Expanding spectrum access for satellite gateways

Call for Input on making additional spectrum available for satellite gateway use in Q/V and E bands

Call for input

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Contents

Section

Annex

1. Overview

1.1 Services which rely on satellite connectivity are increasingly important for UK consumers and businesses and play a key role in providing broadband to hard-to-reach premises in the UK, as well as to ships and aircraft. Delivery of these services relies on availability of suitable radio spectrum. This call for input (CFI) is requesting information to inform Ofcom's considerations on expanding access to spectrum for use by satellite gateway earth stations.

1.2 Satellite gateways are hubs that connect the 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 non-geostationary orbit (NGSO) satellite systems. In the UK gateways are authorised to use spectrum under "Permanent Earth Station" (for GSO gateways) and "NGSO Earth Station (Gateway)" licences.

1.3 In responses to our 2022 Space Spectrum Strategy stakeholders told us that it was important to make additional spectrum available for gateways.[1] Various satellite industry stakeholders have expressed specific interest in accessing the Q and V (Q/V) spectrum bands (37.5 – 43.5 GHz, 47.2 – 50.2 GHz and 50.4 – 52.4 GHz), and E band (71- 76 GHz and 81 – 86 GHz), and some operators have already begun deploying satellites capable of using Q/V and E band frequencies.

1.4 Around 20 GHz of spectrum is potentially available for access to future satellite gateways across Q/V and E bands. We recognise that there could be innovation and consumer benefits from enabling satellite gateways to access this spectrum and are seeking further information to inform our work on the scope for enabling satellite gateway access in these bands, alongside existing uses. To make an informed decision and support innovation, we are seeking further evidence about when these gateways would be in use in the UK, and what types of benefits they would provide to people and businesses in the UK.

What we are seeking views on – in brief

In this document we discuss two potential frequency ranges for future satellite gateways in the UK:

- Q/V band (37.5 – 43.5 GHz, 47.2 – 50.2 GHz and 50.4 – 52.4 GHz)
- E band (71 – 76 GHz and 81 – 86 GHz)

For each band, we provide information and seek input on the following factors:

- Future demand from the satellite sector, in particular the timescale on which stakeholders expect gateways to begin using spectrum in these bands in the UK.
- Current allocations and use in the band with potential coexistence cases to be considered.

We also welcome comments from stakeholders on the relative importance of Q/V and E bands.

1.5 There are a range of differences in considerations relating to the Q/V band and E band. Different operators have expressed interest in the two bands. Further, they are allocated to

[1] Responses are summarised in Space Spectrum Strategy – annex, November 2022

a variety of other services in the UK. To make these bands available to satellite gateways we need to consider sharing with existing and adjacent spectrum users where appropriate:

- In Q/V bands, there is Ofcom coordinated fixed links use in 37.5 – 39.5 GHz, existing Spectrum Access use (operator coordinated fixed links) in 40.5 – 43.5 GHz and Radioastronomy use in the adjacent band 42.5 – 43.5 GHz. These bands or parts thereof are also allocated to Mobile, Space Research, Mobile Satellite and Broadcasting Satellite on a primary basis.
- E band is used by fixed links in the UK. These bands or parts thereof are also allocated to Mobile, Mobile Satellite, Broadcasting, Broadcasting Satellite, and Radioastronomy on a primary basis. The adjacent band 86 – 92 GHz is a passive band[2] allocated to, amongst other services, Earth Exploration Satellite Service (passive) ("EESS (passive)") on a primary basis.

1.6 In addition, there is an established international framework for managing the international/cross border interference environment between satellite and terrestrial services for Q/V band but there is not currently an equivalent framework for E band. In Q/V band this framework, set out in the Radio Regulations, provides power limits[3] on downlink transmissions from satellites in space for the protection of terrestrial receivers and power limits on transmitting ground stations (earth stations and terrestrial stations) to protect satellite space receivers and terrestrial receivers; for E band the limits for the protection of terrestrial services are still to be defined at the 2027 World Radiocommunications Conference (WRC-27).

1.7 Inputs from stakeholders in response to this Call for input will inform our work to consider which frequencies to make available for satellite gateways, and appropriate timelines for doing so.

1.8 Any future proposals to make changes to the use of these bands will be subject to our normal consultation process, including an impact assessment, in line with our statutory duties and regulatory principles.

1.9 This call for input closes on 14 June 2024. We plan a further publication on our next steps in Q3 2024/25.

The overview section in this document is a simplified high-level summary only. The full document sets out the information and questions that we are seeking stakeholder input on.

[2] Radio Regulations Article 5, No. 5.340 applies i.e. all emissions are prohibited in this band
[3] EIRP (equivalent isotropically radiated power) and pfd (power flux density) limits

2. Introduction and context

2.1 This call for input (CFI) discusses and seeks input on the potential for satellite gateway use of two frequency ranges in the UK:

a) Q/V band: 37.5 – 43.5 GHz, 47.2 – 50.2 GHz and 50.4 – 52.4 GHz
b) E band: 71 – 76 GHz and 81 – 86 GHz

2.2 The purpose of this publication is to seek further information to inform our work on the scope for enabling satellite gateway spectrum access in these bands, alongside other spectrum users of these bands.

