with the following conditions:

a) Maximum of 76 total simultaneously transmitting gateway sites within any square on the Earth that covers 2,000,000 km^2 that includes one or more of the licenced gateway sites in the UK
b) Maximum of 32 total simultaneously transmitting uplink beams per operational gateway site.

Consultation question 4:

Do you have any comments regarding our proposed licence conditions?

7. Next steps

7.1 The consultation period for this document will close on 27 June 2025, after which we will consider responses and publish a statement outlining our decision. Subject to the responses we receive, we expect to publish the statement in Q2 2025/6.

7.2 Should we decide to grant Starlink these temporary E band licences, we will issue the licences following publication of our decision and when we receive payment of the licence fee. The licences will also be made available on our NGSO licensing website.

7.3 We expect to consult on adding Q/V band to the PES and NGSO gateway licences in Q2 2025/6, as set out in our Plan of Work.

Consultation question 5: Do you have any other comments regarding our proposals or any of the issues raised in this document?

A1. Coexistence with existing services in the 71 – 76 and 81 – 86 GHz and adjacent bands

A1.1 In this annex, we set out the coexistence analysis we have considered to assess the impact of the three requested NGSO gateway earth station ("gateway") sites - Morn Hill, Wherstead and Woodwalton - on existing services in the 71 – 76 GHz and 81 - 86 GHz bands and the adjacent 86 – 92 GHz band.

A1.2 The 71 – 76 GHz and 81 – 86 GHz bands are used by the Fixed Services in the UK, with both Ofcom-coordinated and self-coordinated fixed links.[25] The adjacent 86 - 92 GHz band is a passive band[26] allocated to, amongst other services, the Earth Exploration Satellite Service (passive) on a primary basis.

Self-coordinated fixed links and NGSO gateways (73.375 – 75.875 GHz and 83.375 – 85.875 GHz)

A1.3 There are currently around 4460 self-coordinated fixed links in the 73.375 – 75.875 GHz and 83.375 – 85.875 GHz bands as published in our Wireless Telegraphy Register. The locations and characteristics of these fixed links have been used in our coexistence analysis.

A1.4 We have carried out coexistence analysis with self-coordinated fixed links based on ITU-R recommended protection criteria and other parameters taken out of the self-coordinated Wireless Telegraphy Register.[27] We have analysed the potential for interference from transmitting NGSO gateways into receiving fixed links within 70 km of the three sites and vice versa (this is consistent with the Ofcom coordinated part of the fixed link band where a 70 km coordination distance applies).[28]

A1.5 The protection criteria for fixed links were taken from Recommendations ITU-R F.758 and F.1606 (38 GHz band). It consisted of a long-term criterion of interference to noise (I/N) not to exceed -10 dB for more than 20% of the time, and a short-term criterion of I/N not to exceed +10 dB for more than 0.013% of the time.

A1.6 We have used the short-term protection criteria of the nearest band (see ITU-R Recommendation F.1606) as currently there is no agreed international short term protection criteria for fixed links in the 71 – 76 GHz and 81 – 86 GHz bands.

A1.7 The NGSO gateway protection criteria of I/N not to exceed -10 dB for more than 20% of the time and I/N not to exceed 0 dB for more than 0.005% of the time were used as they reflect what is currently applied in our licencing software to protect receiving NGSO gateways in other bands. These are based on Recommendation ITU-R S.1006.

[25] Fixed terrestrial links
[26] Radio Regulations Article 5, No. 5.340 applies i.e. all emissions are prohibited in this band.
[27] 70/80 GHz section of the Wireless Telegraphy Register (XLSX, 1.6 MB)
[28] OfW 446: Technical Frequency Assignment Criteria for Fixed Point-to-Point Radio Services with Digital Modulation

A1.8 The propagation model contained in Recommendation ITU-R P.452 was used throughout our analysis.

Existing self-coordinated fixed links

A1.9 For the coexistence of existing self-coordinated fixed links with NGSO gateways we analysed the fixed links within 70 km of the three NGSO gateway sites and assessed the I/N protection criteria of both the fixed links and the NGSO gateways.

A1.10 Fixed links were modelled with the Recommendation ITU-R F.1245 antenna pattern with height, gain, and azimuth and elevation pointing as given in the self-coordinated Wireless Telegraphy Register. NGSO gateways were modelled using the Recommendation ITU-R S.580 antenna pattern in elevation with an on-axis gain of 60.5 dBi, and omni-directional in azimuth.[29]

A1.11 Propagation model contained in Recommendation ITU-R P.452 was used.

