Your response

Question	Your response
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.	Viasat welcomes Ofcom's proposal to maximize spectrum use in the 27.5-29.5 GHz (28 GHz) band and license satellite gateways for access to the 28 GHz spectrum in portions that are not currently available for satellite gateways. Viasat urges Ofcom to provide access to the 28 GHz band to all satellite operators and not only to those currently hold non-geostationary (NGSO) gateway and Permanent Earth Station (PES) licenses in the 28 GHz band. There is increasing spectrum demand for contiguous spectrum in the 28 GHz band for satellite broadband services. Satellite operators are currently innovating to provide additional services that requires access to the entire 28 GHz band, including for connectivity to users and devices on land, in the air, and on the sea. Satellite gateway connectivity is also a key component of the overall satellite network, aggregating traffic from/to the user terminals. Viasat generally supports the approach proposed by Ofcom as outlined in sections 4.32-4.35 of the Consultation. To facilitate the process by which incumbent user of the spectrum ascertains potential of interference to its existing and planned deployments Viasat recommends that Ofcom establishes a guiding procedure, for shared use of the portions of the 28 GHz band that are currently authorized on a national or regional basis for Spectrum Access licensees. We suggest the same approach is applied to the three geographic Spectrum Access licences held by Arqiva until 31 August 2026. Many modern Ka band satellite gateways are small, low on the ground, very efficient in reducing the out of axis emission and, therefore, have a very limited radio wave footprints on the ground. In particular, we suggest that Ofcom considers an advanced approach based on the use of a power flux density (PFD) criterion. The PFD approach is based on a set of accurate parameters which accurately model the actual technical solution. The PFD approach uses

	actual receiver protection requirements and is technology neutral. Moreover, the PFD approach factors in propagation conditions (e.g., shielding, terrain and clutter) reflecting true earth station deployment. Finally, a PFD approach is already used to provide mutual access for the 28 GHz band spectrum for terrestrial and satellite earth stations in other countries. For example, in the United States, under decisions defined by the Federal Communications Commission (FCC), gateway-type satellite earth stations have been permitted to operate on a protected basis with terrestrial services in the 27.5-28.35 GHz band at over 9,000 locations. Notwithstanding the fact that terrestrial services have primary status in the 27.5-28.35 GHz portion of the 28 GHz band in the United States, an applicant for a gateway-type satellite earth station can obtain licenses for transmitting earth stations in the 27.5-28.35 GHz band if the established criteria in the Code of Federal Regulations is met[1]. One of the conditions is that the applicant earth station generates a power flux-density (PFD), at 10 meters above ground level, of less than or equal to −77.6 dBm/m^2/MHz (-107.6 dBW/m^2/MHz in dBW units) with respect to existing facilities constructed and in operation by the terrestrial licensee[2]. In Australia, under decisions by the Australian Communications and Media Authority (ACMA), the vast majority of the 28 GHz band is allocated for primary FSS use across the country[3]. Only the 27.5-28.1 GHz band portion is permitted for co-primary use by fixed wireless access (FWA) and satellite gateway earth stations inside selected high population metropolitan areas. In the rest of Australia, FSS for fixed and mobile uses is authorized

1 *See Code of Federal Regulations of the United States, § 25.136 Earth Stations in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2, GHz and 50.4-51.4 GHz bands* here https://www.ecfr.gov/current/title-47/chapter-I/subchapter-B/part-25#25.136.

2 *See Code of the Federal Regulations of the United States § 101.103 Frequency coordination procedures*, https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-101/subpart-C/section-101.103#p-101.103(d).

3 *See* Australian Communications and Media Authority, *Applicant information pack*, https://www.acma.gov.au/sites/default/files/2020-10/Applicant%20information%20pack_Allocation%20of%20apparatus%20licences%20in%20the%2026%20and%2028%20GHz%20bands_0.docx.

	exclusively on a primary basis and terrestrial licenses are secondary. According to established licensing and coordination procedures, the coordination PFD limit at the geographical boundary for satellite gateway earth stations in the selected metro areas is -91 dBW/m^2/MHz, not to be exceeded for more than 5% of time within a 24-hour window[4]. To facilitate the coordination process between satellite gateways and incumbent Spectrum Access licensees in the UK, as well as any other possible users, Viasat proposes that Ofcom considers the development of a database of frequency assignments of the incumbents and satellite gateways, where possible. For example, the incumbent Spectrum Access licensees could provide the following basic information to a third-party database service provider to facilitate efficient spectrum use: • Frequency range used (transmit and receive); • Geographic coordinates of the transmitter; • Geographic coordinates of the receiver(s); • Height of the transmitting site above mean sea level; • Height of the transmitting antenna above ground level; • Manufacture and model of the transmitting and receiving equipment (including antennas); • Antenna gain; • Antenna azimuth; • Antenna polarization; • Antenna type, dimensions, and boresight gain; • Boresight pointing range (azimuth, elevation, tilt, polarization); • Beam null depth; • Transmitter power (e.i.r.p.); • Transmission bandwidth (MHz); • Emission type (bandwidth, modulation); • Bandwidth, modulation; • Receiver noise figure (dB); • Operating radius; • Date installed; and

[4] *See* Australian Communications and Media Authority, *Licensing and coordination procedures for area-wide apparatus licensed services in the 26/28 GHz band here:* https://www.acma.gov.au/publications/2020-10/instruction/rali-ms46-licensing-and-coordination-procedures-area-wide-apparatus-licensed-services-2628-ghz-bands .