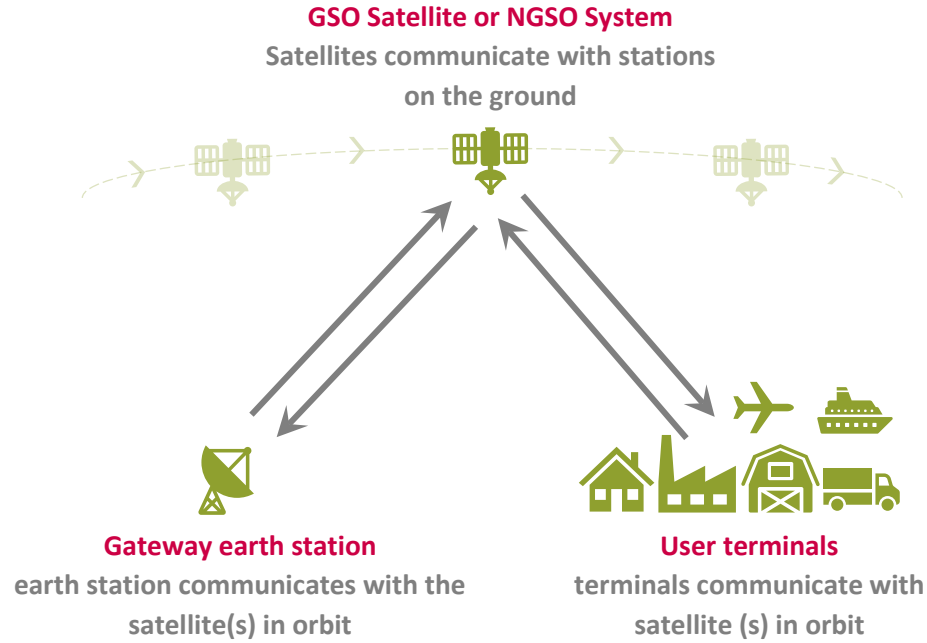
Background

Our Space Spectrum Strategy set out plans to enable access to additional spectrum for gateway Earth stations

2.3 Services which rely on satellite connectivity are increasingly important for UK consumers and businesses and play a key role in providing broadband to hard-to-reach premises in the UK, as well as to ships and aircraft. Delivery of these services relies on radio spectrum.

2.4 Satellite gateways are hubs that connect the 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 non-geostationary orbit (NGSO) satellite systems. The key elements of a satellite system are shown in Figure 1 below.

Figure 1: Key elements of a satellite communication system



2.5 There are two types of licences that authorise gateway earth stations in the UK:

a) Permanent Earth Station (PES) licences authorise gateways operating from a permanent, specified location transmitting to geostationary (GSO) satellites, and

b) Non-geostationary (NGSO) earth station licences authorise gateways operating from a permanent, specified location transmitting to non-geostationary (NGSO) satellites.

2.6 Both permanent and non-geostationary gateways are currently authorised to transmit in Ku band (14.0 – 14.5 GHz) and Ka band (27.5 – 28.0525 GHz, 28.4445 – 29.0605 GHz and 29.4525 – 30 GHz) in the UK. In addition, PES gateways are currently authorised to transmit using certain lower frequency bands including C band (5.725 – 7.075 GHz) and 12.75 – 13.25 GHz. However, there is demand from satellite operators to make use of additional spectrum at higher frequencies that are currently not authorised for gateway use in the UK.[4] Various stakeholders have indicated the future importance of the Q/V spectrum bands for gateways, and there has also been a degree of stakeholder interest expressed in E band. We note that satellites capable of using Q/V and E band frequencies are starting to be deployed. We discuss this in Section 3.

2.7 In our 2022 Space Spectrum Strategy we said that we would consider providing access for more spectrum to enable the delivery of higher speed satellite broadband services to businesses and people in places that are difficult to reach by terrestrial fixed or mobile connections. As part of this, we said that we would consult on proposals for enabling access to Earth station gateways in the Q/V band, and possibly the E band.[5] We have also made additional spectrum available in the 28 GHz band, which is used by the current generation of satellites (see 2.11-2.13).

[4] Space spectrum strategy - annex, November 2022, pages 46, 47
[5] Space Spectrum Strategy, Statement, November 2022, paragraphs 4.4 – 4.6, and paragraph 6.5

Figure 2: Current allocations and use in Q/V band (based on the UK Frequency Allocation Table (UK FAT))[6] [7]

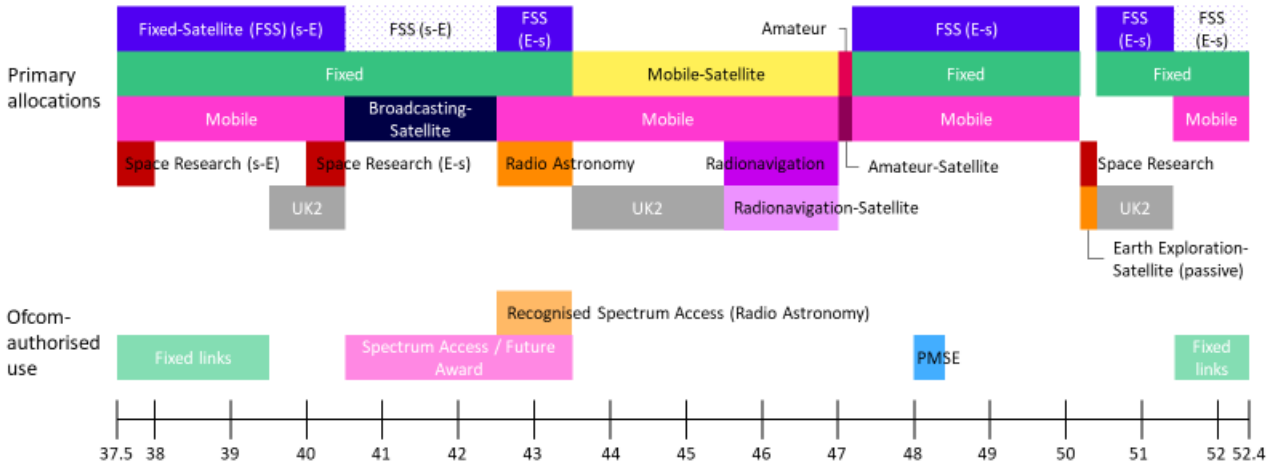
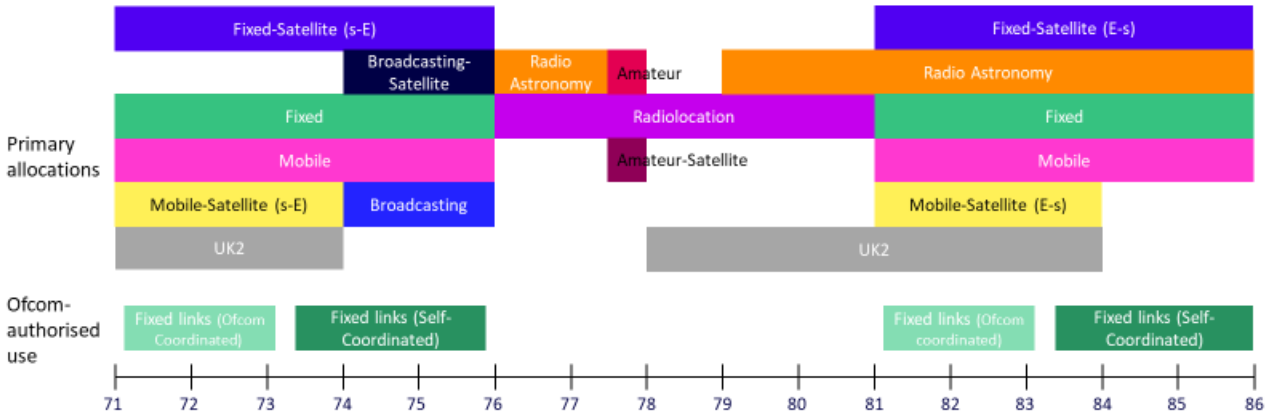


