Increasing use of the 27.5 – 30 GHz band

Improving spectrum access for satellite gateways and enabling other uses

Statement and consultation

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Annex

1. Overview

1.1 Ofcom is responsible for managing the UK's radio spectrum, ensuring it is used in the best interests of all in the UK. This finite resource is crucial to delivering a wide range of valuable wireless applications benefitting many different users.

1.2 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. Delivery of these services relies on radio spectrum. Globally, there is growth in the use of the 27.5 – 30 GHz ("28 GHz") band, which is one of the core satellite bands for satellite uplinks (Earth-to-space transmission).

1.3 In the UK, some blocks of the 28 GHz band were auctioned and authorised under Spectrum Access licences on a technology and service neutral basis in 2000 and 2008. The licences are primarily used for fixed link deployment; in a small number of cases spectrum is leased by Spectrum Access licensees to satellite operators at specific locations for satellite gateway use.

1.4 This document comprises:

- A statement on our decision to enable satellite gateways in the spectrum returned by Arqiva and guard bands, as proposed in our 18 August 2023 consultation; and
- A consultation on proposals to
  - i) Introduce a new mechanism to enable satellite gateway access to the whole band; and
  - ii) Make available the returned Arqiva spectrum for use by land-based satellite user terminals and point-to-point fixed links.

Decision to enable satellite gateways in the spectrum returned by Arqiva and guard bands

1.5 On 7 February 2023, Arqiva requested that we vary its national 28 GHz Spectrum Access licence, which authorises use of 2 x 224 MHz (448 MHz) of spectrum at 27.8285-28.0525 GHz paired with 28.8365-29.0605 GHz. We decided on 23 March 2023 to agree to Arqiva's variation request, reducing the scope of its national licence to three locations and limiting its duration until July 2026.

1.6 On 18 August 2023 we consulted on allowing satellite gateways to use the returned Arqiva spectrum ("returned spectrum") and the four 28 MHz guard bands separating the block assigned bands. Satellite gateways are a key element of satellite networks and act as hubs that connect the satellite network to the internet and/or to private networks and cloud services.

In this document, we set out our decision to make the 448 MHz of near national returned spectrum and the four "guard bands" within the 28 GHz band available for NGSO Earth station gateways and Geostationary satellite ("GSO") gateways (Permanent Earth stations – "PES"). Satellite operators can now apply to use this spectrum through the normal Ofcom NGSO gateway or PES licence application/variation process.

New consultation proposals to enable further access of the 28 GHz band

1.7 Growing demand for access to satellite spectrum has emerged to meet the needs of an increasing number of users, new NGSO constellations, and new space-based applications that support connecting more users.

1.8 We have received feedback from stakeholders that access to gateway spectrum in the UK is being unnecessarily restricted by challenges in accessing 28 GHz spectrum in the block assigned portions of the band (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).

1.9 In light of this, and to enable further expansion in satellite connectivity services in the UK, we are consulting on a proposal for Ofcom to directly authorise satellite gateways on a case-by-case basis in these frequencies, which are not currently available for satellite gateways under the existing NGSO Gateway and PES licences. This direct authorisation would be subject to consultation processes to avoid material impacts on incumbent Spectrum Access licensees. We are proposing that this approach would also apply to the three geographic Spectrum Access licences held by Arqiva until 31 August 2026, and the currently unallocated spectrum blocks in the Northern Ireland and London regions at 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz.

1.10 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.

1.11 We are also consulting on authorising other uses of the returned spectrum alongside satellite gateways. We are consulting on proposals to make available:

i) 112 MHz of spectrum in the 28.8365 – 28.9485 GHz range for land-based satellite user terminals under existing authorisation of these users; and
ii) 2 x 112 MHz for point-to-point fixed links in the ranges 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz under an Ofcom managed authorisation approach.

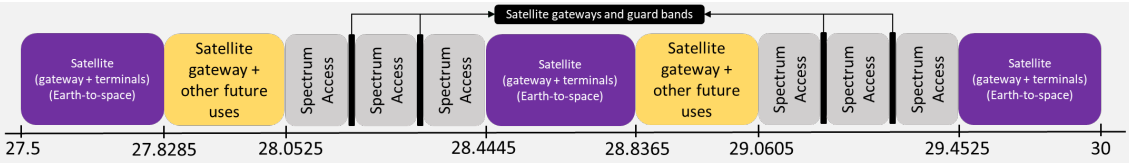
1.12 This approach would align the UK with the amount of spectrum available for satellite user terminals in Europe and could provide additional spectrum to connect more homes and businesses especially in hard-to-reach areas. The proposed additional spectrum for point-to-point fixed links assignment could provide additional wide band channels for fixed links deployment.

1.13 Further, we are seeking stakeholder views on demand for the currently unused regional blocks at 28.1925 – 28.3045 GHz and 29.2005 – 29.3125 GHz in London and Northern Ireland, for shared use with satellite gateways.

In brief

We have decided to:

• make spectrum available for satellite gateways (Earth-to-space) in the returned 28 GHz spectrum (orange blocks) and the four guard bands (black bars).



• extend access for satellite gateway use in these bands under the existing NGSO Earth station (Gateway) licence and PES licence, with the associated licensing process and licence fees.

Subject to consultation responses, we are minded to:

• authorise satellite gateway (NGSO and PES) access across the whole band including the block assigned bands (grey blocks) under the existing NGSO Gateway and PES licences where there is no material impact on incumbent Spectrum Access licensees.

• make available (by licensing) 112 MHz of spectrum at 28.8365 – 28.9485 GHz for land-based satellite terminals in the same way we currently authorise satellite terminals.

• make available 2 x 112 MHz for point-to-point fixed links in the ranges 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz in the same way we authorise fixed links in other Ofcom managed fixed link bands.

The closing date for responses to this consultation is 31 May 2024. We plan to publish our decision on enabling satellite gateways across the whole band and additional spectrum access for satellite terminals and fixed links by end 2024.

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

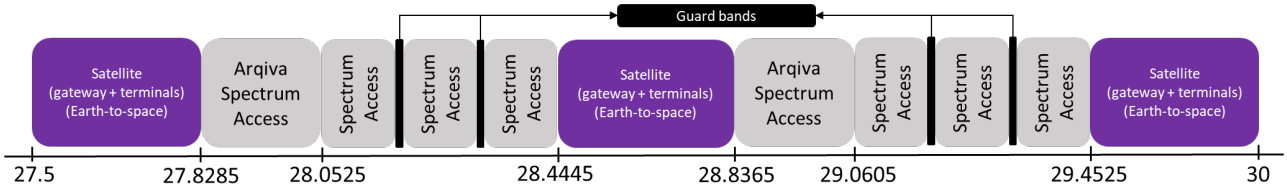
2. Introduction

Background

The 28 GHz band

2.1 In the UK, the 28 GHz band is allocated on a co-primary basis to Fixed, Mobile and Fixed-Satellite (Earth-to-space) Service (FSS) and is currently used for fixed wireless and satellite purposes.

Figure 1: 28 GHz band plan before Arqiva's 2023 licence variation



2.2 The guard bands shown in Figure 1 were implemented to ensure different fixed wireless service (Broadband Wireless Access[1]) users operating in adjacent bands could coexist within the same geographic area.

2.3 Spectrum Access licences were awarded as regional[2] and national[3] spectrum blocks through auctions in 2000 and 2008, and permit fixed and satellite (Earth-to-space, also known as uplink) uses. The current licensees in these bands are Arqiva, UK Broadband (owned by Three), Virgin Media O2 (VMO2), and Vodafone who are using the spectrum primarily for point-to-point fixed links; some licensees also lease their spectrum to satellite operators to deploy satellite gateways.

2.4 Prior to the 2023 variation of its licence (see paragraphs 2.10-2.12), Arqiva held a national Spectrum Access licence as shown in Figure 1.

2.5 The purple blocks in Figure 1 are authorised for FSS only and are accessed by satellite operators on a shared basis[4]. The key elements of a satellite system are shown in Figure 2; our approach to licensing each of these satellite elements in the 28 GHz band is outlined below:

a) Gateway earth stations, typically large hubs that connect the satellite system to the internet and/or to private networks. There are two types of licences that authorise gateway earth stations in the UK:

i) Permanent Earth Station (PES) licences[5] authorise one or more Earth stations operating from a permanent, specified location transmitting to a *geostationary (GSO) satellite* and,

[1] When the Spectrum Access licence was awarded, it was envisaged that spectrum could be used for broadband wireless access which influenced the need for the guard bands. The current use however of the spectrum is for point-to-point fixed wireless services and satellite gateway.
[2] 2000 and 2008 spectrum awards.
[3] 2008 spectrum award.
[4] Avanti is also authorised to use the entire 28 GHz band to operate permanent earth stations since 2009.
[5] We refer to this as PES licence in the rest of the document.

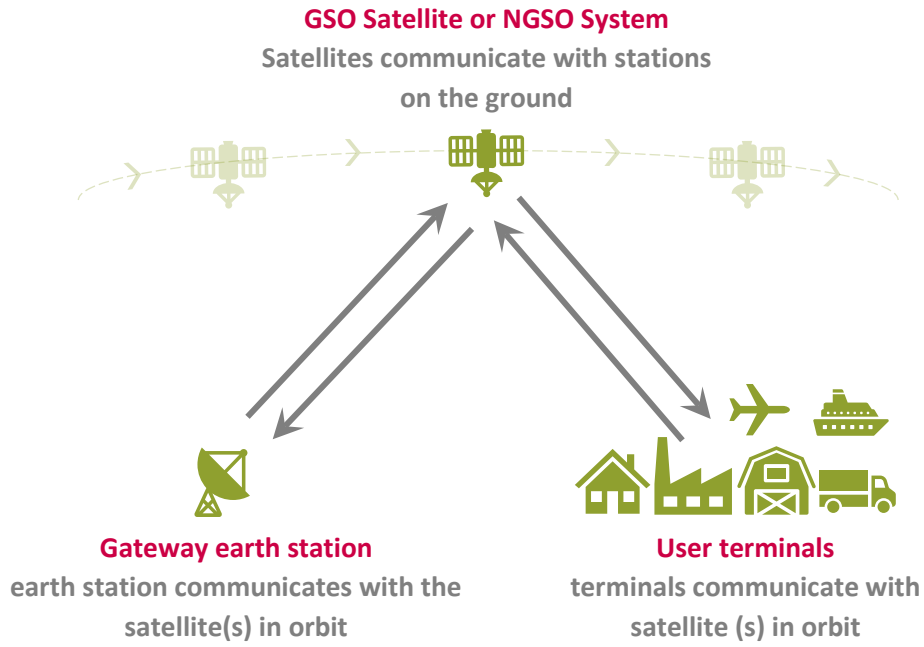
ii) NGSO Earth Station (Gateway) licences[6] authorise one or more earth stations operating from a permanent, specified location transmitting to a specified *non-geostationary (NGSO) satellite system*.

b) Satellite terminals typically comprise a small antenna and associated equipment, which can be fixed or mounted on mobile platforms (we will refer to these mobile terminals as ESIMs[7]). They operate as part of a network where data is routed from each terminal via a satellite to and from satellite gateway.

i) NGSO and GSO satellite terminals in 14 GHz and 28 GHz band are typically authorised under an Earth Station Network licence (ESN). However, GSO fixed terminals operating in the 28 GHz band and complying with the conditions set out in Interface Requirement 2066 (IR 2066) are licence exempt.