	• Active status. Viasat recommends that the database contain up-to-date location and operating information and that it be maintained and managed by a neutral, third-party administrator (*e.g.*, Ofcom, private sector database manager). As an alternative to the database solution, the incumbent Spectrum Access licensees may present a typical set of parameters which could be considered within a coordination procedure together with information about station locations and their activity status. In either case, making information about incumbents' deployment and their characteristics available will help satellite operators to plan their gateways and avoid affecting the incumbents facilitating the coordination process.
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.	N/A
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?	Viasat strongly supports Ofcom's intention to revise the approach for fees for NGSO and PES licenses. Currently, as defined in the Ofcom satellite earth station guidance document[5], two different approaches are inexplicably used for NGSO gateway and PES licenses. For example, if a NGSO operator already has a 28 GHz license, then, after approval of the license variation, it can have access to additional spectrum at no additional cost. A geostationary (GSO) operator, on the other hand, will have to pay an additional fee. Moreover, NGSO operators use

[5] *See Fees for Satellite Earth Station licenses* here https://www.ofcom.org.uk/__data/assets/pdf_file/0020/27461/fees.pdf.

	multiple antennas at one site, with each antenna dynamically pointing in many different directions. Thus, the actual amount of spectrum used at NGSO gateway locations is more intensive than GSO gateway locations, and the possibility of sharing frequencies with other users is significantly reduced, compared to GSO gateway locations. GSO operators need to have sufficient space separation between gateway antennas to allow frequency reuse and will be pointing to a single GSO satellite. Thus, when calculating overall cost of additional spectrum for GSO network gateways the amount per one site needs to be multiplied by amount of sites, while NGSO operator can increase number of antennas per site in existing license without additional cost. Therefore, fees for NGSO gateway and PES licenses must be revised to ensure a consistent approach to all satellite systems configurations. We propose that a new fee approach is developed based on the cost of administrative work associated with processing of the license application.
Question 4: Have we correctly identified the possible uses of the returned spectrum? If not, what other potential uses should we consider?	Viasat has reviewed Ofcom's identification of the possible users of the returned spectrum (*i.e.*, 27.8285-28.0525 GHz and 28.8365-29.0605 GHz) and supports Option 4 that would open the entire 2 x 224 MHz of spectrum for land-based satellite user terminals, including land-based earth stations in motion (ESIM), in addition to the satellite gateway use, noting that Ofcom plans to consult on maritime and aeronautical ESIM use in the 28 GHz band in 2025. Notably, the CEPT 5G Roadmap expressly provides that the 28 GHz band is to be preserved across CEPT administrations for satellite broadband services. The CEPT 5G Roadmap (Version 10, Revised 6 March 2020) explains that "Europe has harmonized the 27.5-29.5 GHz band for broadband satellite and is supportive of the worldwide use of this band for ESIM. This band is therefore not available for 5G"[6].

[6] *See* European Conference of Postal and Telecommunications Administrations (CEPT), *Spectrum for wireless broadband – 5G*, Section B.3 (Version 10, Revised 6 March 2020), https://www.cept.org/Documents/ecc/57839/ecc-20-055-annex-15_cept_5g_roadmap.

	Therefore, we urge Ofcom allocating the 27.8285-28.0525 GHz and 28.8365-29.0605 GHz sub-bands to land-based satellite terminals, including land-based ESIM, in the scope of this consultation.
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.	Viasat's use of the full frequency band 27.5-30 GHz (Earth-to-space) is necessary as Viasat uses this spectrum today to provide hundreds of millions of high-speed broadband connections every year to households, businesses and passengers in North America, Central America, Latin America,[7] Australia,[8] and across Europe[9]. The Viasat satellites using the 28 GHz band today bridge the digital divide and will continue to do so in the future. These satellites also provide ubiquitous connectivity using the same 28 GHz spectrum for users on the move that no other technology can offer. Viasat has pioneered mobile broadband services using innovative antenna designs for ESIM on aircraft, ships and other land-based vehicles and users to facilitate communications with Ka band satellite networks. Access to the 28 GHz band for satellite service is constrained in the UK. It is critical for modern satellite

[7] *See Viasat Brings Fastest Home Satellite Internet Service to Mexico*, https://www.viasat.com/news/viasat-brings-fastest-home-satellite-internet-service-mexico; *Viasat Completes Brazilian Residential Internet Service Roll-Out--Now Covers 100% of the Country; Offers New Premium Satellite Internet Service Plan with Highest Speed and Data*, https://www.prnewswire.com/news-releases/viasat-completes-brazilian-residential-internet-service-roll-outnow-covers-100-of-the-country-offers-new-premium-satellite-internet-service-plan-with-highest-speed-and-data-301161443.html.