Figure 3: Current allocations and use in E band (based on UK FAT)[8]



2.8 Access to increased spectrum for gateways should enable FSS to provide better broadband services, enabling higher throughput and therefore increased capacity to service more customers or deliver broadband with faster speeds.

2.9 However, it is not clear how many gateways an operator would need in the UK and thus how much spectrum each would need to access. We note the current or intended use of inter-

[6] The frequencies 40.5 – 42.5 GHz and 51.4 – 52.4 GHz are currently not allocated to the Fixed Satellite Service in the UK; however we note that there are primary allocations for this service in the Radio Regulations (limited to GSO networks in 51.4 – 52.4 GHz) and so we have shown these in this diagram. Certain frequencies and allocations within the Q/V band are designated "UK2.1" in the UK FAT, which states that responsibility for granting permissions to use frequencies in these allocations rests with Defence (we explain this further at 4.3). We have marked frequencies with a UK2 designation for any service on this diagram, detail can be found in the UK FAT. The PMSE authorisation at 48 GHz does not have any current licences issued. The Fixed Links authorisation at 51.4 – 52.6 GHz does not have any current licences issued. At 49.2 – 50.2 GHz there is a legacy fixed link band, this is closed to new fixed link assignments and therefore not shown in the diagram above; there are 12 remaining licences in this band.

[7] We are aware of a discrepancy between the interactive version and PDF version of the UK FAT. The interactive version has an allocation to Fixed Satellite Services (space-to-Earth) for 40.5 – 41 GHz, whereas the PDF version does not. We will make a correction in due course. When answering our questions, please refer to the PDF version.

[8] Certain frequencies and allocations within the E band are designated "UK2.1" in the UK FAT; see footnote 6 above.

satellite optical links by some satellite systems to route traffic around the network, which may have an impact on the number of UK gateways required.[9]

2.10 As additional spectrum is already being made available for gateways in the 28 GHz band (see below), we are requesting additional information from stakeholders to better understand demand for Q/V and E band spectrum and when these services may deploy. We are also seeking stakeholder input on coexistence with other services currently using Q/V, E or the adjacent bands.

We are already making additional spectrum available for gateways in 28 GHz

2.11 We have today published a statement and consultation on improving spectrum access for satellite gateways and enabling other uses in the 28 GHz band (27.5 – 30 GHz).

2.12 The 28 GHz band is one of the core satellite bands for satellite uplinks. We have decided to make 448 MHz of near-national spectrum returned by Arqiva and four "guard bands" within the 28 GHz band available for GSO and NGSO gateways.

2.13 In addition, we are consulting on directly authorising satellite gateways on a case-by-case basis in the portions of the 28 GHz band which are not currently available for satellite gateways under the existing NGSO gateway and PES licences, subject to consultation processes to avoid material impacts on incumbent licensees.[10] Taken together, our decision above and this consultation proposal could enable satellite operators to access the entire 28 GHz band in the UK for use by satellite gateways, providing additional capacity which we expect will benefit people in the UK.[11]

Purpose of this CFI

2.14 We are seeking to understand the evolution of satellite systems and the potential implications for future satellite gateway spectrum access and authorisation in the UK, to:

- understand the nature of demand for gateways in Q/V and E bands, including the timing of this demand and the relative importance of these specific bands to the satellite industry; and
- gather information to inform our work on the scope for enabling access to these bands for satellite gateway use, alongside existing and future uses in the bands and adjacent spectrum users.

2.15 Inputs from stakeholders will enable to us to better take account of up to date strategic and technological developments to develop proposals for specifically which frequencies to make available, under which technical conditions to support coexistence, and appropriate timelines for doing so.

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[9] For example, satellite operators who are using or testing the use of intersatellite optical links include Amazon Kuiper, Telesat (see 'Technology' section) and Rivada.

[10] This proposal applies to the following frequencies: 28.0525 - 28.1645 GHz, 28.1925 - 28.3045 GHz, 28.3325 - 28.4445 GHz, 29.0605 - 29.1725 GHz, 29.2005 - 29.3125 GHz and 29.3405 - 29.4525 GHz.