2.6 There is more spectrum available in the 28 GHz band than in 14 GHz which means that satellite operators operating in the 28 GHz band could support more customers and/or offer faster services. The higher frequencies also mean the satellite terminals can be much smaller making them easier to install.

Figure 2: Key elements of a satellite communication system



Introduction of Annual Licence Fees

2.7 In March 2023, we published our decision on Annual Licence Fees (ALFs) for the 28 GHz licences which had been awarded in 2008, following the end of their initial licence term.[8] In setting spectrum licence fees, if we expect that setting cost-based fees would result in excess demand for the spectrum, our policy is to set fees based on the estimated market

[6] We refer to this as NGSO gateway licence in the rest of the document.
[7] Earth stations in motion (ESIMs) are satellite terminals mounted on mobile platforms (vehicles, ships and aeroplanes) intended to be in use while in motion.
[8] Those licences awarded in 2000 were already subject to ALFs. The ALF decision also related to licences in the 10 GHz and 32 GHz bands which are also used for (block-assigned) fixed links.

value of the spectrum. This is so that licensees will only continue to retain their licences if they value the spectrum at least as highly as the highest-value alternative user or use.

2.8 We said in the March ALF statement (paragraph 3.7) that we expected that there would be excess demand for the licences from fixed link users, noting that current licensees had more demand for fixed links than they could meet using their block-assigned licences (shown by their additional use of Ofcom-assigned fixed link licences in other bands), our upcoming clearance of fixed links from the 26 GHz and 40 GHz bands, and the potential for 5G demand to require increased fixed link capacity. We also noted potential demand for the spectrum from other uses, including satellite broadband provision and Fixed Wireless Access.

2.9 However, we said in the same statement (paragraph 3.28) that evidence of future demand for fixed links was somewhat mixed, noting a substantial ongoing decline in Ofcom-assigned fixed links in recent years (although the number of fixed links in 28 GHz had increased). We decided, in light of our conservative approach to setting ALFs, to reduce our estimate of the market value of the spectrum (and hence the licence fees) by 25% relative to the original estimate on which we had consulted.

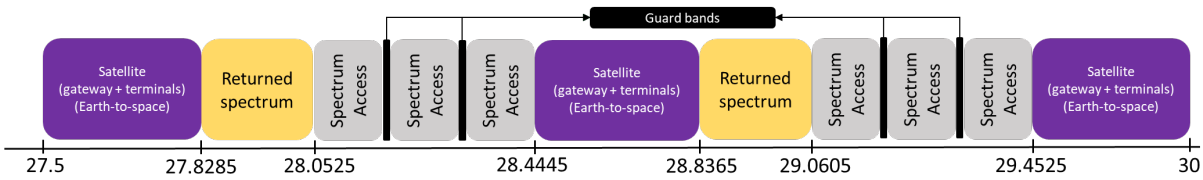
Arqiva licence variation

2.10 On 7 February 2023, Arqiva requested that we vary its national Spectrum Access licence, licence number 0307328[9], which authorised use of 2x224 MHz of 28 GHz spectrum as shown in Figure 1. The variation request sought to enable Arqiva to retain its licence in three locations[10] until July 2026, but return the balance of its nationally licensed 28 GHz spectrum.

2.11 We consulted on this variation request on 15 February 2023, and received three responses, all from satellite operators who supported the proposed variation.

2.12 On 24 March 2023, we published a statement which confirmed that, taking account of the consultation responses, we agreed to the variation request. Consequently, the near-national 2x224 MHz of spectrum was returned to Ofcom for reauthorisation, with the spectrum being available nationally from August 2026.

Figure 3: Updated 28 GHz band plan after Arqiva's licence variation



August 2023 gateway consultation

2.13 On 18 August 2023, we consulted on proposals to expand spectrum access for satellite gateways in the returned spectrum as well as the guard bands. We also proposed to authorise access under the existing NGSO Earth station (Gateway) licence and the PES licence with the associated licensing process and licence fees. This would mean access to an

[9] The licence was originally awarded in 2008 and subsequently varied on 27 April 2016 and again on 18 May 2021.

[10] Arqiva has entered into commercial agreement with a satellite operator which enables that operator to provide satellite gateway services at Goonhilly, Morn Hill and Chalfont Grove until 31 July 2026.

additional 560 MHz of spectrum for satellite gateways in the returned spectrum and guard bands (2x224 MHz of returned spectrum and 4x28 MHz of guard band spectrum).

2.14 We said our proposal would:

a) enable satellite operators to provide additional capacity to serve more consumers and provide new services;
b) give satellite operators the certainty they need to access the spectrum they require for future gateways in the UK; and
c) give operators access to the spectrum under an approach consistent with that for satellite services.

2.15 We said that we planned to consult on authorisation options for access to the returned spectrum by other users such as fixed services and satellite terminals. We considered that our proposals would not significantly constrain deployment of future users in the returned spectrum nor adversely affect existing users.

Our policy objectives

2.16 Our policy objective for the 28 GHz band is to secure optimal use of the band for the benefit of UK citizens and consumers. Our Spectrum Management Strategy (paragraph 3.55) sets out that greater sharing is an important way to achieve more efficient use which is why we are seeking to promote sharing in the context of the 28 GHz band.

2.17 The 28 GHz band is an important band for FSS for both GSO and NGSO satellite systems and there has been significant growth and development in its use globally, notably the launch and operation of large-scale constellations of non-geostationary orbit (NGSO) satellites. The band has a primary allocation to the FSS globally in the Radio Regulations and in the UK, making it ideal for the delivery of global satellite services.

2.18 On page 3 of our Space Spectrum Strategy, we set out two key objectives which are relevant to our decisions on the future of the 28 GHz band. These include 'providing access to spectrum to enable growth in the benefits that the space sector delivers for people, businesses and the public sector in the UK' and 'enabling as many NGSO satellite systems as possible to provide services in the UK'.

Relevant legal framework

2.19 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").

Communications Act 2003

2.20 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.

2.21 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

2.22 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.

2.23 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.

2.24 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.

2.25 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 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.

Structure of this document

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

- **Section 3** sets out our decision to expand spectrum access for satellite gateway in the returned spectrum and the guard bands.
- **Section 4** outlines our initial view on enabling satellite gateway access across the whole 28 GHz band and sets out proposals for consultation.
- **Section 5** outlines our initial view on other potential shared use of the returned spectrum and sets out proposals for consultation.
- **Section 6** summarises our impact assessment of our decision and proposals and sets out our next steps.

3. Decision to enable access to the returned spectrum and 28 MHz guard bands for satellite gateways

Introduction

3.1 In this section, we set out our decision, having considered stakeholder comments, to enable access to the returned spectrum and the four 28 MHz guard bands for satellite gateway use under our existing authorization approaches for NGSO and GSO gateways.

Satellite gateways in the returned spectrum and guard bands

Our proposal

3.2 In our August 2023 consultation, we proposed making the returned spectrum and guard bands outlined in Table 1 available for satellite gateway (Earth-to-space) use under the existing NGSO Earth station (Gateway) licence and the PES licence framework and fees.

Table 1: August 2023 consultation proposal for additional 28 GHz band frequencies for satellite gateway use

	Frequency ranges (GHz)	Bandwidth (MHz)
Returned spectrum	27.8285 – 28.0525	224
	28.8365 – 29.0605	224
Guard bands	28.1645 – 28.1925	28
	28.3045 – 28.3325	28
	29.1725 – 29.2005	28
	29.3125 – 29.3405	28
Total		**560**

3.3 We received 12 responses to our consultation, most of which were from satellite operators. Non-confidential responses were provided by 10 respondents and these are published on our website.

Summary of responses

Use and authorisation of the frequency ranges

3.4 11 responses[11] expressed support for the proposal to expand spectrum access for satellite gateways to enable them to use the frequency ranges in Table 1. One respondent disagreed with our proposal to use the frequencies for satellite services and said that 5G fixed wireless access (FWA) systems would be a better use of the spectrum. They argued that while fibre or mobile 5G New Radio are ideal for densely populated areas, Last Mile Access[12] in rural and sub-urban environments is more affordable and easier to set up and administer using 5G fixed solutions.

3.5 Six satellite operators[13] stated their support for authorizing the spectrum under the existing NGSO and PES licence frameworks and the associated fees while the remaining respondents did not comment specifically to how the spectrum may be authorised.

3.6 Vodafone cautioned against authorizing the frequencies nationally and said this could restrict use by other services in areas which were unlikely to have gateways deployed.

Coexistence considerations

3.7 Arqiva and Vodafone expressed concerns about possible interference to existing services in the adjacent block assigned band if gateways are introduced. Arqiva said they are keen that the assessments provided by network and gateway operators are validated thoroughly for any additional network or gateway use in line with the assessments for coexistence with existing systems and future systems that are included in the NGSO earth station licensing process[14]. Vodafone said if a satellite gateway solely intended to operate in the spectrum vacated by Arqiva and guard bands, then out of band (OOB) limits would apply because in principle the gateway operator would have had no communication/agreement with the adjacent incumbent licensee[15].

3.8 A confidential respondent expressed concern regarding the protection of GSO gateway links in specific frequency bands. They noted that Ofcom's current framework to protect these links assumes adequacy of the ITU-R co-ordination process and thought that the validity of this assumption was threatened by the potential for Article 22 protections for geostationary satellites to be reviewed at future WRC.

Licence fee

3.9 Three responses[16] commented on the proposed approach to fees for the NGSO and PES gateway licences.

- Amazon agreed with the current cost-based fees for NGSO gateways as opposed to AIP, on the basis that they considered it to be more appropriate for spectrum that can be shared between different GSO and NGSO stations.
- Viasat said since the objectives for both GSO and NGSO satellite services are the same, the spectrum fees should be the same to encourage full competition between operators.

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[11] Amazon p.1, Arqiva p.1, GSOA p.1, OneWeb p.1, Telesat International Limited p.1, SES p.1, SpaceX p.1, Rivada Space Networks p.1, Viasat p.1 and Vodafone p.2.
[12] The final part of the telecommunications network that delivers telecommunications services to customers.
[13] Amazon p.1, GSOA p.1, OneWeb p.1, Rivada Space Networks p.1 and SpaceX p.1.
[14] Arqiva p.2
[15] Vodafone p.2
[16] Amazon p.4, Viasat p.6 and Vodafone p.3.

- Vodafone said that NGSO gateway licences should be based on AIP, otherwise, it is unfair that the incumbent spectrum access users and new NGSO users are charged differently for use of the same spectrum.

Our response and decision

Use and authorisation of the frequency ranges

3.10 We note that there was general agreement with our proposal to open the returned spectrum and 28 MHz guard bands for satellite gateway use. We also note that there was no disagreement with our proposal to authorize the spectrum under the existing NGSO and PES licence frameworks.

3.11 We consider that our proposed approach to authorising gateways on a per location basis would enable spectrum to be used by other users in locations where gateways are not deployed, which addresses the concerns raised by Vodafone on the case for not authorising gateway use nationally.