A1.12 The NGSO gateway transmit power was set to -20.8 dBW/1 MHz with an aggregation factor of +16 dB added to represent 40 antennas transmitting simultaneously.

A1.13 From the results of this analysis, the highest long-term I/N observed at the fixed link receivers near Morn Hill, Wherstead, and Woodwalton showed margins of 28 dB, 17 dB, and 90 dB respectively, with the short-term I/N showing greater margins.

A1.14 In the reciprocal case, we split the 71 – 76 GHz band up into ten 500 MHz carriers for the NGSO gateway and recorded the I/N at each of the carriers due to transmissions from the fixed links.

A1.15 Margins of 55 dB, 49 dB, and 93 dB were observed for the 500 MHz NGSO gateway carriers with the worst I/N values at Morn Hill, Wherstead and Woodwalton respectively.

A1.16 Our analysis indicated that the protection criteria for existing fixed links and NGSO gateways were satisfied, so coexistence between existing self-coordinated fixed links and NGSO gateways at these three sites is feasible.

Future self-coordinated fixed links

A1.17 We also analysed the potential impact that future fixed links could have on NGSO gateways (and vice versa). We used the results of this analysis to establish coordination zones around the three requested NGSO gateway sites where Ofcom intends to check any proposed new fixed links deployment to minimise the risk of mutual interference.

A1.18 We modelled NGSO gateways at the specified locations and analysed the area around these locations using the propagation model from Recommendation ITU-R P.452 to determine the separation distance required to satisfy the protection criteria of the earth stations and fixed links.

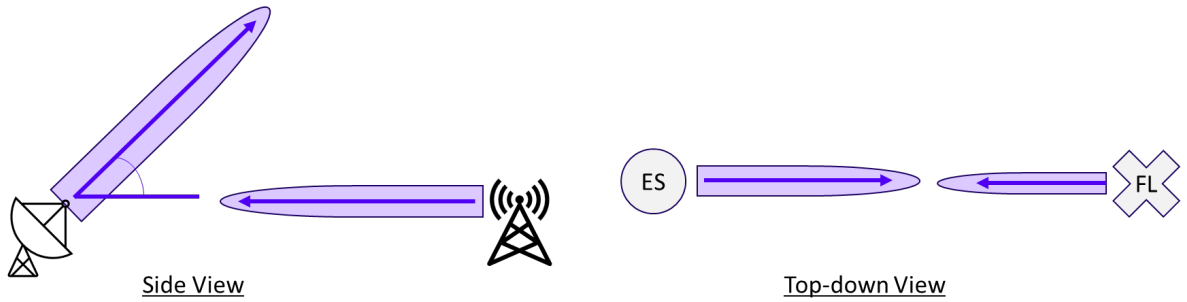
A1.19 The fixed link station was modelled using the average height of all fixed links in the self-coordinated Wireless Telegraphy Register (40.55m), the 90th percentile gain of all links (52 dBi), and the maximum EIRP density (24 dBW/1 MHz) for all links that have this gain in the register. In our view, these parameters give a reasonably worst-case view for us to determine separation distances.

[29] Omni-directional in azimuth models the earth station as always pointing in the direction of all fixed link receivers.

A1.20 The NGSO gateway was modelled using a transmission power of -20.8 dBW/1 MHz, and an antenna gain of 60.5 dBi with side-lobe pattern as per Recommendation ITU-R S.580.

A1.21 The NGSO gateway was set up to point in the direction of the fixed link station, at an elevation of 20°[30], while the fixed link station was set up to point at the NGSO gateway with 0° elevation as illustrated in Figure A1.1.

Figure A1.1 Antenna pointing of NGSO gateway and fixed link



A1.22 The analysis showed that, in the case of a transmitting fixed link station and a receiving NGSO gateway, a separation distance of 10 km is required to ensure the protection criteria for NGSO gateways is met.

A1.23 In the case of a transmitting NGSO gateway and a receiving fixed link station, the analysis showed that a separation distance of 24.6 km is required to satisfy the fixed link protection criteria.

A1.24 We propose to implement a single coordination zone for fixed links within 25 km of each nominated NGSO gateway's centrally located antenna.