[11] Alongside the statement and consultation relating to gateways, in the 28 GHz document we also consult on proposals to make 112 MHz of spectrum in the 28.8365 – 28.9485 GHz range available for land-based satellite user terminals under existing authorisation of these users and 2 x 112 MHz for point-to-point fixed links in the ranges 28.9485 - 29.0605 GHz and 28.0525 - 29.9405 GHz under an Ofcom managed authorisation approach.

2.16 A key part of making any specific proposals to authorise spectrum in these bands will be to manage sharing with other services that use the band, or adjacent bands. In this document we present some initial information about sharing scenarios in Section 4. In principle, satellite gateways can share spectrum with other spectrum users due to their low numbers/geographical spread but we wish to ensure we have fully considered potential sharing scenarios before developing specific proposals to enable access to gateways in Q/V and E band, including engagement with public sector users of spectrum.

Ofcom's duties

2.17 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 ("WT Act").

2.18 These are summarised in Annex 1, where we also address our approach to impact assessments.

3. Understanding satellite gateway demand for Q/V and E bands in the UK

3.1 In this section we set out our understanding of the demand for Q/V and E band gateways. We are seeking additional input to better understand the nature of this demand from stakeholders, and crucially how stakeholders envisage access to these bands will enable services to benefit citizens and consumers in the UK.

Q/V Band

3.2 There is increasing satellite operator interest in using Q/V bands for gateways. Internationally, some operators have already begun using Q/V bands for feeder links in their systems. Equally, other administrations have authorised, or received applications for, using gateways in Q/V bands from various operators.[12]

3.3 Several satellite operators and other stakeholders have expressed to Ofcom the importance of making Q/V band available for satellite gateways in the UK.[13] Some of the reasons given by operators for why Q/V bands should be made available for gateways include the 'large bandwidth it can offer' and that other bands were becoming 'congested'. The Q/V band offers potentially up to around 10 GHz of spectrum, so could represent a significant increase in available capacity for satellite gateways.

3.4 Accordingly, we are seeking to refine and further our understanding of the following:

- The benefits and importance of Q/V band in the UK, including specific bandwidths/frequency ranges sought in addition to the Ka/Ku band frequencies already authorised for satellite use.
- The likely benefits of enabling access to Q/V band for gateways to people and businesses in the UK.
- Specific information on whether operators plan to build Q/V gateways in the UK and the likely timing of deployment, given some operators have suggested they won't use these bands until their next-generation satellite systems.

E Band

3.5 There is also satellite operator interest in using E band for gateways, which could offer up to 10 GHz of spectrum. We note that the FCC has recently authorised E band for use in

[12] Echostar's Jupiter 3 system uses Q/V for feeder links in North and South America (see fact sheet). The FCC has authorised and/or received applications from several systems to use Q/V for gateways, for example: Hughes, OneWeb, Viasat, O3b Networks, Telesat, SpaceX, Amazon Kuiper, Theia Holdings

[13] In response to our 2022 Space Spectrum Strategy consultation, OneWeb, Telesat, Amazon, GSOA, tech UK and SES all supported developing an approach to authorising Q/V band for satellite earth stations

gateways in the US,[14] and have noted demand expressed for future gateway use for this band in response to our Space Spectrum Strategy.[15] We would like to better understand if, when, and why operators intend to use E band in gateways in the UK, how much is needed and what benefits this might bring for people and businesses in the UK.

3.6 As we are looking at both Q/V and E bands, we are interested in whether satellite operators intend to use these bands together. Equally, one band may be of higher priority or importance than another.

Questions

Question 1: Do you plan to use Q/V and/or E bands for gateways in the UK? Please provide further detail as follows:

a) Which bands are you planning to use?

b) When and for what purposes?

c) How much spectrum do you anticipate will be needed in each band referred to in 1a) (indicating the total uplink and total downlink spectrum required)? Please provide evidence to support your capacity estimation.

d) If you anticipate needing access to both Q/V and E band please explain the reasons. Provide supporting evidence explaining how you determine how much spectrum will be required for future gateways, and how this demand changes over time.

e) What factors would influence your decision to place one or more gateway(s) in the UK? How many gateway locations do you anticipate needing in the UK for each of the frequency bands referred to in 1a). Why?

Question 2: To help us understand the services that the gateways will support, please provide the following information:

a) Which downstream services do you anticipate serving with Q/V or E band gateways deployed in the UK?

b) For each service in your answer to 2a) please explain which, if any, of these services will be available in the UK and who they would serve.

c) For your response to 2b) please indicate when these services are expected to become available globally and to UK consumers.

d) Are gateways in the UK required in order to serve UK consumers? If not, do you have plans for gateways (which will use Q/V/E) in other countries, which could be used to serve the UK?

e) Do you plan to deploy gateways in the UK to serve consumers in countries other than the UK? If yes, please provide reasons for this approach.

[14] The FCC have recently given conditional approval for SpaceX's second-generation satellite constellation to use E band.

[15] We have noted that in response to our 2022 Space Spectrum Strategy consultation, SpaceX told us that there is 'high, immediate demand for E-band spectrum', and that their second-generation constellation 'will use spectrum in the E band for gateway earth stations'.

f) Are there any other identifiable benefits to UK people and businesses of locating gateways in the UK? If so, please provide evidence of this.

4. Coexistence considerations

4.1 In principle, satellite gateways can share spectrum with other spectrum users due to their low numbers/geographical spread. However, we wish to ensure we have adequately considered potential sharing scenarios before developing specific proposals to enable access to Q/V and E bands, including conditions to manage the potential risk of undue interference to/from gateway links to other co-primary services that are allocated and used in these bands and adjacent bands[16], as appropriate.

4.2 In this section we consider the specific coexistence considerations which would be relevant to enabling satellite gateway access to Q/V and E bands in future. These are both large bands and we think it may be feasible to initially take action to enable access to parts of the Q/V band for satellite gateway use. There are also timing considerations in view of the partial international regulatory framework currently in place for E band.