3.12 Regarding the argument for making the spectrum available for 5G FWA, in May 2023 we decided to make over 6 GHz of millimetre wave ("mmWave") spectrum across the 26 GHz (24.25 - 27.5 GHz) and 40 GHz (40.5 - 43.5 GHz) bands available for mobile technology, including 5G and deployment of 5G FWA. This aligns with European harmonisation adopting the 26 GHz band as pioneer band for 5G in Europe. In light of this, we do not consider that there is a demand case for FWA as potential future uses of the returned 28 GHz spectrum in the UK.

Coexistence consideration

3.13 We note concerns regarding possible interference to existing services in the adjacent band if satellite gateways are introduced in the returned spectrum and the guard bands. In practice, we think it is very unlikely that a satellite operator would seek to make use of the guard bands without access to adjacent spectrum having been agreed with the existing licence holder, given the narrow bandwidths available in the guard bands. However, we would check this at the application stage. We reserve the right not to grant a licence where we think there is a risk of interference into adjacent band users in the location of the proposed gateway. Further, in section 4 we set out proposals for enabling satellite gateways to access the whole 28 GHz band, which could further mitigate any coexistence concerns between satellite gateway and adjacent users.

3.14 We have noted the concern raised regarding the risk of GSO satellite systems being affected by NGSO satellite systems due to possible changes to the limits in Article 22 at a future WRC. No changes to the Equivalent Power Flux Density (EPFD) limits in Article 22 (or Resolution 76) were made at WRC-23. In addition, it was discussed and is expected that any potential future changes would be agreed internationally and recognize the needs to protect current and future GSO systems.

Licence fees

3.15 We recognise there is a difference in how the fees are calculated for NGSO and PES licences, although they use the same spectrum and provide similar types of services.

3.16 PES licence holders are charged Administered Incentive Pricing (AIP) licence fees, whereas NGSO Earth Station (Gateways) are charged cost-based fees. As noted in our Space Spectrum Strategy statement (paragraph 4.29), we will consider the introduction of AIP licence fees for NGSO satellite Earth stations, to reflect the opportunity cost of spectrum

denied to other uses and users (rather than just the costs of managing the radio spectrum) when we next review the pricing of our satellite Earth station licences.

Ofcom's decision

3.17 Having considered the responses to our August 2023 consultation, we have decided to allow satellite gateway use in the returned spectrum and the four 28 MHz guard bands, under the existing PES and NGSO licensing framework and associated fees.

3.18 We consider that our decision will benefit citizens and consumers by enabling satellite operators to increase their capacity to serve more consumers and businesses with improved services and would not significantly constrain deployment of future users in the returned spectrum nor adversely affect existing users.

3.19 This spectrum will now be available on a nationwide basis, excluding the following three areas which are licenced to Arqiva until 31 July 2026:

- a radius of 3km around Goonhilly, Cornwall with NGR SU723214;
- a radius of 2 km around Morn Hill, Hampshire with NGR SU516292; and
- a radius of 2 km around Chalfont Grove, Buckinghamshire with NGR SU983917.

3.20 Further details on accessing this spectrum are set out in at paragraph 6.25 in section 6.

Other issues raised

Easier access to spectrum for gateway across the whole 27.5 – 30 GHz band

3.21 Three respondents[17] called for Ofcom to enable easier access to the whole 27.5 – 30 GHz frequency range, particularly the portions of the band currently authorised under Spectrum Access licences.

Specifically,

a) SpaceX urged Ofcom to prohibit incumbent licensees from exerting market power by unreasonably foreclosing satellite operators from accessing licensed-but-unused (or lightly used) spectrum in the band. It stated that gateways can and do coexist with fixed links in the 28 GHz band around the world, and that operators could coordinate the two services easily.[18]

b) Telesat noted that satellite operators can access the bands but only if they establish commercial agreements with terrestrial operators, which can be costly and time consuming. It said that these agreements offer little regulatory certainty as Spectrum Access licensees can surrender their licences at any time in the future.[19]

c) Viasat said Ofcom should consider introducing gateway use in the entirety of 28 GHz band and that ECC Decision (05)01[20] outlines that coordinated FSS earth stations can still make use of the whole band, using established co-ordination procedures.

[17] Telesat International Limited p.3, SpaceX p.3 and Viasat p.6.
[18] SpaceX p.3
[19] Telesat International Limited p.4.
[20] ECC Decision (05)01 – The use of the band 27.5-29.5 GHz by the Fixed Service and uncoordinated Earth stations of the Fixed-Satellite Service (Earth-to-space).

Ofcom's response

3.22 We discuss this issue in more detail in section 4 of this document.

Other use of the returned spectrum

Satellite terminals

3.23 Five responses[21] supported allocating the returned spectrum for satellite terminals.

Specifically,

a) Amazon and Rivada Space Networks GmbH (Rivada) support enabling the use of the returned spectrum by satellite terminals and authorizing access under the existing Earth Station Network (ESN) licence process. Rivada also said that since all satellite systems rely on satellite terminals (as opposed to gateways), a more efficient result would be if the returned spectrum were made available for satellite terminals.[22]
b) Telesat considered that allocating the returned spectrum to user terminals would reduce the existing segmentation in the larger 27.5 - 30 GHz band, minimising the adverse impact on connectivity. It further said this would facilitate the provision of advanced satellite services for UK customers and encouraged Ofcom to extend authorisations to a larger range of frequencies within 27.5 – 30 GHz[23].
c) SES said opening the returned spectrum for satellite terminals would better enable satellite operators to meet the escalating demand for satellite services in the UK. It also said that from an operational perspective the coexistence of uncoordinated satellite terminals and satellite gateways within these uplink 28 GHz frequencies would foster the efficient utilization of these frequencies[24].
d) Viasat said to achieve the full benefits for citizens and consumers, the full Ka band must be opened to gateways, uncoordinated FSS terminals and ESIMs[25].

3.24 GSOA[26] said it anticipates commenting on Ofcom's future proposals regarding authorisation options for use of the returned spectrum for other users, such as satellite terminals, in due course.

ESIMs

3.25 Two responses[27] suggested authorizing Earth stations in motion (ESIMs) in either the returned spectrum or across the whole band.

a) Telesat and Viasat said the conditions provided in Annex 2 of ECC/DEC/(15)04[28] are sufficient to protect the Spectrum Access licensees and that authorising ESIMs across the whole band would promote innovation in satellite network technologies and meet customers' growing demand for satellite connectivity.

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[21] Amazon, p.4; Rivada Space Networks GmbH p.2; SES S.A p.3; Telesat International Limited p.1-4; Viasat p.3-4.
[22] Rivada Space Networks GmbH p.2
[23] Telesat International Limited (p.2)
[24] SES S.A p.4;
[25] Viasat p.3-4
[26] GSOA p.3
[27] Telesat International Limited p.1-2 and Viasat p.1-2
[28] ECC/DEC/(15)04 - The harmonised use, free circulation and exemption from individual licensing of Land, Maritime and Aeronautical Earth Stations On Mobile Platforms (ESOMPs) operating with NGSO FSS satellite systems in the frequency ranges 17.3-20.2 GHz, 27.5-29.1 GHz and 29.5-30.0 GHz.

b) Viasat also said that following the conclusion of WRC-19 Agenda item 1.5[29], Ofcom should allow operation of GSO ESIMs across the whole band nationally.[30]

Fixed wireless systems

3.26 Three respondents[31] cautioned Ofcom against re-introducing fixed services including point-to-multipoint and multipoint-to-area systems in the band.

In particular,

a) A confidential respondent said there is no demonstrated demand for fixed point-to-multipoint or multipoint area services and proposing to introduce these is unlikely to further the interests of citizens and consumers. GSOA also expressed similar sentiments while adding that including fixed services would in its view introduce unduly high barriers to ubiquitous use of the band by the Fixed Satellite Service.[32]
b) SES said they prefer restricting access to the returned frequencies by non-satellite services because coordination is more challenging and if new interests were expressed by fixed service operators, the 26 GHz band could be used instead.[33]

Ofcom's response

3.27 We address the other uses of the returned spectrum (excluding aeronautical and maritime ESIMs) in section 5 of this document. As noted in paragraph 3.12 and discussed further in paragraph 5.7, we do not consider that there is a demand case for FWA as potential future uses of the returned 28 GHz spectrum in the UK.

3.28 With regards to aeronautical and maritime ESIMs including related WRC-19 and WRC-23 outcomes[34], we plan to address access to the returned spectrum and the wider 28 GHz band for these services in a future consultation.

Access to Q/V bands for satellite services

3.29 Two respondents[35] mentioned access to the Q/V bands for either satellite gateways or satellite terminals.

Specifically,

a) Amazon supports in principle the use of the Q/V bands for satellite terminals and welcomes Ofcom's future consultations relating to the Q/V band.[36]
b) GSOA also welcomes Ofcom's plans to consult on proposals to allow satellite gateway use in the Q/V bands before March 2024.[37]

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[29] WRC-19 Agenda Item 1.5 - to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution 158 (WRC-15).
[30] Viasat p.2.
[31] GSOA p.3 and SES S.A p.4.
[32] GSOA p.3
[33] SES S.A p.4
[34] Resolution 169 and conclusion of Agenda item 1.16.
[35] Amazon p.4 and GSOA p.3
[36] Amazon p.4
[37] GSOA p.3

Ofcom's response

3.30 We have also issued a call for input alongside this publication on future satellite gateway access to the Q/V and E bands.

3.31 With regards to satellite terminals using the Q/V band, we are not aware of any satellite services planning to deploy terminals in the Q/V band in the immediate future. Furthermore, international regulations regarding satellite terminals onboard boats and planes using Q/V bands will be discussed under WRC-27 Agenda Item 1.1. We consider that it may be too early to authorise terminals using these frequencies.

4. Consultation on enabling satellite gateways across the whole 28 GHz band

Introduction

4.1 Satellite gateways are typically designed to use wideband channels that span the whole 28 GHz band. At present, only one satellite operator, Avanti, is licensed to use the whole 28 GHz band to deploy its satellite gateways. Other satellite operators rely on commercial arrangements to access portions of the band not currently available for satellite gateways; to date none has been able to secure access to the whole band.