Coordination approach for new self-coordinated fixed links

Scope of coordination

A1.25 This coordination will apply to newly registered self-coordinated fixed link transmitters and receivers located within 25 km of the centrally positioned Starlink NGSO gateway. The affected frequency bands are 73.375-75.875 GHz and 83.375-85.875 GHz.

Coordination process

A1.26 Starting today, Ofcom will incorporate this coordination step into the registration process for all new self-coordinated link applications and would remain in effect for the duration of the temporary licences, if we decide to grant these following this consultation. Applicants do not need to take any additional action—Ofcom will carry out all necessary coordination using the self-coordinated fixed link data provided by the licensee. Any additional data used in this process has been explicitly stated below:

a) **Identification of new registrations that may be affected**

Ofcom will identify proposed new registrations with any transceivers located within 25 km of Starlink's three proposed NGSO gateway sites. If any transceivers are within this 25 km

[30] In our analysis on future self-coordinated fixed links, we used minimum elevation angle of 20 degrees for gateways. All other analysis was based on 25 degrees minimum elevation angle for gateways.

range, Ofcom will carry out coordination as described below. Any self-coordinated link with all transmitters and receivers located outside this range will be processed under the existing self-coordinated registration approach (i.e. without the additional coordination check with the Starlink NGSO gateways).

b) **Coordination checks**

Ofcom will test whether the identified transceivers of self-coordinated fixed links can coexist with Starlink's NGSO gateway. For this assessment the following additional parameters and criteria will be used to assess the interference from self-coordinated fixed link transmitters to Starlink's NGSO gateway receivers and from Starlink's NGSO gateway transmitters to self-coordinated fixed link receivers:

- N = KTB where for NGSO gateways, the T is the Starlink's system noise temperature provided
- For Self-coordinated Fixed Link receivers, we will be using the receiver noise temperature (T) of 290 kelvin and a Noise Figure of 8dB based on Recommendation ITU-R F.758.
- For self-coordinated fixed link applications will be modelled using antennas as in recommendation in ITU-R F.699.
- The analysis will rely on the ITU-R P.452 (v18) propagation model.

i) Check for Self-coordinated **Fixed Link** transmitters interfering in**to** receiving **NGSO gateway:**

The following tests must pass:

1. Short-term interference test: I/N of 0 dB not to be exceeded for 0.005% of the time
2. Long-term interference test: I/N of -10 dB not to be exceeded for 20% of the time

ii) **Check for NGSO gateway transmitters interfering into Self-coordinated Fixed Link receivers:**

- The following tests must pass:
  1. Short-term interference test: I/N of +10 dB not to be exceeded for more than 0.013% of time
  2. Long term interference test: I/N of -10 dB not to be exceeded for more than 20 % of time

c) **Decision**

- Ofcom will conduct a pass/fail check to determine whether the new registration meets interference protection requirements. A self-coordinated fixed link will be approved only if all the checks listed in sections bi) and bii) above have successfully passed.
- Applicants will not be directly involved in this assessment process.

Ofcom coordinated fixed links and NGSO gateways (71.125 – 73.125 GHz and 81.125 – 83.125 GHz)

A1.27 There are currently around 1740 Ofcom coordinated fixed links.

A1.28 We have carried out coexistence analysis between NGSO gateways and Ofcom coordinated fixed links based on our existing coordination approach between NGSO gateways and fixed links in other bands within 70 km of these three sites. For the assessment of potential interference to fixed links, the NGSO gateway was allowed a single-entry interference level based on fixed link assignment criteria as set out in our technical frequency assignment criteria[31]. For the potential interference assessment from fixed links to NGSO gateways, the NGSO gateway protection criteria set out in A1.7 was used. Other parameters of fixed links were taken from our assignment database and NGSO gateway parameters were supplied by Starlink.

A1.29 The propagation model contained in Recommendation ITU-R P.452 was used.

A1.30 The fixed link parameters were taken from our Ofcom coordinated fixed link database.

A1.31 Our analysis indicated that the protection criteria for existing fixed links set out in our technical frequency assignment criteria[32] and NGSO gateway protection criteria set out in A1.7, were satisfied so coexistence between existing Ofcom coordinated fixed links and NGSO gateways at the three sites is also feasible.