4.3 We note that certain frequencies and allocations within the Q/V and E bands that we are considering in this CFI (39.5 – 40.5 GHz and 50.4 – 51.4 GHz in Q/V, 71 – 74 GHz and 81 – 84 GHz) are designated "UK2.1" in the UK FAT, which 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 will therefore need to work with the Ministry of Defence (MOD) as we consider the scope for enabling satellite gateways in these bands. In our analysis below we do not include any details of MOD use.

Q/V band

Gateway Downlink (37.5 – 42.5 GHz)

Other uses and allocations

4.4 The current UK users are Ofcom coordinated fixed links in the 37.5 – 39.5 GHz and existing Spectrum Access licences in 40.5 – 43.5 GHz (used for operator coordinated fixed links). Additionally, there is Radioastronomy use of the adjacent band 42.5-43.5 GHz.

4.5 These bands or parts thereof are also allocated to Mobile, Space Research, Mobile Satellite and Broadcasting Satellite on a primary basis.

4.6 The band 40.5 – 42.5 GHz is currently not allocated to the Fixed Satellite Service (s-E) in the UK, however we note that there is an allocation for this service in the Radio Regulations.

Coexistence measures in place

4.7 There are existing international rules for coexistence between fixed services and gateway downlinks in 37.5 – 39.5 GHz mainly through power flux density (pfd) limits in Article 21 of the Radio Regulations. We would envisage a coordination approach, similar to that in lower bands (e.g. 4/6 GHz bands), being developed to facilitate any future sharing between receiving gateway earth stations and transmitting fixed service stations.

[16] https://www.ofcom.org.uk/__data/assets/pdf_file/0016/103309/uk-fat-2017.pdf

4.8 The rules to ensure compatibility between space stations in the fixed satellite service (s-E) and adjacent Radioastronomy use in the 42.5 – 43.5 GHz band are addressed in Article 5 of the Radio Regulations.[17]

Further coexistence considerations

4.9 Coexistence with the existing Spectrum Access licence use in 40.5 – 43.5 GHz is likely to be more complex, as the fixed links in these frequencies are not coordinated by Ofcom. However, these licences are in the process of being revoked. Many of these links will be removed by 2028 although those outside of major towns and cities (referred to as High Density areas) are being allowed to remain.

4.10 We will be awarding access to 40.5 – 43.5 GHz for new mobile services in High Density areas via auction.[18] At present we do not envisage that any future proposals to enable access to satellite gateway use of the Q/V bands would include enabling access in these High Density areas.

4.11 Outside the High Density areas, we plan to allow Shared Access licences in 40.5 – 43.5 GHz. These licences will be made available from 2028, once the existing Spectrum Access licences have been revoked. As set out above, we have offered to authorise continued use of Spectrum Access licensees' existing fixed links outside High Density areas beyond 2028 (via individual fixed link licences). Around 1,000 links would be eligible to remain.[19] [20]

4.12 In enabling access to satellite gateways, we will need to consider coexistence with Shared Access licence use and any remaining fixed links, as well as adjacent channel and area coexistence issues, if any, between gateway earth stations and mobile use in High Density areas.

4.13 We are interested in stakeholders' views whether it would be appropriate to wait until after 2028 to make these frequencies available for satellite gateways (see 4.26).

Gateway Uplink (42.5 – 43.5 GHz, 47.2 – 50.2 GHz and 50.4 – 52.4 GHz)

Other uses and allocations

4.14 The main other users in the 42.5 – 43.5 GHz band are Radioastronomy and existing spectrum access use (fixed links). The 42.5 – 43.5 GHz is also allocated to the Mobile service.

4.15 The main user of the 47.2 – 50.2 GHz band is fixed services in 49.2 – 50.2 GHz. The 47.2 – 50.2 GHz band is also allocated to the Mobile Service on a primary basis.

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[17] Radio Regulations Article 5 no's 5.551I and 5.551H provide pfd and epfd limits to be respected by GSO/NGSO fixed satellite service (s-E), respectively, for the protection of Radioastronomy sites in the 42.5 – 43.5 GHz band.

[18] https://www.ofcom.org.uk/__data/assets/pdf_file/0015/255030/03-23-statement-and-consultation-mmwave.pdf

[19] https://www.ofcom.org.uk/__data/assets/pdf_file/0015/255030/03-23-statement-and-consultation-mmwave.pdf

[20] We have also offered to grant MBNL individual temporary licences – expiring on 1 January 2030 – for up to 500 of its existing fixed links in or around certain high density areas where the installation of the replacement link/fibre connection has been delayed for reasons outside of MBNL's reasonable control. We will also need to take these links into account in our decision making. See https://www.ofcom.org.uk/consultations-and-statements/category-1/mmwave-spectrum-for-new-uses/revoking-licences-in-40-ghz-band

4.16 The 49.2 – 50.2 GHz band is an old legacy fixed link band, closed to new fixed link assignments, but there are some remaining fixed links. We plan to consider the most appropriate approach to enable coexistence between transmitting gateway earth stations and existing fixed service stations in this band.

4.17 The band 50.4 – 52.4 GHz is allocated to fixed, fixed satellite (E-s) and mobile services in the Radio Regulations.

4.18 The 50.2-50.4 band sits between (and adjacent to) the 47.2 – 50.2 GHz and 50.4 – 52.4 GHz bands and needs to be considered for the restrictions it can cause on use of adjacent bands. 50.2 – 50.4 GHz is allocated to EESS (passive) and Space Research Services and is subject Radio Regulation Article 5 No. 5.340, meaning that all emissions are prohibited in this band.

4.19 The band 51.4 – 52.4 GHz is currently not allocated to the Fixed Satellite Service (E-s) in the UK, however we note that there is an allocation for this service in the Radio Regulations (limited to GSO networks).

4.20 The band 51.4 – 52.6 GHz is available to fixed links in the UK but at present there are no fixed links in this band. We envisage potential for coordination between transmitting gateway earth stations and receiving fixed service stations, should such a need arise in the future.