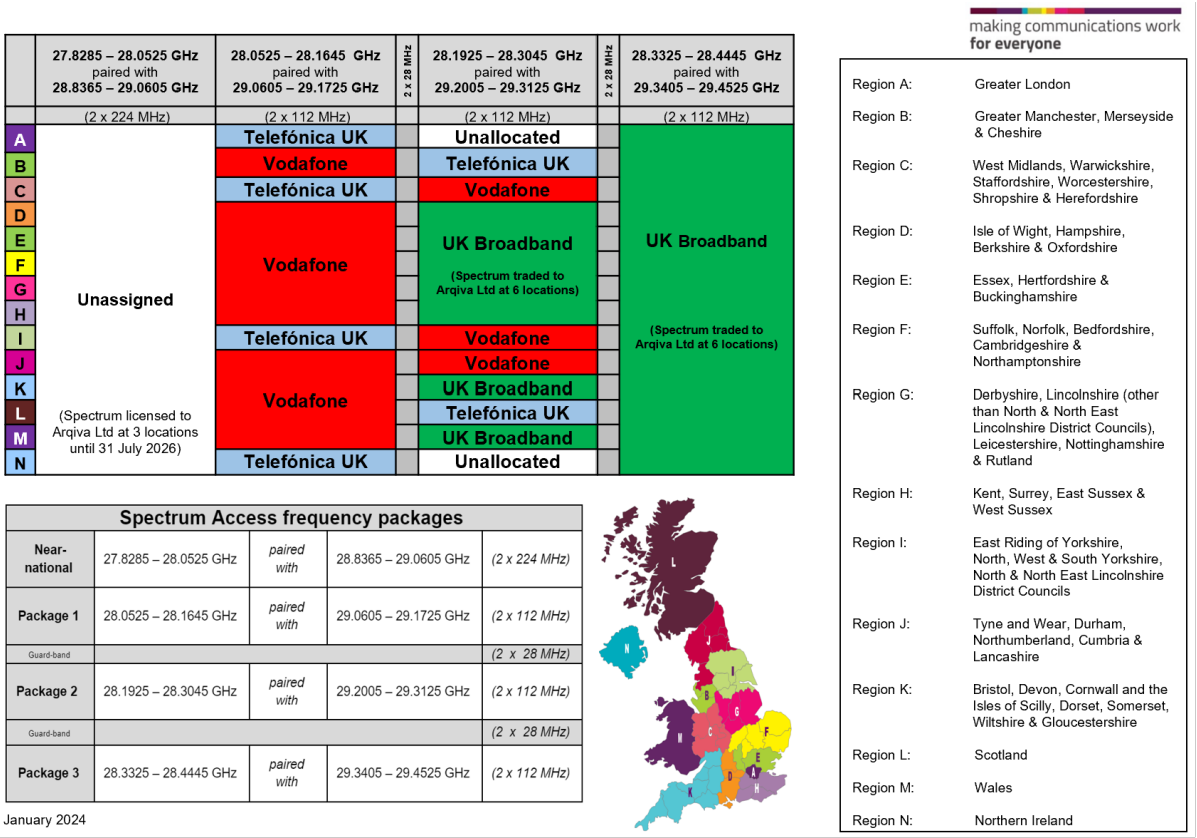
4.2 As noted in paragraph 3.23, several satellite operators have requested easier access to the whole 28 GHz band.

4.3 In this section, we consider the issues raised by stakeholders and set out consultation proposals to directly license satellite gateways in the remaining portions of the band (i.e., those not currently available for satellite gateways), where this would not materially affect existing or planned deployments by incumbent licensees.

Background to satellite access across the 28 GHz band

4.4 Spectrum Access licences in the 28 GHz band were originally awarded via auctions in 2000 and 2008. The spectrum was made available on a technology and service neutral basis but in practice, the main use is for wireless point-to-point fixed services. The current licensees in this spectrum are Arqiva, UK Broadband (owned by Three), Virgin Media O2 (VMO2) and Vodafone. The current spectrum holdings for each of these licensees is shown in Figure 4.

Figure 4: Spectrum Access licences in the 28 GHz band



4.5 In advance of the 2008 award, some satellite operators argued that they required access across the 28 GHz band and that the proposed award of spectrum would be detrimental for satellite broadband applications[38]. In the August 2007 statement, Ofcom recognised that where satellite operators "require access to the whole 28 GHz band it may be the case that neither the auction nor the secondary market will provide them with sufficient certainty that they will be able to acquire the spectrum they require."

4.6 In recognition of this, Ofcom decided to open a window for applications from satellite operators in advance of the 2008 auction to use this spectrum in specific locations. Applications were received for satellite PES use at nine locations. Some of these applications were later withdrawn, with gateways at three locations ultimately being licensed to Avanti.

4.7 Spectrum Access licensees were informed of the locations of these gateways (and the technical limits that would be applied to these gateways) and were able to plan their deployments to avoid receiving harmful interference.

Current satellite access across the 28 GHz band

4.8 Currently, satellite operators that wish to access the whole of the 28 GHz band[39] can apply for a gateway authorisation in the parts of the band open to them and approach the

[38] Paragraph 3.9, Award of available spectrum: 10 GHz, 28 GHz, 32 GHz and 40 GHz: Spectrum packaging and auction design (January 2007 discussion document)

[39] With the exception of Avanti, as highlighted in paragraph 4.6.

relevant Spectrum Access licensees for commercial arrangements to access the remaining spectrum in the areas where their gateway will operate.

4.9 In response to our August 2023 consultation and previous consultations, some satellite operators have indicated that negotiations to establish these commercial arrangements can be costly, time consuming and in some cases unsuccessful.

4.10 We are aware of commercial negotiations that have taken place between existing Spectrum Access licensees and satellite operators and that leases have been agreed in some instances. However, ✂. To date, we are not aware that any satellite operator has successfully managed to negotiate access to the whole of the 28 GHz band.

Case for regulatory intervention

4.11 As discussed in our Spectrum Strategy[40], our approach to spectrum management is guided by the general principle of relying on the use of market mechanisms to determine the use of spectrum, where possible and effective, whilst undertaking regulatory action where necessary.

4.12 A number of market mechanisms are already deployed in the 28 GHz band, including spectrum trading, leasing and, from last year, annual licence fees (ALFs) for continued use of the spectrum that was originally awarded via auction.

4.13 It remains our preference to rely on these mechanisms where possible and effective, with Spectrum Access licensees and satellite operators negotiating bilateral agreements for trading or leasing of this spectrum. In our view, there is clear potential for additional satellite gateway use in this spectrum that could be enabled under existing mechanisms and that would not significantly constrain future use for fixed links, as:

a) We anticipate a limited number of satellite gateways, and these typically operate in rural locations with relatively small coordination areas required to coexist with other spectrum users.
b) Current fixed link usage (and trends of usage), whilst varying by licensee, indicate that there is an opportunity for greater shared use of this spectrum with satellite gateways.

4.14 We consider that greater sharing would support optimal use of this spectrum. However, we currently have mixed evidence on the success of the secondary market in the specific circumstances of the 28 GHz band in the UK. Whilst the successful leases that have taken place show that this process can work in some cases, we are concerned by satellite operator reports that they have been unable to gain access to the whole of the 28 GHz band despite efforts over a prolonged period of time to achieve this.

4.15 We consider that there are likely to be a number of reasons why, under the current approach, it is challenging for satellite operators to secure access to the whole of the 28 GHz band in a timely manner and on reasonable terms:

a) Due to the current mix of national and regional licences held in this band, operators must simultaneously negotiate with two or three licensees for each gateway location[41] which creates additional cost, time and complexity.

[40] See par. 2.15-2.20, Statement: Supporting the UK's wireless future, July 2021
[41] Or three to four licensees prior to Arqiva's return of its 28 GHz spectrum.

b) Each Spectrum Access licence holder may have differing commercial priorities and approaches to leasing spectrum.
c) Satellite operators are generally interested in gaining access to spectrum in relatively small discrete geographic areas, whereas Spectrum Access licence holders hold spectrum on a regional or national basis.
d) The above context creates opportunities for "hold up" that impact the availability of spectrum and certainty for investment in satellite services in the UK.
e) Stakeholder feedback is that the fees sought for access to this spectrum are high.

4.16 In the August 2007 statement, Ofcom took specific regulatory action as a result of our conclusion that where satellite operators "require access to the whole 28 GHz band it may be the case that neither the auction nor the secondary market will provide them with sufficient certainty that they will be able to acquire the spectrum they require."

4.17 As highlighted in paragraph 4.6, at that time Ofcom allowed satellite applicants to apply for access across the band prior to auction of spectrum access licences. Of the nine sites applied for, three of those sites have now been taken up and are in use by GSO gateways. The action in 2007 reflected Ofcom's view on the shared use of the band for satellite gateways and the need for easy access to the band by satellite operators.

4.18 Since the 2008 award, there has been substantial change in the UK satellite connectivity market, most notably recently with the deployment of new NGSO systems. Satellite operators who have entered the market since 2008 (or wish to increase their use of 28 GHz gateways) have not had the opportunity to benefit from the easier access to spectrum across the band that was offered to gateways in advance of the award.

4.19 The evidence that we have observed to date suggests that the secondary market has not provided satellite operators with sufficient certainty that they will be able to acquire the spectrum they require for satellite gateways across the 28 GHz band. This also limits the ability of satellite operators to offer improved satellite services for consumers and citizens (increased availability and speed of services).

Our proposed approach

4.20 In view of the above and our duty to secure optimal use of the spectrum, we are consulting on introducing a process for Ofcom to directly license satellite gateways to access 28 GHz spectrum that is currently authorised on a national or regional basis to Spectrum Access licensees, subject to consultation processes to avoid material impacts on incumbent licensees.

4.21 Under this proposal, satellite operators would not need to rely on commercial negotiations to gain access to this spectrum.

4.22 As set out in previous Ofcom documents [42], Spectrum Access licences issued by Ofcom do not guarantee exclusive use of the spectrum to the licensee. We have discretion to authorise use of these or any other frequencies, for any purpose, in line with our statutory duties, whether through licensing or licence exemption.

4.23 We are consulting on this proposal and remain open to pursuing a different approach if we receive evidence that it is possible and more effective to rely on existing market mechanisms

[42] See for example paragraph 5.67 of our July 2012 800 MHz/2.6 GHz award statement

in the specific circumstances of the 28 GHz band than is indicated by our current understanding, both for satellite operators that have an immediate demand for wider 28 GHz band access and for those who may require access in the future.

We are consulting on enabling satellite operators to apply directly to Ofcom to access Spectrum Access licence frequencies

4.24 Under this approach, satellite operators could apply to Ofcom to access 28 GHz spectrum that is currently authorised on a national or regional basis to Spectrum Access licensees, including the three geographic Spectrum Access licences held by Arqiva until 31 July 2026, using the existing PES or NGSO licence application process on an ongoing basis.

4.25 Upon receiving an application, Ofcom would coordinate with existing Spectrum Access licensees who would have an opportunity to raise objections if they thought that the proposed gateway could interfere with its existing or planned deployments. Where no material impact on the incumbent Spectrum Access licensees was identified (or where the impact could be mitigated), the gateway application would be licensed by Ofcom. We detail the proposed process in paragraphs 4.32-4.35 below.

4.26 This approach would enable the same regulatory framework to be applied for satellite gateways across the whole 28 GHz band, in contrast to the current approach where satellite operators are subject to standard PES or NGSO licence conditions in the satellite parts of the band and Spectrum Access licence conditions in leased spectrum.

4.27 We recognise that this proposed approach could result in some reduction in flexibility of future deployment for Spectrum Access licensees in the areas around gateways. We consider that these impacts on Spectrum Access licensees are likely to be limited, given that we expect there to be a limited number of gateways, located in rural areas where the density of fixed links deployments is generally low, with relatively small coordination areas required to coexist with other spectrum users.

4.28 Similar to the current approach of negotiations with satellite companies, the proposal would involve some costs associated with checking that new proposed gateways would not affect their existing or planned deployments. However, other administrative costs associated with bilateral commercial negotiations would be avoided. Whilst licensees may lose out on leasing revenue, overall, we consider the impact of our proposals on licensees to be proportionate given the value of the satellite services and investment that could be enabled.

4.29 We have considered alternative options including consulting on various approaches that would designate a specific number of coordinated and ‘approved’ gateway locations, where satellite operators could operate across the 28 GHz band including Spectrum Access licence frequencies, with localised constraints on fixed links to enable gateway operations. In principle, these types of option could offer practical and cost benefits. For example, it could lower administrative costs involved in reviewing and coordinating applications for new gateway locations on an ongoing basis. However, this approach would be less flexible and responsive to different satellite operator business models and market developments; it would also require exercise of regulatory judgement as to where the pre-coordinated locations should be, the appropriate size of the gateway zones and how many will be required, and carries greater risk of inefficient use of spectrum.