A1.32 We also intend to apply the coordination approach set out in A1.28 to future Ofcom coordinated fixed links in these higher bands, with respect to the three NGSO gateway sites to manage the mutual risk of interference. The fixed link parameters will be taken from the new licence application. Starting today, Ofcom will incorporate this coordination approach which would remain in effect for the duration of the temporary licences, if we decide to grant these following this consultation.

Fixed links and NGSO space station downlink transmissions in 71 – 76 GHz band

A1.33 Article 21 of the Radio Regulations at present does not include sharing conditions between fixed and satellite services in the 71 – 76 GHz and 81 – 86 GHz bands. WRC-27 Agenda Item 1.10 aims to add these conditions in the Radio Regulations; studies on this are currently underway in ITU-R.

A1.34 Absent these conditions, we have applied the pfd limits given in Article 21 for the nearest band (42 – 42.5 GHz band) for NGSO space station down link transmissions in the 71 – 76 GHz. These limits are given in Table A1.1 below.

Table A1.1: Article 21 power flux density limits for NGSO Space Station in the 42 - 42.5 GHz band

Reference Bandwidth 1 MHz				
Angle of arrival, δ, above the horizontal plane (°)	**0-5**	**5-15**	**15-25**	**25-90**
PFD limit in dB(W/m^2)	**-120**	**-120+(δ-5)**	**-110+0.5(δ-15)**	**-105**

[31] OfW 446: Technical Frequency Assignment Criteria for Fixed Point-to-Point Radio Services with Digital Modulation

[32] OfW 446: Technical Frequency Assignment Criteria for Fixed Point-to-Point Radio Services with Digital Modulation

A1.35 In our analysis, we modelled Starlink's NGSO system based on the number of satellites and associated orbital parameters specified in their E Band satellite filings[33] and applied the pfd mask in Table A1.1 to these satellites. This system has around 30,000 planned space stations in the constellation.

A1.36 Two fixed link stations were also modelled, with one in the North of the UK and one in the South, with each station pointing in the four cardinal directions. These fixed link receivers were modelled based on our self-coordinated and Ofcom managed fixed links databases with the fixed link protection criteria as set out in A1.5 above. Each fixed link antenna used the ITU-R Recommendation F.1245 antenna pattern, with 50 dBi of on-axis gain and pointing at 5° in elevation.

A1.37 Results of our analysis highlight that there were exceedances in the I/N protection criteria at the fixed link receivers, by up to 0.4 dB for the short-term protection criteria and by up to 13 dB for long term protection criteria, depending on the location and pointing of the fixed link.

A1.38 However, we note that our simulations assumed that all space stations in the filings were operational and transmitting at the same time using the maximum pfd levels contained in Table A1.1. This is a conservative approach as, in practice, it is likely for most of the power of space station transmissions to be directed towards the NGSO gateways. Additionally, the current number of operational space stations is significantly lower than the 30,000 specified in the Starlink filings, and in our view, this is likely to be the case for the period of the temporary licences. Therefore, we do not expect that the fixed link protection criteria are likely to be exceeded in practice.

A1.39 We also note that WRC-27, through agenda item 1.10, is expected to develop a suitable international framework including pfd limits which would also account for any aggregate interference from multiple satellite systems. The outcome of WRC-27 should set the long term internationally agreed sharing conditions for these bands.

A1.40 In the meantime, we believe that pfd limits given in Table A1.1 should minimise the potential risk of interference to fixed links until WRC-27 makes long term decisions.

A1.41 In order to further minimise the risk of interference to fixed links before WRC-27, Ofcom plans to put measures in place that would require Starlink to resolve any reported interference events or stop transmissions.

NGSO gateway uplink transmissions in 81 – 86 GHz and EESS (passive) in the adjacent 86 – 92 GHz band

A1.42 The 86-92 GHz band is used for the passive remote sensing of several atmospheric, cloud and precipitation parameters (precipitation, deep convection, cloud ice and liquid water, integrated total water vapour), and contributes to land surface characterisation (e.g. for snow and sea ice). Data from these measurements is used for operational weather forecasts and form part of global climate records of these variables.

A1.43 There is a potential for NGSO gateways transmitting (uplink) in the 81 – 86 GHz band to interfere with the EESS (passive) in the adjacent 86 – 92 GHz band. Limits on out-of-band emissions in conjunction with other operational characteristics such as the maximum

[33] Space Networks Systems Database of the Radiocommunication Bureau

number of simultaneous uplink beams and NGSO gateway density are required to protect the EESS (passive).