Coexistence measures in place

4.21 Radio Regulations Resolution 750 (Rev.WRC-19) sets out a number of provisions to protect EESS (passive) in adjacent bands, specifically:

i) unwanted emission limits on GSO/NGSO transmitting earth stations in the 49.7 – 50.2 GHz band to protect EESS (passive) in the adjacent 50.2 – 50.4 GHz band;
ii) unwanted emission limits on GSO/NGSO transmitting earth stations in the 50.4 – 50.9 GHz band to protect EESS (passive) in the adjacent 50.2 – 50.4 GHz band; and
iii) unwanted emission limits for GSO transmitting earth stations in the 51.4 – 52.4 GHz band to protect EESS (passive) in the adjacent 52.6 – 54.25 GHz band.

Further coexistence considerations

4.22 As part of any future proposals we would plan to develop appropriate measures to ensure coexistence between gateway transmitting earth stations and relevant Radioastronomy sites in the 42.5 – 43.5 GHz band. We may consider an approach based on developing suitable coordination zones.

4.23 We have discussed at paragraphs 4.9-4.11 the current and future use of 40.5 – 43.5 GHz. This will also be relevant to the consideration of 42.5 – 43.5 GHz for gateway uplink.

4.24 In relation to 4.21 (iii) above, we note that there are currently no unwanted emission limits for NGSO transmitting earth stations in the 51.4 – 52.4 GHz band to protect EESS (passive) in the adjacent band at 52.6 – 54.25 GHz. This is because the allocation to the fixed satellite service (E-s) in 51.4 – 52.4 GHz is limited to GSO satellites only.

4.25 WRC-27 Agenda Item 1.3 will consider the removal of this restriction to allow gateways to NGSO fixed satellite services (E-s) in the 51.4 – 52.4 GHz band, with appropriate protection measures for other services including EESS (passive) in the adjacent 52.6 – 54.25 GHz band. In the interim, there is no equivalent international measure to that shown at 4.21(iii) to protect EESS (passive) from NGSO gateways. This means that we would need to consider whether it would be appropriate to develop UK measures prior to WRC-27 to protect EESS

(passive) and allow NGSO gateways in the UK, in derogation of the Radio Regulations. If were to do so, we may need to review our regulations following decisions at WRC-27.

Our current assessment of options for making Q/V band spectrum available for satellite gateways

4.26 We currently consider it may be more feasible to initially take action to enable access to parts of the Q/V band for satellite gateway use. From our initial assessment, we think it might be feasible to propose enabling access to satellite gateway access on a shared basis to up to 3 GHz of downlink and up to 4 GHz uplink Q/V band spectrum.

4.27 For downlink, we think that the most feasible option in the near term would be to enable access to those frequencies that:

a) have an existing allocation to FSS in the UK FAT; and
b) are not subject to licence revocation (i.e. excluding 40.5 – 43.5 GHz).

4.28 This would make 3 GHz of spectrum (37.5 – 40.5 GHz) available for downlink. Doing so would remove the need to coordinate with the links of the Spectrum Access licensees that are subject to licence revocation which, as we note at 4.9, is likely to be more complex. This coordination would become easier after 2028, when the Spectrum Access licences are revoked and the band will be made available for mobile services in High Density areas, and Ofcom-coordinated Shared Access licences and residual Ofcom coordinated fixed links outside High Density areas, with the locations of remaining fixed links known.

4.29 For uplink, we consider that it may be more feasible to focus on the frequencies 47.2 – 50.2 GHz and 50.4 – 51.4 GHz:

a) We are interested to understand from stakeholders how usable 42.5 – 43.5 GHz would be to stakeholders for uplink, given that this block is immediately adjacent to a downlink allocation (while 40.5 - 42.5 GHz is currently not allocated to the Fixed Satellite Service (s-E) in the UK, we note that there is an allocation for this service in the Radio Regulations).
b) The 51.4 – 52.4 GHz frequencies do not currently have a UK FAT allocation, and are limited in the Radio Regulations to use by GSO systems.[21]

4.30 We are keen to understand from stakeholders whether enabling access to this more limited frequency range would meet the requirements of satellite systems, at least in the near term (before WRC-27 has concluded) and until we have decided whether to extend UK allocations to the Fixed Satellite Service to align with the Radio Regulations.

Question 3: Do you have any information on gateways that are planned to be deployed in the UK in the Q/V bands including technical parameters? If so, please provide details.

Question 4: Do you have any comments on the spectrum sharing considerations set out for the gateway downlink and uplink in the Q/V bands? If so, please provide details.

[21] Radio Regulations Article 5 No. **5.555C** limits the use of the frequency band 51.4 – 52.4 GHz by the fixed-satellite service (Earth-to-space) to geostationary-satellite networks. The earth stations are limited to gateway earth stations with a minimum antenna diameter of 2.4 metres.

Question 5: Do you have any additional information which could facilitate our consideration of coexistence between gateway uplink/downlink and other services in the Q/V band and adjacent bands, as appropriate? If so, please provide details.

Question 6: What are your views on enabling NGSO gateway earth stations to access the 51.4 – 52.4 GHz band before WRC-27 concludes?

Question 7: What are your views on initially enabling access to 37.5 – 40.5 GHz for gateways, with a later consideration of the 40.5 – 43.5 GHz frequency range? Do you consider 42.5 – 43.5 GHz to be usable in the uplink?

E band

4.31 Like Q/V bands, any consideration of expanding access to these bands for GSO and NGSO gateway links will require necessary conditions to be put in place to manage the potential risk of undue interference to/from gateway links to other co-primary services that are allocated and used in these bands and adjacent bands,[22] as appropriate. Currently, there are gaps in the international Radio Regulations which will be addressed by WRC-27 to manage the international interference aspects between the services allocated in these and adjacent bands.