4.30 On balance, we consider that our proposed approach offers the greatest likelihood of optimal spectrum use, by enabling gateways to access portions of the band not currently available for satellite gateways in a flexible manner, coordinating with Spectrum Access licensees to ensure there is no material impact on their existing or planned deployments based on actual gateway use.

Unallocated 28 GHz spectrum blocks in London and Northern Ireland

4.31 We are also proposing to allow applications under this proposed approach for satellite gateway access to the currently unallocated spectrum blocks in the Northern Ireland and London regions at 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz.

Implementing the proposal: extending the existing gateway licensing process

4.32 Under our proposed approach, we would expect to apply the following process:

a) For applications for NGSO gateways at new sites:

i) Under current NGSO licensing arrangements, Ofcom publishes and invites comments on applications that it is considering authorising.[43] Interested parties have 20 working days within which to provide comments.

ii) For applications which include requests for access to spectrum authorised under Spectrum Access licences, Spectrum Access licensees could provide comments where they consider that the proposed gateway might affect existing or planned deployments. We propose that we would only take account of comments in respect of fixed links that the licensee plans to deploy in the following 12 months (counting from the date when the applicable gateway consultation is issued), and we would expect the licensee to provide credible evidence to support these plans.

iii) If existing or planned fixed link deployments would not be materially affected, Ofcom would issue a new licence to the satellite operator to authorise use of the spectrum. We would inform affected parties and the licence would be published on Ofcom's website.

iv) If deployments were identified as materially affected and Ofcom considered that the objection raised was reasonable, satellite operators would need to demonstrate how they would avoid affecting these deployments. This might include reaching a commercial agreement with Spectrum Access licensees (as currently) to reflect any mitigation costs, and Ofcom would issue a licence once this agreement was in place.

b) For applications for PES (GSO) gateways at new sites and variations to existing gateways (both NGSO and PES): Ofcom would send details of the application to Spectrum Access licensees directly. Licensees would have 20 working days to provide comments. (The subsequent process would follow that outlined above for new NGSO sites).

4.33 Spectrum Access licences allow licensees to make deployments without notification to Ofcom, and deployments under these licences are not in the public domain. Ideally this information would be made publicly available as it could enable satellite operators to plan their gateways to avoid affecting existing fixed link deployments and streamline the coordination process. However, we recognise that Spectrum Access licensees may have valid concerns around confidentiality of this information. We welcome any suggestions from Spectrum Access licensees on how to make information available in a way that would address confidentiality concerns.

[43] Apply for a non-geostationary satellite earth station licence (FSS)

4.34 We recognise that our proposal to allow Spectrum Access licensees to raise objections on the basis of planned deployments (in addition to existing deployments) may raise concerns that this could be used as a way to refuse new gateway spectrum access requests without due consideration. We note that similar concerns were raised in response to our 2018 local licensing consultation.

4.35 We expect all parties to act reasonably and constructively when participating in this process. If we have concerns that this is not the case, we would need to reconsider this part of the process and consider whether further regulatory intervention might be required.

Fee considerations

4.36 We propose that existing PES and NGSO licence fees would apply for any new gateways licensed in the 672 MHz of spectrum that is not currently available for satellite gateways. As noted in paragraph 3.16, we plan to consider the introduction of AIP licence fees for NGSO earth stations when we next review the pricing of our satellite earth station licences.

4.37 We recognise that existing Spectrum Access licensees currently pay annual licence fees (ALFs) and that our proposal will result in some reduction in deployment flexibility for these licensees. We have considered whether to apply a discount to the fees that apply to these licences, should we decide to proceed with this proposal. Our current view is that we expect that the areas that could restrict fixed link deployments as a consequence of new gateways are likely to be small. Accordingly, were we to adjust the ALFs to take account of this any discount would be likely to be very small. We are therefore proposing that the most straightforward approach would be to maintain existing fee rates for 28 GHz Spectrum Access Licences, rather than adjust the existing ALFs in light of any gateways.

Question 1: Do you agree with our analysis of the case for regulatory intervention and our proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways? If not, please provide reasons/evidence for your response.

Question 2: If we decide to proceed with this proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways, do you agree with our proposal not to adjust Spectrum Access licence fees to reflect locations where we authorise future satellite gateways? If not, please provide reasons/evidence for your response.

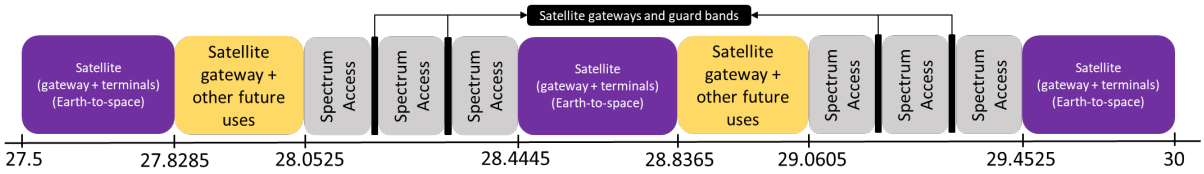
Question 3: Do you have any further views / comments on our proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways?

5. Consultation on enabling further use of the returned 28 GHz spectrum on a shared basis

Introduction

5.1 In section 3, we outlined our decision to enable satellite gateway use in the returned spectrum (orange blocks in Figure 5) and the four 28 MHz guard bands (black bars), under the existing PES and NGSO licence framework and fees. The updated band plan following this decision is shown in Figure 5.

Figure 5 showing the updated 28 GHz band plan in the UK



5.2 In our decision, we said that we anticipate a limited number of satellite gateways, and that these typically operate in rural locations and therefore would not significantly constrain deployment of future users in the returned spectrum.

5.3 In this section, we set out our consultation proposals to make the returned spectrum (27.8285-28.0525 MHz and 28.8365-29.0605 MHz, orange blocks in Figure 5) available for other uses as follows:

- 112 MHz at 28.8365 – 28.9485 GHz for land-based satellite terminal use under existing authorisation of these users; and
- 2 x 112 MHz at 27.9405 – 28.0525 GHz paired with 28.9485 – 29.0605 GHz for point-to-point fixed links authorised as Ofcom managed spectrum, licensed on a first-come-first-served basis.

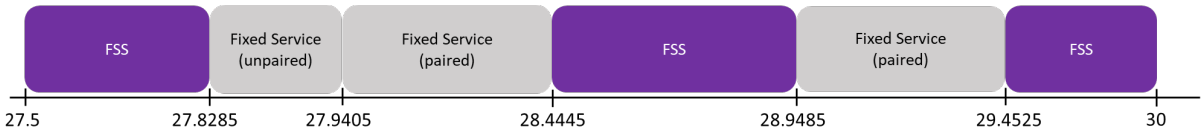
5.4 We are also seeking views on demand for use of the spectrum at 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz for point-to-point fixed links in Northern Ireland and London, as these blocks are currently unallocated in these regions, noting that in section 4 we propose to directly authorise gateways in these regional blocks of spectrum.

Potential other users

5.5 In Europe, the 28 GHz (27.5 – 30 GHz) band is allocated to the Fixed-Satellite (FSS) (Earth-to-space) and Fixed Service (FS) as specified in CEPT Decision ECC/DEC/(05)01 (see Figure 6). As indicated in paragraph 2.1, in the UK, the 28 GHz band is allocated on a co-primary basis to Fixed, Mobile and Fixed-Satellite (Earth-to-space) (FSS) and is currently used for point-to-

point fixed links and satellite uses. The current UK band plan differs from the CEPT band plan in that, in CEPT, there is an additional 112 MHz of spectrum at 28.8365 - 28.9485 GHz allocated for uncoordinated FSS user terminals.

Figure 6 showing the CEPT 28 GHz band plan



5.6 In the UK, we consider that satellite user terminals and point-to-point fixed links are the most likely potential future uses of the returned spectrum alongside satellite gateways.

5.7 The 28 GHz band has been made available for 5G in some other regions (outside Europe) with 5G equipment that can support mobile and FWA use available primarily in frequencies below 28.35 GHz. However, as noted in paragraph 3.12, in May 2023 we decided to make over 6 GHz of mmWave spectrum across the 26 GHz and 40 GHz bands available in the UK for mobile technology, including 5G and deployment of 5G FWA. This aligns with European harmonisation adopting the 26 GHz band as pioneer band for 5G in Europe. In light of this, we do not consider that there is a significant additional demand case for mobile or FWA as potential future uses of the returned 28 GHz spectrum in the UK.

We will consult separately on authorising aeronautical and maritime mobile ESIM use of the 28 GHz band

5.8 We recognise that there is satellite operator interest in operating aeronautical and maritime ESIMs across the 28 GHz band. In this consultation with respect to satellite terminals we are only considering further access to 28 GHz spectrum for land based (fixed and ESIMs) satellite terminals. As noted in paragraph 3.28, we plan to consider spectrum access for aeronautical and maritime mobile ESIMs across the whole 28 GHz band separately in a future consultation, including related WRC-19 and WRC-23 outcomes.[44]

Potential approaches to making returned spectrum available

5.9 We have considered a few approaches to making the returned spectrum available for land-based satellite user terminals, and/or point-to-point fixed links.

Approach 1: Auctioning the spectrum to determine optimal use

5.10 We have considered reauctioning the spectrum on a technology and service neutral basis in line with our previous approach to awarding spectrum in the band. As discussed in paragraphs 5.18-5.24 below, overall, we consider that evidence of future demand for fixed links remains somewhat mixed. On the other hand, we note interest to use the returned spectrum for satellite user terminals and the growth in terminal deployments globally and in

[44] Article 21 of the ITU Radio Regulations set out conditions for how satellite operators should protect fixed links and Resolution 169 sets out technical conditions for aeronautical and maritime ESIMS operating in 28 GHz.

the UK. Our initial view is that an auction may not secure optimal use of the spectrum given these competing demands.

5.11 This is because, while an auction could determine the highest value user among bidders who wanted to use the spectrum for fixed links, it might not determine the highest value use overall. Auctions are typically suitable for awarding use of spectrum within a frequency range (subject to the rights defined in the licence) across a geographical area on an uncoordinated (with other users) basis and where there is a clear excess demand. However, satellite networks using 28 GHz can share the frequency band through well-established coordination rules. While an auction could allow one or more satellite operators to acquire spectrum for user terminals, it would limit the number of operators who could use the band for this purpose compared to what is technically feasible.

5.12 While in principle it could be possible to allow a consortium bid from satellite operators for the spectrum, in practice this may not be effective in allowing satellite operators to express their true (collective) valuation for the spectrum and it could block entry by new satellite providers. For example, satellite operators are continuing to enter the market and auctioning may limit new operators from entering. It is also possible that satellite demand for the spectrum will continue to grow in the future as the cost to develop and launch satellites continues to fall. In addition, individual satellite operators could have an incentive to understate their valuation and "free ride" on other members of the consortium, increasing the challenges to arranging an effective consortium.[45]

Approach 2: Ofcom coordinating use of the band to enable sharing between satellite terminals and point-to-point fixed links

5.13 As set out in our Spectrum Management Strategy (2021), our preferred approach when authorising spectrum is to facilitate sharing where possible.