A1.44 The protection criterion for EESS (passive)is given in ITU-R RS.2017 as a maximum interference level of -169 dBW/100 MHz from all sources which must not be exceeded for more than 0.01% of the time when considering a measurement area of 2 million km^2 on the surface of the Earth.

A1.45 Starlink has provided a dynamic analysis on the interference levels at EESS (passive) receivers due to NGSO gateway transmissions, the parameters and assumptions that Starlink used can be found in Table A1.2. This Starlink report is published on our website, see "Dynamic Simulation Methodology for EESS (passive) interference from NGSO Earth-to-Space Links".

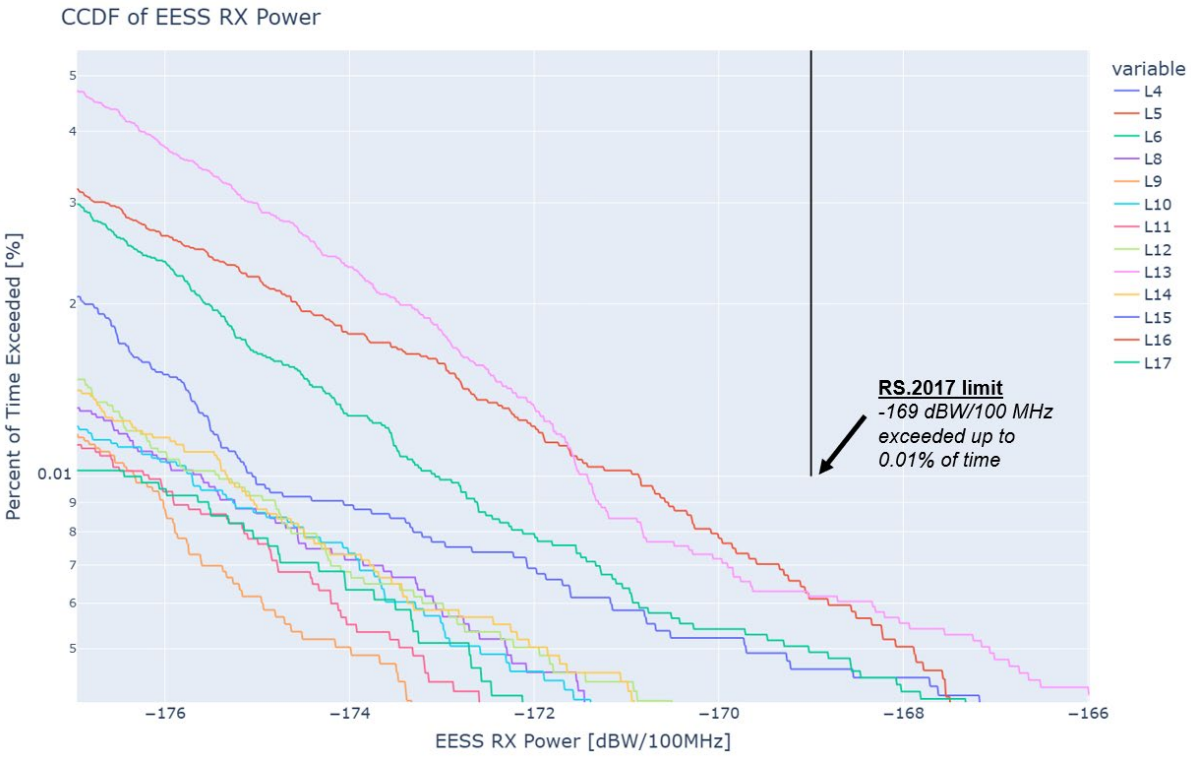
A1.46 The analysis consisted of simulating a constellation of NGSO space stations based on known orbital characteristics from the satellite filings and then modelling NGSO gateways transmitting to a randomly selected space station within the constellation. The resulting interference level at the EESS (passive) receiver is recorded for each simulated time step and used to plot a complementary cumulative distribution function curve.