Gateway Downlink (71 – 76 GHz) and Uplink (81 – 86 GHz)

Current uses and allocations

4.32 The 71 – 76 GHz and 81 - 86 GHz bands are allocated and used by fixed services (around 5000 links) in the UK. Our recent CFI indicated ongoing and increasing demand for Fixed links in the E band.[23]

4.33 These bands or parts thereof are also allocated to Mobile, Mobile Satellite, Broadcasting, Broadcasting Satellite, Radioastronomy on a primary basis and to amateur, amateur satellite, Space Research, Earth Exploration Satellite on a secondary basis.

Further coexistence considerations

4.34 For fixed services, we have two approaches for authorisation in this band:

a) Ofcom coordinated frequencies (71.125 – 73.125 GHz and 81.125 – 83.125 GHz) where Ofcom is responsible for coordinating and assigning fixed links. For any future proposals we would envisage proposing a coordination approach between transmitting/receiving gateway earth stations and fixed service stations in these Ofcom coordinated parts of this spectrum that is similar to our approach in lower bands (e.g. 4/6 GHz bands).
b) Self-coordinated frequencies (73.375 – 75.785 GHz and 83.375 – 85.785 GHz) where licensees are responsible for coordinating their fixed links with existing registered fixed links. Coordination between gateways and fixed links in this part of E band is likely to be more complex.

4.35 Whilst in general the Radio Regulations provide the basis for sharing between fixed and satellite services at the international level, such provisions are not in place in these bands. There are no pfd limits in the Radio Regulations Article 21 to manage the interference from

[22] https://www.ofcom.org.uk/__data/assets/pdf_file/0016/103309/uk-fat-2017.pdf
[23] Review of the use of fixed wireless links and spectrum implications, Call for Input, see figure 4.2

space transmissions to receiving fixed and mobile stations in the 71 -76 GHz band. Similarly, there are no EIRP limits for earth stations in Radio Regulations Article 21 to manage the interference to receiving fixed and mobile stations in the 81 – 86 GHz band.

4.36 The adjacent band 86 – 92 GHz is allocated to EESS where Radio Regulations Article 5 No. 5.340 applies i.e. all emissions are prohibited. There are currently no unwanted emissions limits for earth stations in the 81 – 86 GHz band in the Radio Regulations Resolution 750 (Rev. WRC-19) to protect EESS in the adjacent 86 – 92 GHz band.

4.37 There are two WRC-27 Agenda Items (WRC-27 Agenda Item 1.10 and 1.18) which are likely to address the gaps in the Radio Regulations mentioned in 4.35 and 4.36 above.

4.38 In absence of international protection measures for EESS and terrestrial stations mentioned in 4.35 and 4.36, we would have to develop UK measures for gateway downlink/uplink in these bands which may be subject to review after decisions of WRC-27.

Our current assessment of options for making E band spectrum available for satellite gateways

4.39 Taking into account the above, we consider that we could take two high-level approaches to the timing of developing any proposals to enable access to satellite gateway use of E band in the UK:

a) **Earlier option**: we would need to develop all the sharing and compatibility conditions before WRC-27, noting the risk that WRC-27 may adopt different conditions which we would then have to review and update our regulations.
b) **Later option**: we would make E band available for gateway use after WRC-27, taking account of agreements reached there, noting that the 28 GHz band (and, subject to further consultation, potentially the Q/V band) would be available for gateway use before WRC-27.

4.40 We would further need to determine which specific frequencies within E band to make available in the UK, noting the extensive existing use.

4.41 Our decision on these options will also be based on the evidence provided on demand and timing relevant to the UK for Q/V and E bands respectively as part of this CFI.

Question 8: Do you have any information on gateways that are planned to be deployed in the UK in E band including technical parameters? If so, please provide details.

Question 9: Do you have any comments on the spectrum sharing considerations set out for the gateway downlink and uplink in E band? If so, please provide details.

Question 10: Do you have any additional information which could facilitate our consideration of coexistence between gateway uplink/downlink and other services in E band and adjacent bands, as appropriate? If so, please provide details.

Question 11: What are your views on considering enabling gateways to use E band before WRC-27 concludes?

5. Next steps

5.1 This call for input will close on 14 June 2024. The responses from stakeholders will enable to us consider proposals for frequencies to make available in Q/V and E bands, and appropriate timelines for doing so.

5.2 We will publish an update in Q3 2024/25. If we propose to make changes to the use of these bands, we will follow our normal consultation process, including an impact assessment, in line with our statutory duties and regulatory principles.

Question 12: Are there any other points that you deem would be helpful in our consideration of Q/V and E bands for future gateways? In providing your response, please include as much supporting evidence as you can.

A1. Legal framework

A1.1 This annex explains our legal framework, derived from our duties and powers under both the Communications Act 2003 and the Wireless Telegraphy Act 2006. It is not a full statement of all the legal provisions which may be relevant to our functions and wireless telegraphy licensing.

Communications Act 2003

A1.2 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.

A1.3 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

A1.4 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.

A1.5 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.

A1.6 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.

A1.7 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.

Impact assessment

A1.8 Section 7 of the Communications Act requires us to assess and publish the likely impact of implementing a proposal which would be likely to have a significant impact on businesses or the general public, or when there is a major change in Ofcom's activities. As a matter of policy Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions, although the form of that assessment will depend on the particular nature of the proposal. This guidance sets out our general approach to how we assess and present the impact of our proposed decisions.

A1.9 Ofcom is an evidence-based organisation and welcomes responses to this CFI. We note that this document is not yet making firm proposals, only seeking input. We have therefore not undertaken an impact assessment in this document. If in future we propose to make changes to the use of these bands, this would be subject to our normal consultation process, including an impact assessment, in line with our statutory duties and regulatory principles.