5.14 ECC/DEC(05)01 concluded that interference levels between fixed service receivers and uncoordinated transmitting FSS terminals are regarded as unacceptable on a co-frequency basis in the same densely populated geographical area. Point-to-point fixed links could therefore suffer harmful interference when operating on an uncoordinated basis with FSS terminals.

5.15 Sharing would be possible through a coordinated use. However, it's unlikely to be practical to coordinate the two services, given the expected use cases for land-based satellite user terminals which include consumer satellite broadband as well as on moving platforms such as trains. Therefore, our initial view is it is not likely to be feasible for satellite terminals and point-to-point fixed links to share frequencies in this band.

Approach 3: Allocating some or all of the returned spectrum to either point-to-point fixed links or land-based satellite terminal use

[45] We understand that consortium bidding could be useful in some cases, but do not think it would be effective in this case for the reasons mentioned.

5.16 In light of the above, our initial view is that the alternative use of the returned spectrum would be an allocation decision for **either** point-to-point fixed links or land-based satellite terminal use. Both of these allocations could coexist and be coordinated with satellite gateway use. Using this approach, we would allocate part of the returned spectrum (defined by a frequency range) for one use, and some or all of the remainder for the other use.

5.17 If we were to allocate some or all of the spectrum for point-to-point fixed links, in principle, we would have the option of either awarding block-assigned licences through an auction or making the spectrum available on a first-come-first-served basis (Ofcom-coordinated approach).

Demand for additional 28 GHz spectrum

Fixed wireless point-to-point links

5.18 Currently, the 672 MHz of spectrum in the 28 GHz band authorised under Spectrum Access licences is mainly used for point-to-point fixed links to provide backhaul services for MNOs.

5.19 In our Annual Licence Fee Statement (2023), we concluded that fixed wireless links remained the highest value use for 28 GHz spectrum. However, we recognised that future demand for fixed wireless links in this band was somewhat mixed.

Review of the use of fixed wireless links and spectrum implications

5.20 In our recent Call For Input (CFI), "Review of the use of fixed wireless links and spectrum implications", published in October 2023, we set out information on the current usage and trends in spectrum use for fixed links, and sought input from stakeholders. We asked fixed link users to provide information on their planned use to help us better understand how usage may change over the next 5-10 years.

5.21 Overall, we observed that the number of fixed links in use is declining over time. This was mainly driven by a decline in the number of links deployed by mobile network operators (MNOs). When we looked at other sectors use of fixed links (by excluding MNO links from the analysis), we observed that the number of links in use had increased by 24%.

5.22 In their responses, MNOs said they have fibre-first strategies and that, overall, we can expect to see a continued decline in the total number of their fixed links, as fibre is used more widely throughout their networks, especially in urban areas. However, this will be offset by a continued increase in bandwidth of the links they continue to use (and deploy)[46].

5.23 The number of links in the 28 GHz band bucked the overall trend, with a 25% increase between 2016 and 2023. However, this increase came from a relatively low base; in 2016, the 28 GHz band had the lowest number of deployments of all bands in the 18-40 GHz range. Despite the increased number of deployments since 2016, usage of the band remains limited across many geographical areas and the increased usage reflects the incentive to use block-assigned bands when feasible. Only one of the current 28 GHz spectrum access licensees

[46] Fixed links using channel bandwidths of: 28 MHz or less decreased by 58%, 29-112 MHz increased by 73% and greater than 112 MHz increased by 105%.

responded to the CFI with information on its plans for using the band; Virgin Media O2 said it expects to increase use of its licensed 28 GHz block, where applicable[47].

Our initial assessment: the extent of potential citizen and consumer benefits likely to be realised from additional 28 GHz spectrum for fixed links is unclear

5.24 We consider that this spectrum would continue to be of interest to users of fixed links. For example, some fixed links operators who have been required to vacate the 26 GHz band may be interested in this spectrum. However, overall we consider that evidence of future demand for fixed links remains somewhat mixed. Accordingly, we are seeking further stakeholder evidence and views on this.

Satellite user terminals

Satellite operators' view on future spectrum requirement

5.25 As outlined in paragraph 3.23, five satellite operators (Amazon, Rivada, SES, Telesat, Viasat) asked for this spectrum to be opened for satellite terminals in response to the August 2023 consultation[48], saying it would create more contiguous satellite spectrum which would lead to more efficient use, and facilitate the provision of advanced satellite services for UK citizens and consumers.

5.26 Amazon, Avanti and Viasat responded to the Arqiva variation in March 2023, requesting we extend existing ESN and gateway licences in the returned spectrum. Avanti said that there was higher demand for satellite services than for fixed wireless access; Amazon said that satellite terminals as well as gateways should be given access to these frequencies and all three emphasised the benefits of contiguous spectrum for satellite services.

5.27 As set out in recent NGSO applications, the current use cases for NGSO FSS land user terminals include backhaul for MNOs, enterprise and residential broadband, solutions for government and defence and disaster relief.[49] These are similar to known use cases for GSO FSS services[50].

Spectrum available for satellite user terminals and current authorisation

5.28 Satellite terminals are currently authorised in two uplink frequency bands in the UK: 14 GHz and 28 GHz. Under the ESN licence, 500 MHz is available in the 14 GHz band (14.0 – 14.5 GHz) and 1238 MHz spectrum is available in 28 GHz band. GSO land-based terminals are currently licence exempt and operate under the conditions set out in IR 2066.

5.29 The ESN licence permits any number of GSO and NGSO satellite terminals to be deployed by the operator and covers use of land, maritime and aeronautical terminals. Each licence lists the satellite (or satellite constellation) to which its terminals will operate.

5.30 Tables 2 and 3 show the two main frequency bands currently used by satellite operators to deploy satellite terminals. Note that some parts of the downlink spectrum in both bands are shared with fixed links services.

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[47] Vodafone did not comment specifically on its plans in the 28 GHz band and UK Broadband (Three) did not respond to our CFI.

[48] Amazon, p.4; Rivada Space Networks GmbH p.2; SES S.A p.3; Telesat International Limited p.1-4; Viasat p.3-4.

[49] See 'Applications received for NGSO network earth station licences'.

[50] Avanti, Eutelsat/OneWeb see section on markets; Telesat see *connectivity solutions*; SES see *find a service*; Viasat;

Table 2 showing the 14 GHz satellite uplink and the paired 12 GHz downlink band in the UK

Transmit direction	Frequency range (GHz)	Bandwidth (MHz)	Total unshared spectrum (MHz)
Uplink (Earth-to-space)	14 – 14.5	500	500
FSS Downlink (space-to-Earth) shared with FS	10.7 – 11.7	1000[51]	1250
FSS Downlink (space-to-Earth)	12.5- 12.75	250	Very few links remaining in 10.7-11.7GHz[52]

Table 3 shows the 28 GHz satellite uplink and the paired 18 GHz downlink bands in the UK

Transmit direction	Frequency ranges (GHz)	Bandwidth (MHz)	Total unshared Spectrum (MHz)
Uplink (Earth-to-space)	27.5 – 27.8185 28.4545 – 28.8365 29.4625 – 30	1238	1238
FSS Downlink (space-to-Earth)	17.3 – 17.7	500	900
FSS Downlink (space-to-Earth) shared with FS	17.7 – 19.7	2000	
FSS Downlink (space-to-Earth)	19.7 - 20.2	400	

Our initial assessment: there are potential citizen and consumer benefits from additional 28 GHz spectrum for satellite land terminals however the extent of usability is uncertain

5.31 An increasing number of satellite operators are planning to deploy in the 28 GHz band, and are interested in accessing additional uplink spectrum in the returned spectrum for satellite terminals.

5.32 As shown in Table 3, there is currently 1238 MHz available in the UK for FSS uplink in the 28 GHz spectrum; while 2.9 GHz of spectrum is potentially available for FSS downlink (between 17.3 - 20.2 GHz). However, in practice we understand that the amount of usable downlink spectrum may be constrained. This is because the paired downlink frequency band 17.7-19.7 GHz is shared with point-to-point fixed links and there are over 3600 active fixed links deployed across the UK in this band.

5.33 Our understanding is that, to provide predictable quality of service, satellite operators are more likely to deploy terminals in spectrum not shared with fixed services, especially in the downlink direction to avoid harmful interference from fixed services. Therefore, satellite operators who try to downlink to land terminals in those frequencies which are shared with fixed services may suffer harmful interference or operate at reduced capacity, especially when operating in the vicinity of densely deployed fixed links.

5.34 In addition, our understanding is that some satellite operators will only operate terminals in parts of the band 28 GHz. That is, some will only operate in frequencies above 28.35 GHz[53]

[51] Shared with fixed links.
[52] The band is now closed to fixed links with only 9 links located in Scotland still in operation.
[53] In some regions, spectrum below 28.35 GHz has been made available for 5G.

or 29.5 GHz[54] which are available for satellite services in most countries. Noting this and recognising potential constraints in the downlink spectrum, it is difficult to assess how much additional 28 GHz uplink spectrum for satellite land terminals will be required.

5.35 However, we recognise the potential benefits and importance of making harmonised spectrum available for satellite services. As indicated in Figure 6, there is an additional 112 MHz of spectrum available for satellite terminals at 28.8365 – 28.9485 GHz in CEPT countries that is not currently available in the UK; band plan harmonisation could deliver benefits for the price and availability of satellite services in the UK. We have taken this into consideration in our assessment of the options that follow.

Allocation and authorisation options

Allocation options

5.36 We have considered different options for the use of the remaining frequencies noting:

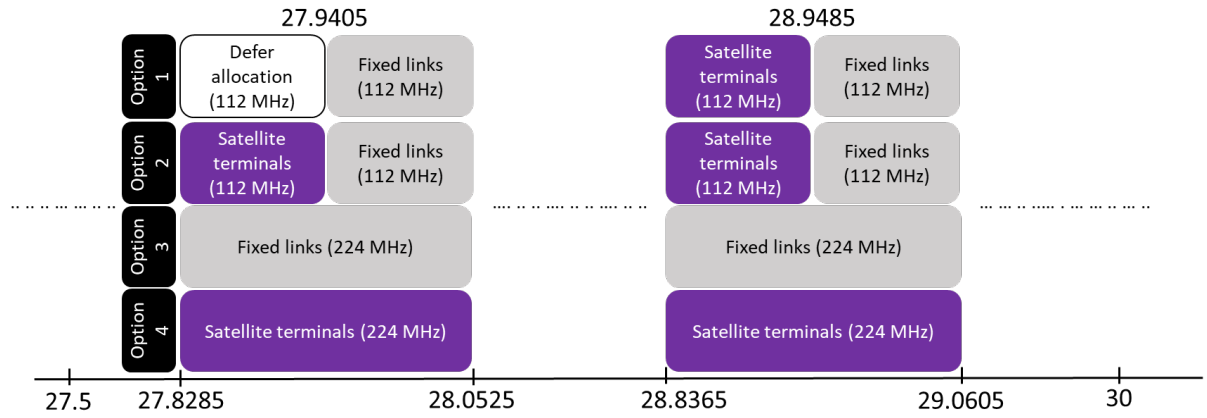
a) Our duty to secure optimal use of the spectrum,
b) Our view that this spectrum would continue to be of interest to users of fixed links,
c) That most fixed links in this band operate in frequency division duplex (FDD) mode and therefore need different frequencies (paired bands) to transmit and receive traffic,
d) There appears to be demand for more satellite spectrum for terminals but questions about the usefulness of different quantities of additional 28 GHz capacity due to 18 GHz downlink constraints, and
e) That CEPT band plan has 112 MHz more spectrum available (28.8365 – 28.9485 GHz) than in the UK for satellite terminals and harmonisation of band plan could realise benefits for the price and availability of satellite services in the UK.