Table A1.2: Simulation parameters for Starlink analysis into EESS (passive) coexistence

Description	Assumption
Number of NGSO gateway sites in two million km^2	76
Number of uplink beams per NGSO gateway site	32
Minimum elevation angle per uplink beam	25°
NGSO gateway pointing strategy	Select random satellites above minimum elevation angle
NGSO gateway gain pattern	Recommendation ITU-R S.580
Polarisation mismatch loss	0 dB
NGSO gateway emission mask	−41.2–16.3(f−86) dBW/100 MHz for 86.05≤ f ≤87 GHz −57.5 dBW/100 MHz for 87 < f ≤ 91.95 GHz
EESS (passive) sensors characteristics	Recommendation ITU-R RS.1861-1 L4-L6, L8-L17 L7 is not simulated since it is not operational anymore
EESS (passive) satellite antenna pattern	Recommendation ITU-R 1813
Simulation iterations	Approximately 600,000 iterations per sensor

A1.47 Results from Starlink's analysis in Figure A1.2 highlight that there is approximately a 2 dB margin for the most susceptible sensor based on an NGSO system with characteristics that align with the assumptions in Table A1.2.

Figure A1.2: Results from Starlink's analysis on coexistence with EESS (passive)



A2. Impact assessments

A2.1 Section 7 of the Communications Act requires us to carry out and publish an assessment of the likely impact of implementing a proposal which may significantly affect businesses or the public, or when there is a major change in Ofcom's activities.

A2.2 More generally, impact assessments form part of good policymaking and we therefore expect to carry them out in relation to a large majority of our proposals. We use impact assessments to help us understand and assess the potential impact of our policy proposals before we make them. They also help us explain the policy decisions we have decided to take and why we consider those decisions best fulfil our applicable duties and objectives in the least intrusive way. Our impact assessment guidance sets out our general approach to how we assess and present the impact of our proposed decisions.

A2.3 The relevant duties in relation to the proposal on which we are consulting are set out in Section 2.

A2.4 Having carefully considered the potential impact of granting temporary E band licences to Starlink in this consultation, our preliminary view is that the benefits of authorising the temporary licences for citizens and consumers are likely to outweigh the risks, given the mitigations put in place.

A2.5 Our preliminary view is that granting temporary E band licences at these sites would likely:

d) support efficient use of spectrum by enabling three of Starlink's satellite gateways to use E band, as a precursor to Ofcom considering making the band available more widely to satellite operators;
e) encourage investment and innovation, by enabling new usage of E band and supporting satellite infrastructure in the UK, in turn fostering economic growth; and
f) promote the interests of UK consumers, who would likely benefit from improved satellite broadband services, particularly in areas with constrained capacity, and in hard-to-reach areas.

A2.6 We assess the potential impact of granting these licences on coexistence and competition more fully in sections 4 and 5 above. Our preliminary view is that where there is the potential for Starlink to cause harmful interference to other services in the frequencies it intends to use, our proposed mitigation measures should protect these users, thereby ensuring coexistence.

Impact assessment of the proposal to grant Starlink temporary licences to use E band

A2.7 In this section we discuss the expected benefits of authorising Starlink's temporary use of E band, followed by the proposed mitigations to any risks to competition or coexistence. These are discussed in more detail in sections 4 and 5. We also discuss why we believe authorising Starlink on a temporary basis is justified.

A2.8 In its request, Starlink outlined several benefits of increased E band access, including:

- Promoting competition and benefitting consumers and businesses without raising coexistence concerns.

- Improving latency and service quality.
- Providing redundancy for fibre-based broadband connections.
- Potentially lowering costs for customers, as temporary E band access offers a more cost-effective way to expand capacity compared to deploying additional Ka-band gateways.

A2.9 We believe these benefits, if realised, should also encourage investment and foster innovation and bolster growth of satellite services in the UK.

A2.10 We discuss in Section 4 that there are co-channel and adjacent-channel users that require protection from transmissions to and from satellite gateways, including fixed links and EESS (passive). Where deemed necessary, we are introducing measures to mitigate these risks. We briefly outline these measures below.

A2.11 With respect to Ofcom coordinated fixed links, we are proposing to apply the same coordination approach that we currently apply for NGSO gateways and fixed links in other frequency bands, taking into account the technical parameters for fixed links and gateways for E band.

A2.12 With respect to self-coordinated fixed links, Ofcom will coordinate any new fixed link registration requests planned to be located within 25 km of the gateway with the proposed gateway sites.

A2.13 With respect to EESS (passive), we are proposing a set of technical conditions including unwanted emission power limits for the earth stations in the 81 – 86 GHz band. In addition, we are proposing that transmissions from gateways in the 81 – 86 GHz band should be on a non-interference basis with respect to EESS (passive). Starlink would be required to resolve any reported interference events or stop transmissions.