Equality impact assessment

A1.10 Section 149 of the Equality Act 2010 (the 2010 Act) imposes a duty on Ofcom, when carrying out its functions, to have due regard to the need to eliminate discrimination, harassment, victimisation and other prohibited conduct related to the following protected characteristics: age; disability; gender reassignment; marriage and civil partnership; pregnancy and maternity; race; religion or belief; sex and sexual orientation. The 2010 Act also requires Ofcom to have due regard to the need to advance equality of opportunity and foster good relations between persons who share specified protected characteristics and persons who do not.

A1.11 Section 75 of the Northern Ireland Act 1998 (the 1998 Act) also imposes a duty on Ofcom, when carrying out its functions relating to NI, to have due regard to the need to promote equality of opportunity and regard to the desirability of promoting good relations across a range of categories outlined in the 1998 Act. Ofcom's Revised NI Equality Scheme explains how we comply with our statutory duties under the 1998 Act.

A1.12 To help us comply with our duties under the 2010 Act and the 1998 Act, we assess the impact of our proposals on persons sharing protected characteristics and in particular whether they may discriminate against such persons or impact on equality of opportunity or good relations. We fulfil these obligations by carrying out an Equality Impact Assessment ('EIA'), which examines the impact our policy is likely to have on people, depending on their personal circumstances. EIAs also assist 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.

A1.13 We do not consider this document has equality implications under the 2010 Act or the 1998 Act.

Welsh language impact assessment

A1.14 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).

A1.15 As above, we note that this document is not yet making firm proposals, only seeking input. We have therefore not undertaken a Welsh language impact assessment in this document.

A2. Responding to this consultation

How to respond

A2.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 14 June 2024.

A2.2 You can download a response form from https://www.ofcom.org.uk/consultations-and-statements/category-1/expanding-spectrum-access-for-satellite-gateways. You can return this by email or post to the address provided in the response form.

A2.3 If your response is a large file, or has supporting charts, tables or other data, please email it to qvegateways@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet.

A2.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:

Spectrum Group
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A2.5 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.

A2.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)

A2.7 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.

A2.8 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.

A2.9 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 5. 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.

A2.10 If you want to discuss the issues and questions raised in this consultation, please contact the Q/V and E band Gateways Team by email to qvegateways@ofcom.org.uk.

Confidentiality

A2.11 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.

A2.12 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.

A2.13 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.

A2.14 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.

A2.15 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

A2.16 Following this consultation period, Ofcom plans to publish an update in Q3 2024/25.

A2.17 If you wish, you can register to receive mail updates alerting you to new Ofcom publications.

Ofcom's consultation processes

A2.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 3.

A2.19 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.

A2.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

A2.21 Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A3. Ofcom's consultation principles

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

Before the consultation

A3.1 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

A3.2 We will be clear about whom we are consulting, why, on what questions and for how long.

A3.3 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.

A3.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.

A3.5 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.

A3.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

A3.7 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.

A4. 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)

A5. Consultation questions

A5.1 We invite responses to the following questions we have asked in this CFI:

Question 1: Do you plan to use Q/V and/or E bands for gateways in the UK? Please provide further detail as follows:

a) Which bands are you planning to use?

b) When and for what purposes?

c) How much spectrum do you anticipate will be needed in each band referred to in 1a) (indicating the total uplink and total downlink spectrum required)? Please provide evidence to support your capacity estimation.

d) If you anticipate needing access to both Q/V and E band please explain the reasons. Provide supporting evidence explaining how you determine how much spectrum will be required for future gateways, and how this demand changes over time.

e) What factors would influence your decision to place one or more gateway(s) in the UK? How many gateway locations do you anticipate needing in the UK for each of the frequency bands referred to in 1a). Why?

Question 2: To help us understand the services that the gateways will support, please provide the following information:

a) Which downstream services do you anticipate serving with Q/V or E band gateways deployed in the UK?

b) For each service in your answer to 2a) please explain which, if any, of these services will be available in the UK and who they would serve.

c) For your response to 2b) please indicate when these services are expected to become available globally and to UK consumers.

d) Are gateways in the UK required in order to serve UK consumers? If not, do you have plans for gateways (which will use Q/V/E) in other countries, which could be used to serve the UK?

e) Do you plan to deploy gateways in the UK to serve consumers in countries other than the UK? If yes, please provide reasons for this approach.

f) Are there any other identifiable benefits to UK people and businesses of locating gateways in the UK? If so, please provide evidence of this.

Question 3: Do you have any information on gateways that are planned to be deployed in the UK in the Q/V bands including technical parameters? If so, please provide details.

Question 4: Do you have any comments on the spectrum sharing considerations set out for the gateway downlink and uplink in the Q/V bands? If so, please provide details.

Question 5: Do you have any additional information which could facilitate our consideration of coexistence between gateway uplink/downlink and other services in the Q/V band and adjacent bands, as appropriate? If so, please provide details.

Question 6: What are your views on enabling NGSO gateway earth stations to access the 51.4 – 52.4 GHz band before WRC-27 concludes?

Question 7: What are your views on initially enabling access to 37.5 – 40.5 GHz for gateways, with a later consideration of the 40.5 – 43.5 GHz frequency range? Do you consider 42.5 – 43.5 GHz to be usable in the uplink?

Question 8: Do you have any information on gateways that are planned to be deployed in the UK in E band including technical parameters? If so, please provide details.

Question 9: Do you have any comments on the spectrum sharing considerations set out for the gateway downlink and uplink in E band? If so, please provide details.

Question 10: Do you have any additional information which could facilitate our consideration of coexistence between gateway uplink/downlink and other services in E band and adjacent bands, as appropriate? If so, please provide details.

Question 11: What are your views on considering enabling gateways to use E band before WRC-27 concludes?

Question 12: Are there any other points that you deem would be helpful in our consideration of Q/V and E bands for future gateways? In providing your response, please include as much supporting evidence as you can.