5.37 In principle, we consider that future allocation could consist of the following options (shown in Figure 7):

- **Option 1** would open 112 MHz for satellite land-based terminals, 2 x 112 MHz for point-to-point fixed links and defer allocation of the remaining 112 MHz until we better understand the demand for additional 28 GHz spectrum from alternative applications;
- **Option 2** would split the spectrum equally between land-based satellite terminals and point-to-point fixed links, which would mean 2 x 112 MHz of spectrum for land-based satellite terminals and 2 x 112 MHz for fixed links;
- **Option 3** would open the entire 2 x 224 MHz of spectrum for point-to-point fixed links; and
- **Option 4** would open the entire 2 x 224 MHz of spectrum for satellite land-based terminals.

[54] Frequencies above 29.5-30 GHz are harmonised in all regions for high-density applications in the fixed-satellite service.

Figure 7 showing the possible options for allocating the returned 28 GHz spectrum for satellite land terminals and or point-to-point fixed links



5.38 In opening some or all of the band for point-to-point fixed links, we could either award block-assigned licences through an auction or license the spectrum on a first-come-first-served basis (Ofcom-coordinated approach). As discussed in paragraph 5.48b) we are minded to license spectrum made available for fixed links on a first-come-first-served basis.

Allocation options assessment

Option 1 - 112 MHz for land-based satellite terminals, 2 x 112 MHz for fixed links, defer decision on 112 MHz

5.39 Option 1 would make available further spectrum to meet potential demand from both fixed link and satellite users. It would also align with the amount of spectrum harmonised in CEPT for use by fixed services and uncoordinated FSS earth stations. Whilst we note the uncertainty on potential usability of additional uplink spectrum, this approach would also mean that over 1 GHz of spectrum would be available for FSS above 28.35 GHz, enabling satellite operators who plan to operate satellite terminals in this range to increase their capacity. It would also allow them to make greater use of the same satellite terminal equipment across the UK as they do in other major markets such as CEPT and the USA (which has made spectrum below 28.35 GHz available for 5G), which could realise benefits for the price and availability of satellite services in the UK.

5.40 Under this option, we would defer the allocation decision for 27.8285 – 27.9405 GHz (the bottom half of the lower returned spectrum) which is harmonised in CEPT for fixed service (unpaired). We are not aware of point-to-point fixed links being used in an unpaired configuration (TDD) nor demand for such use. As noted in paragraph 5.7, we consider that FWA which operates under TDD can be deployed in the mmWave spectrum that we are making available. While our preference is not to leave spectrum unused where possible, the benefit of this option would be that we could decide on allocation when we have greater clarity on its most appropriate use.

Option 2- 2 x 112 MHz for land-based satellite terminals, 2 x 112 MHz for fixed links

5.41 Like Option 1, Option 2 offers a balance between satellite and fixed link demands and would make an additional 224 MHz of spectrum available for satellite services, including a further 112 MHz beyond the amount of spectrum currently available in Europe. However, as noted in paragraph 5.34, our current understanding is that some satellite operators are only

deploying in spectrum above 28.35 GHz so it is not clear that making available this additional 112 MHz at 27.8285 – 27.9405 GHz would deliver incremental benefits in practice.

Option 3- Fixed links only

5.42 Option 3 would effectively retain the returned spectrum for use by fixed links, except that we would propose making it available on a first-come-first served basis (rather than the existing block-assigned approach). As noted above, we consider that this spectrum is likely to be of interest to users of fixed links, such as fixed links operators who have been required to vacate the 26 GHz band.

5.43 On the other hand, as noted in our 2023 decision on Annual Licence Fees for 10 GHz, 28 GHz and 32 GHz licences, there is uncertainty about how demand for fixed links will evolve in the future, and MNOs have told us that they are adopting a fibre-first strategy. It is not clear that there is a strong case for making all of the returned spectrum available for fixed links, particularly in light of the demand for this spectrum which satellite operators have expressed. Furthermore, there are other frequency bands that could be used for point-to-point fixed links if there is a need for more spectrum in the future.

Option 4 – Land-based satellite terminals only

5.44 We consider this option could support the growing satellite industry in the UK by making a significant amount of spectrum for satellite user terminals. It would also create larger blocks of contiguous spectrum, which operators have said is important for efficient use and to facilitate the provision of advanced satellite services for UK citizens and consumers. That is, it would improve the flexibility in frequency use between satellite gateway and user terminals.

5.45 It would also mean more spectrum is made available for satellite terminals in the UK than in any other region and although operators have expressed interest in using it for satellite terminals, the full amount (2 x 224 MHz) may not be usable for the reasons outlined in paragraph 5.32. It is therefore not clear that making available this 2 x 224 MHz of additional spectrum would deliver significant additional benefits in practice compared with option 1.

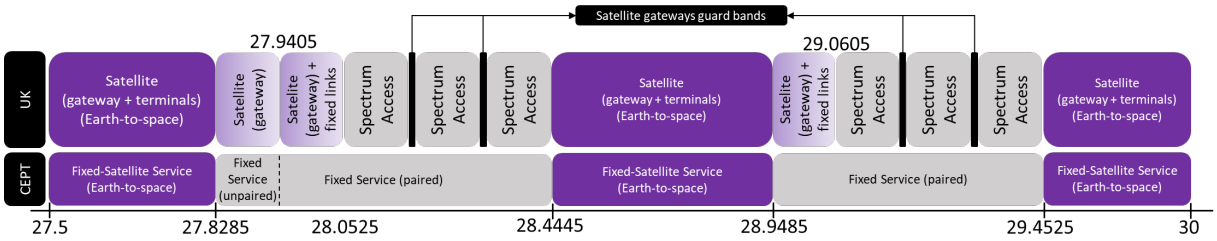
Our initial view

Proposed allocation option

5.46 As set out above, we currently hold mixed evidence on the likely potential benefits of making additional 28 GHz spectrum available for satellite land terminals or fixed links. Notwithstanding, subject to the information provided in consultation responses, our current preferred approach is Option 1 which would make 112 MHz at 28.8365 – 28.9485 GHz available for land-based satellite terminal use, 2 x 112 MHz for point-to-point fixed links at 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz and defer allocating the remaining 112 MHz of spectrum. This provides the opportunity to further assess optimal use for other services that could in the future deliver benefits for UK citizens and consumers.

5.47 If we decide to adopt this option following consideration of the responses to the consultation, our initial view is that a 10 MHz guard band would be needed between the satellite terminal and fixed links allocations to protect fixed links receivers from harmful interference, as noted in ECC/DEC(05)01. This would mean the amount of additional spectrum that would be available in practice for satellite terminals would likely be 102 MHz (28.8365-28.9385 MHz).

Figure 8 showing the updated 28 GHz band plan if Option 1 is adopted and CEPT band plan



Proposed authorisation

5.48 Should we decide to proceed with making the returned spectrum available for satellite terminals and/or fixed links we would propose to authorise this use as follows:

a) For satellite user terminals, we propose to authorise this under the existing authorisation approach for this use in the satellite portion of the 28 GHz band. Specifically, we propose to authorise NGSO land-based satellite terminals under our existing ESN licence framework and fees and GSO land-based satellite terminals would be licence exempt and operate under the conditions set out in IR 2066. This would provide a consistent regulatory framework for satellite terminals use in the 28 GHz band.

b) For point-to-point fixed links, we are minded to authorise this as Ofcom managed spectrum and license on a first-come-first-served basis as we consider that it would enable a wider range of fixed link users to access the spectrum and is more likely to achieve efficient use than the spectrum being auctioned. We would expect to manage these in the same way we do existing fixed links in other Ofcom-coordinated bands[55], and coordinate the links with future gateways in line with existing coordination procedures. We would also apply the same fee algorithm to this band as we do for other Ofcom managed bands in which we authorise fixed links.

Other issues

Unallocated 28 GHz spectrum blocks in London and Northern Ireland

5.49 As outlined in Figure 4, spectrum in the frequency ranges 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz are currently unallocated in Northern Ireland and London. In section 4 we propose to allow applications for gateway access to the currently unallocated spectrum blocks in the Northern Ireland and London regions.

5.50 We are also seeking views on what additional use may be possible for these frequencies in these regions. Given that the spectrum is not currently internationally harmonised for satellite terminals, we consider the most likely potential future use to be point-to-point fixed links and seek views on demand for fixed use in these regions. As with other fixed link allocations discussed in this consultation, if we were to decide to make this spectrum

[55] Ofw446: Technical Frequency Assignment Criteria for Fixed point-to-point Radio Services with Digital Modulation

available for fixed links, we would propose to treat these blocks as Ofcom managed and license on a first-come-first-served basis in those areas.

Question 4: Have we correctly identified the possible uses of the returned spectrum? If not, what other potential uses should we consider?

Question 5: As a satellite operator, are you currently constrained by the amount of spectrum available in the 28 GHz uplink and 18 GHz downlink to provide your planned and or existing satellite services to UK consumers and citizens? If so, please explain what constraints exist in each band.

Question 6: Do you agree with our initial view that alternative use of the returned spectrum would be an allocation decision for **either** point-to-point fixed links or land-based satellite terminal use because it is unlikely both services can share and auctioning the spectrum is unlikely to secure optimal use? If not, please provide evidence to support your response.

Question 7: Do you agree with our proposal to make 112 MHz at 28.8365 – 28.9485 GHz available for land-based satellite terminal use, 2 x 112 MHz for point-to-point fixed links at 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz and defer allocating the remaining 112 MHz of spectrum? If not, what alternative suggestions do you have?

Question 8: Do you agree with our assessment of how the returned spectrum may be authorised for fixed links and GSO and NGSO land-based satellite terminals? If not, please provide evidence to support your response.

Question 9: Do you have a view on demand for point-to-point fixed links in Northern Ireland and London in the frequency range 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz and our proposed approach that, if we were to decide to make this spectrum available for fixed links, would be to authorise this as Ofcom managed spectrum licensed on a first come first served basis?

Question 10: Do you have further views / comments that you wish to make in respect of this consultation?

6. Impact assessments and next steps

Impact assessment

6.1 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.

6.2 More generally, impact assessments form part of good policy making 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 decisions 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.

6.3 The relevant duties in relation to the proposal on which we are consulting are set out in paragraph 2.21.

6.4 Taking our decision and proposals in the round, we consider that they will support the development of satellite services in the UK, by making it easier for satellite operators to deploy and maximise the efficiency of gateways in the UK, and by providing them with access to additional spectrum for use by user terminals. Making additional spectrum for fixed links will also support the provision of high-capacity wireless backhaul in a range of communication services.

6.5 We consider that the decision and proposed measures to support satellite services which we have set out above will:

a) Support efficient use of spectrum by enabling satellite operators to make greater use of the 28 GHz band;
b) Encourage investment and innovation, by making it easier for satellite operators to roll out infrastructure and services in the UK;
c) Support competition, as satellite is an alternative way for households and businesses to access broadband services, in competition with terrestrial networks;
d) Promote the interests of UK consumers, particularly those in rural areas who may have fewer options for broadband provision.