A2.14 As explained in Section 4, taking into account the results of this analysis and the coexistence measures we are proposing, our assessment is that coexistence with other services is feasible. Furthermore, we expect at this stage that Starlink's NGSO system would be capable of coexisting with future NGSO systems (including gateways and terminal operators) in E band. We believe there are the following mitigations to any risk to coexistence and competition:

- First, these are temporary, fixed-term licences, whose terms would be updated in the future as Ofcom looks to authorise a permanent product. We would also be able to revise the technical conditions of the temporary licences. We believe this limits the risk to long-term competition and coexistence. We will assess the impact of future proposals, such as to make E band available on a permanent basis, in future consultations.
- Second, if another satellite operator were to apply for an E band licence between the time we authorise Starlink and our statement on E band for wider use, we would consider that request by applying the same framework and conditions we are applying to Starlink's request. In particular, we would be open to requests from other satellite gateway operators to use E band frequencies temporarily if they could provide evidence that they have imminent demand for this spectrum as well as the capability to roll out services in the short term. As discussed, we would be able to revise the technical conditions of these licences if necessary.
- Third, Starlink has highlighted its use of narrow and steerable beams with high elevation angles, and the pencil thin beams of E band would allow coexistence with other services. It also stresses that it "routinely coordinates with other operators" and "will continue to do

so." This should support Starlink in coexisting with other services moving forward and help ensure efficient use of the spectrum.

A2.15 We believe granting temporary licences to Starlink before consulting on a permanent product is justified given the anticipated benefits, our competition assessment in Section 5, and proposed licence conditions to (i) protect other authorised users of these and adjacent frequencies from harmful interference; and (ii) provide flexibility should other satellite operators apply to use these frequencies during the licence period. We also do not anticipate that authorising the use of these frequencies at these three sites would have a material impact on the availability of E band for fixed links across the UK.

A2.16 On balance, we believe our proposal would enable Starlink to provide an improved service to citizens and consumers, and meet growing demand, with the risks limited by the proposed mitigations.

Equality impact assessment

A2.17 We have given careful consideration to whether our proposals will have a particular impact on persons sharing protected characteristics (broadly including race, age, disability, sex, sexual orientation, gender reassignment, pregnancy and maternity, marriage and civil partnership and religion or belief in the UK and also dependents and political opinion in Northern Ireland), and in particular whether they may discriminate against such persons or impact on equality of opportunity or good relations. This assessment helps us comply with our duties under the Equality Act 2010 and the Northern Ireland Act 1998.[34] We have also had regard to the matters in section 3(4) of the Communications Act.

A2.18 When thinking about equality we think more broadly than persons that share protected characteristics identified in equalities legislation and think about potential impacts on various groups of persons (see paragraph 4.7 of our impact assessment guidance).

A2.19 In particular, section 3(4) of the Communications Act also requires us to have regard to the needs and interests of specific groups of persons when performing our duties, as appear to us to be relevant in the circumstances. These include:

- the vulnerability of children and of others whose circumstances appear to us to put them in need of special protection;
- the needs of persons with disabilities, older persons and persons on low incomes; and
- the different interests of persons in the different parts of the UK, of the different ethnic communities within the UK and of persons living in rural and in urban areas.

A2.20 We also examine the potential impact our policy is likely to have on people, depending on their personal circumstances. This assists us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers, regardless of their background and identity.

A2.21 We consider our proposal to grant the temporary E band licences is likely to have positive impacts on households, businesses and other potential customers in the UK, as Starlink should be able to provide a faster and/or more reliable service to more customers. This has the potential to have particular benefits for people in rural areas who may have limited access to terrestrial coverage, such as fixed broadband (delivered through wires) or fixed

[34] Section 75 of the Northern Ireland Act 1998

wireless access (delivered through spectrum). It may also have a particular benefit for those in London and surrounding areas (including rural areas), where Starlink has faced capacity constraints.

A2.22 We have not identified any adverse impacts on specific groups of persons, including those sharing protected characteristics, that are likely to be affected in a different way to the general population through the granting of these temporary E band licences.

Welsh language impact assessment

A2.23 Ofcom is required to take Welsh language considerations into account when formulating, reviewing or revising policies which are relevant to Wales (including proposals which are not targeted at Wales specifically but are of interest across the UK).