6.6 Below we discuss how the individual decision and proposals set out in this document may affect relevant stakeholders, including citizens and consumers.

Decision to enable access to returned spectrum and 28 MHz guard bands for satellite gateways

6.7 We consider that our decision to expand spectrum access for satellite gateways in the returned spectrum and the guard bands (see section 3) would benefit citizens and consumers in the UK. This is because it would enable satellite operators to increase their capacity to serve more consumers and businesses with improved services.

6.8 We do not consider that this decision will significantly constrain deployment of future users in the returned spectrum as we expect there to be a limited number of gateways, located in rural areas where the density of fixed links deployments is generally low.

6.9 We have not seen evidence that this decision will adversely affect existing users in adjacent spectrum bands. We have said that we will take adjacent band users into account when we review gateway applications. On balance, we consider that the benefits of our proposal outweigh the impacts on future users or users in adjacent bands.

Consultation on enabling satellite gateways across the whole 28 GHz band

6.10 In relation to our proposals to enable easier access for satellite gateways across the whole of the 28 GHz band (see section 4), subject to consultation responses, we consider that our proposed approach is likely to facilitate increased sharing in the 28 GHz band compared to the current approach (which allows sharing via spectrum leasing). We expect that this would result in more efficient use of spectrum and quicker, less expensive, and more timely access for satellite operators, leading to improved satellite services for consumers and citizens (increased availability and speed of services). Enabling easier access to more spectrum for satellite operators will also support investment in the satellite sector in the UK.

6.11 Our proposed approach could result in some reduction in flexibility of future deployment for Spectrum Access licensees in the areas around gateways. However, we consider that this impact is likely to be limited, because we anticipate a limited number of satellite gateways, and these typically operate in rural locations with relatively small coordination areas required to coexist with other spectrum users. Given the limited impact on licensees' ability to deploy fixed links, we also think that the risk of dampening investment incentives of existing licensees is also likely to be low.

6.12 Similar to the current approach of negotiations with satellite companies, the proposal would involve some costs for Spectrum Access licensees associated with checking that new proposed gateways would not affect their existing or planned deployments. However, other administrative costs associated with bilateral commercial negotiations would be avoided.

6.13 We also note that enabling satellite operators to approach Ofcom directly for access to this spectrum would also mean that Spectrum Access licensees may lose existing or potential revenue through leasing their spectrum for gateway use.

6.14 Our provisional view is that, on balance, the benefits of our proposed approach are likely to outweigh the potential impacts.

Consultation on enabling further use of the returned 28 GHz spectrum on a shared basis

6.15 Next, we turn to our proposal to make 112 MHz of the returned spectrum available for land-based satellite terminals and 2 x 112 MHz of this spectrum available for fixed links. Satellite operators have submitted that making more 28 GHz spectrum available for user terminals would facilitate the provision of advanced satellite services for UK citizens and consumers. Making half of the returned spectrum available for fixed links could help to ensure that we have sufficient capacity to accommodate future demand for fixed links, noting growing demand for higher-bandwidth links.

6.16 We have considered the impact of our proposal on incumbent adjacent users and future satellite gateways (noting our decision in this document to give satellite gateways access to the returned spectrum). As noted in paragraph 5.48b, satellite gateways would be coordinated with other uses including fixed links, while coexistence between satellite terminals and satellite gateways is already considered under the existing satellite licensing processes. We recognise that making the spectrum available to satellite and fixed links in this way would mean that it will not be available as block-assigned spectrum for fixed links operators, which was its previous use. While we recognise there is potential value in use of the spectrum for block-assigned fixed links, our initial view is that the higher-value use overall is likely to be that which we have proposed.

6.17 Our provisional view is the benefits of our proposal are likely to outweigh any potential impacts.

Equality Impact Assessment

6.18 We have given careful consideration to whether our decision and 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.[56] We have also had regard to the matters in section 3(4) of the Communications Act.

6.19 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)]

6.20 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.

6.21 We consider our decision and proposals have the potential benefit of facilitating broadband in 'hard-to-reach' areas across the UK which may improve equality of opportunity in those areas. We have not identified any adverse impacts on specific groups of persons that are likely to be affected in a different way to the general population.

[56] Section 75 of the Northern Ireland Act 1998

Welsh language impact assessment

6.22 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)[57].

6.23 We do not consider our decision and proposals have any impact on opportunities for persons to use the Welsh language or treating the Welsh language no less favourably than the English language. We also do not think there are ways in which our decision and proposals could be formulated so as to have, or increase, a positive impact, or not have adverse effects or decrease any adverse effects. This is because our decision and proposals relate to spectrum access across the UK.

6.24 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.

Next steps

Licensing satellite gateways in returned 28 GHz spectrum and guard bands

6.25 This section outlines how satellite operators can gain access to the returned 28 GHz spectrum and guard bands outlined in Table 1.

New and existing NGSO gateway licensees

6.26 Applications for new NGSO gateway licences will follow the existing NGSO gateway licensing process outlined in the NGSO guidance document.

6.27 Licence holders for existing NGSO gateway licences can request a licence variation to include the frequencies in the same way.

6.28 Licences for gateways at Chalfont, Goonhilly and Morn Hill already have access to the Arqiva spectrum bands under a commercial arrangement. This is already reflected in their licence. When the existing Arqiva licence falls away in 2026, satellite operators can apply to vary their licence.

New and existing PES gateway licensees

6.29 Information on how to apply for a new PES licence can be found on our website. Existing PES licensees can request a licence variation in the same way.

Gateways at existing Arqiva sites.

6.30 Arqiva retains its licence in three locations until July 2026:

a) a radius of 3 km around Goonhilly, Cornwall with NGR SU723214;
b) a radius of 2 km around Morn Hill, Hampshire with NGR SU516292;
c) a radius of 2 km around Chalfont Grove, Buckinghamshire with NGR SU983917.

6.31 For now, we propose:

[57] See Standards 84 – 89 of Hysbysiad cydymffurfio (in Welsh) and compliance notice in English. Section 7 of the Welsh Language Commissioner's Good Practice Advice Document provides further advice and information.

a) New PES applications within the defined area at Goonhilly would be permitted under the conditions of the PES licence.
b) Any new PES or NGSO Earth Station applications at Chalfont or Morn Hill would require agreement from Arqiva. New NGSO Earth Station applications at Goonhilly would also require agreement from Arqiva.

6.32 In 2026, the satellite operators operating gateways at these three sites can apply for a variation to their licence using the relevant process outlined in paragraph 6.25. This variation will come into force on 1 August 2026.

6.33 Any new satellite operators wishing to place gateways at these locations from 1 August 2026 will be able to apply to Ofcom in the usual way.

6.34 We will review this proposed approach to take account of responses received to our consultation on the proposals set out in section 4 of this document, in which we propose to introduce a new mechanism for Ofcom to directly authorise satellite gateways to use spectrum currently authorised under a 28 GHz Spectrum Access licence, including the time limited Arqiva authorisations at Goonhilly, Chalfont and Morn Hill.

Decision on wider use of the 28 GHz band for satellite gateways and other use of the returned spectrum

6.35 We plan to publish the statement to the consultation in section 4 on 'Consultation on enabling satellite gateways across the whole 28 GHz and section 5 – 'Consultation on enabling further use of the returned 28 GHz spectrum on a shared basis' by end 2024.

Future space consultations

Gateways

6.36 We have also issued a call for input alongside this publication on future satellite gateway access to the Q/V and E bands.

6.37 We plan to begin work this year to review the pricing of our satellite Earth station licences to consider introducing AIP licence fees for NGSO satellite Earth stations, to reflect the opportunity cost of spectrum denied to other uses and users (rather than just the costs of managing the radio spectrum).

Other satellite and space related consultations

6.38 Picking up medium term priorities set out in the Space Spectrum Strategy, and our Consultation on Ofcom's Proposed Plan of Work 2024/2025:

a) We will issue a Call for Input on satellite narrowband services (MSS and Direct to Device Services) later this year.
b) We will consult in 2024 on updates to our Procedures for the Management of Satellite Filings, implementing Decisions from WRC-19 and WRC-23.
c) We will consider additional spectrum for aeronautical and maritime ESIMS in 28 GHz (for GSO and NGSO) and 13 GHz (for GSO) services in 2025.

A1. Responding to this consultation

How to respond

A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 31 May 2024.

A1.2 You can download a response form from https://www.ofcom.org.uk/consultations-and-statements/category-2/increasing-use-of-the-27-5-to-30-ghz-band. You can return this by email or post to the address provided in the response form.

A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to 28ghz@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 2024.

A1.4 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

A1.5 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.

A1.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)

A1.7 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.

A1.8 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.

A1.9 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 A4. 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.

A1.10 If you want to discuss the issues and questions raised in this consultation, please contact us by email to 28ghz@ofcom.org.uk.

Confidentiality

A1.11 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.

A1.12 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.

A1.13 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.

A1.14 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.

A1.15 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

A1.16 Following this consultation period, Ofcom plans to publish a statement by end of 2024.

A1.17 If you wish, you can register to receive mail updates alerting you to new Ofcom publications.

Ofcom's consultation processes

A1.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex x.

A1.19 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.

A1.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

A1.21 Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A2. Ofcom's consultation principles

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

Before the consultation

A2.1 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

A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.

A2.3 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.

A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.

A2.5 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.

A2.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

A2.7 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.

A3. 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)

A4. Consultation questions

Question 1: Do you agree with our analysis of the case for regulatory intervention and our proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways? If not, please provide reasons/evidence for your response.

Question 2: If we decide to proceed with this proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways, do you agree with our proposal not to adjust Spectrum Access licence fees to reflect locations where we authorise future satellite gateways? If not, please provide reasons/evidence for your response.

Question 3: Do you have any further views / comments on our proposal to license satellite gateways to access 28 GHz spectrum in portions of the band not currently available for satellite gateways?

Question 4: Have we correctly identified the possible uses of the returned spectrum? If not, what other potential uses should we consider?

Question 5: As a satellite operator, are you currently constrained by the amount of spectrum available in the 28 GHz uplink and 18 GHz downlink to provide your planned and or existing satellite services to UK consumers and citizens? If so, please explain what constraints exist in each band.

Question 6: Do you agree with our initial view that alternative use of the returned spectrum would be an allocation decision for **either** point-to-point fixed links or land-based satellite terminal use because it is unlikely both services can share and auctioning the spectrum is unlikely to secure optimal use? If not, please provide evidence to support your response.

Question 7: Do you agree with our initial view to make 112 MHz at 28.8365 – 28.9485 GHz available for land-based satellite terminal use, 2 x 112 MHz for point-to-point fixed links at 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz and defer allocating the remaining 112 MHz of spectrum? If not, what alternative suggestions do you have?

Question 8: Do you agree with our assessment of how the returned spectrum may be authorised for fixed links and GSO and NGSO land-based satellite terminals? If not, please provide evidence to support your response.

Question 9: Do you have a view on demand for point-to-point fixed links in Northern Ireland and London in the frequency range 28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz and our proposed approach that, if we were to decide to make this spectrum available for fixed links, would be to authorise this as Ofcom managed spectrum licensed on a first come first served basis?

Question 10: Do you have further views / comments that you wish to make in respect of this consultation?