A2.24 Where the Welsh Language Standards are engaged, we consider the potential impact of a policy proposal on (i) opportunities for persons to use the Welsh language; and (ii) treating the Welsh language no less favourably than the English language. We also consider how a proposal could be formulated to have or to increase, a positive impact, or not to have or to decrease any adverse effects.

A2.25 We consider our proposal to grant Starlink these temporary E band licences at three gateway sites would not have any negative impacts on our Welsh language obligations. This is because the licences relate to a nationwide licensing regime, and our proposal also has the potential to increase Welsh language opportunities resulting from improved connectivity.

A2.26 We note that Ofcom's current practice is to offer to produce spectrum licences in Welsh, and when requested does provide licences in Welsh, in accordance with its obligations set by the Welsh Language Commissioner. This will apply to licences discussed in this document.

A3. Responding to this consultation

How to respond

A3.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 27 June 2025.

A3.2 You can download a response form from https://www.ofcom.org.uk/spectrum/space-and-satellites/consultation-proposal-to-grant-temporary-licences-to-starlink-services-llc-to-use-71-76-ghz-and-81-86-ghz-for-ngso-gateway-earth-stations. You can return this by email or post to the address provided in the response form.

A3.3 If your response is a large file, or has supporting charts, tables or other data, please email it to ebandgateways@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet. This email address is for this consultation only and will not be valid after 31 December 2025.

A3.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:

Spectrum Management and Authorisation
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A3.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:

- send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files; or
- upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.

A3.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)

A3.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt of a response submitted to us by email.

A3.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.

A3.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex A6. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

A3.10 If you want to discuss the issues and questions raised in this consultation, email ebandgateways@ofcom.org.uk

Confidentiality

A3.11 Consultations are more effective if we publish the responses before the consultation period closes. This can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish responses on the Ofcom website at regular intervals during and after the consultation period.

A3.12 If you think your response should be kept confidential, please specify which part(s) this applies to and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.

A3.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A3.14 To fulfil our pre-disclosure duty, we may share a copy of your response with the relevant government department before we publish it on our website.

A3.15 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further in our Terms of Use.

Next steps

A3.16 Following this consultation period, Ofcom plans to publish a statement in Q2 2025/6.

A3.17 If you wish, you can register to receive mail updates alerting you to new Ofcom publications.

Ofcom's consultation processes

A3.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex A4.

A3.19 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.

A3.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A4. Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

Before the consultation

1. Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

2. We will be clear about whom we are consulting, why, on what questions and for how long.
3. We will make the consultation document as short and simple as possible, with an overview of no more than two pages. We will try to make it as easy as possible for people to give us a written response.
4. When setting the length of the consultation period, we will consider the nature of our proposals and their potential impact. We will always make clear the closing date for responses.
5. A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
6. If we are not able to follow any of these principles, we will explain why.

After the consultation

7. We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish the responses on our website at regular intervals during and after the consultation period. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A5. Consultation coversheet

Basic details

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

Confidentiality

Please tick below what part of your response you consider is confidential, giving your reasons why

- Nothing ☐
- Name/contact details/job title ☐
- Whole response ☐
- Organisation ☐
- Part of the response ☐

If you selected 'Part of the response', please specify which parts:

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

Yes ☐ No ☐

Declaration

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom aims to publish responses at regular intervals during and after the consultation period. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name Signed (if hard copy)

A6. Consultation questions

Please tell us how you came across about this consultation.

- ☐ Email from Ofcom
- ☐ Saw it on social media
- ☐ Found it on Ofcom's website
- ☐ Found it on another website
- ☐ Heard about it on TV or radio
- ☐ Read about it in a newspaper or magazine
- ☐ Heard about it at an event
- ☐ Somebody told me or shared it with me
- ☐ Other (please specify)

Question 1:

Do you agree that the proposed NGSO gateways are able to coexist with fixed links and EESS (passive) under our proposed approach, for the duration of these temporary licences? If not, please provide supporting evidence with your comments.

Question 2:

Do you agree that the measures set out above to enable coexistence of Starlink's proposed gateways with future NGSO and GSO systems are reasonable? If not, please provide supporting evidence with your comments.

Question 3:

Do you agree with our assessment that granting these temporary licences would not be likely to harm competition? If not, please explain why.

Question 4:

Do you have any comments regarding our proposed licence conditions?

Question 5:

Do you have any other comments regarding our proposals or any of the issues raised in this document?