[8] *See Viasat Wins $286M Satellite Broadband Deal with Australia*, https://spacenews.com/viasat-wins-286m-satellite-broadband-deal-australia/.

[9] *See Viasat's Expansion in Europe Helps Bridge the Gap to Faster Broadband (video),* https://news.viasat.com/blog/satellite-internet/viasats-expansion-in-europe-helps-bridge-the-gap-to-faster-broadband-video; *Viasat Affirms Commitments to Bring its Powerful ViaSat-3 Satellite to Europe*, https://news.viasat.com/newsroom/press-releases/viasat-affirms-commitments-to-bring-its-powerful-viasat-3-satellite-to-europe; *KLM Introduces Viasat In-Flight Wi-Fi on European Flights, https://www.viasat.com/about/newsroom/press-releases/klm-introduces-viasat-flight-wi-fi-european-flights/* (April 22, 2021); *Viasat Completes Acquisition of Remaining Stake in its European Broadband Joint Venture, inclusive of the Ka-Sat Satellite and Ground Assets* (April 30, 2021), https://www.viasat.com/about/newsroom/press-releases/viasat-completes-acquisition-remaining-stake-its-european/; *Viasat Ramps Satellite in the Middle East and Western Europe Ahead of ViaSat-3 Launch; Signs Ka-Band capacity Lease Deal with Avanti Communications* (June 3, 2021), https://investors.viasat.com/news-releases/news-release-details/viasat-ramps-satellite-services-middle-east-and-western-europe.

	broadband system to have access to continuous blocks of spectrum of about 500 megahertz. Notably, Viasat satellite network designs are able to use the same part of the spectrum for user terminals and gateways, employ highly intensive frequency reuse, all contributing towards high overall spectrum reuse and efficiency of the network. Indeed, access to the entire 28 GHz band would enable Viasat to fully utilise the capabilities of its satellites, increase the number of consumers who can be served with a given satellite and reduce the cost of the service to its end-users. According to ECC Decisions ECC/DEC/(05)01, ECC/DEC/(06)03, and ECC/DEC/(13)01 the entire 28.4445-28.9485 GHz (504 megahertz) sub-band is available for land-based satellite terminals, including land-based ESIM, and the entire 27.5-30 GHz (2500 megahertz) is available for maritime and aeronautical ESIM. This is not the case for the UK and that restricts UK citizens and businesses from benefiting the modern satellite broadband services. We note that there is no constraint in use of the 17.7-19.7 GHz (18 GHz) band because the UK implemented ECC/DEC/(00)07 which provides conditions on shared use of the 18 GHz band by the fixed service (FS) and earth stations of the fixed satellite service (FSS) (space-to-Earth).
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.	Viasat urges Ofcom to allocate the returned spectrum (*i.e.*, 27.8285-28.0525 GHz and 28.8365-29.0605 GHz) for land-based satellite terminals, including ESIM. We respectfully disagree with the Consultation statement that the existing 3000+ terrestrial fixed links in the 18 GHz (downlink) band may limit capacity for land-based terminals and usability of the 28 GHz (uplink) band. ECC Report 232 demonstrates that increased access to the 18 GHz band by the next generation of FSS earth stations could be accomplished without prejudicing use of the band by terrestrial FS. ECC Report 232 also demonstrates that FSS earth stations deployed in very high FS density zones will be able to use more than 65% of the 18 GHz band at the worst location. In rural areas, 95% of the spectrum is available for FSS earth stations at the worst location for FSS earth stations. In ECC Report 241 further studies of enhancing access to spectrum for FSS

	uncoordinated earth stations are provided. Finally, ECC/DEC/(00)07 provides conditions on shared use of the 18 GHz band by the FS and FSS earth stations (space-to-Earth). The 28.8365-28.9485 GHz sub-band is designated for land-based satellite terminals, including ESIM, according to ECC/DEC/(05)01 and ECC/DEC/(13)01. The remaining sub-bands, *i.e.*, 27.8285-28.0525 GHz and 28.9485-29.0605 GHz, have very small amounts of spectrum for use by FS systems. Based on industry demand for FS systems for throughput, ERC Recommendation T/R 13-02 contains frequency channels arrangements with up to 112 MHz channel spacing. To further increase throughput, the recommendation allows the merging of 112 MHz channels to create 224 MHz channels. However, there is not sufficient spectrum in the 28 GHz band to support these high demands for FS links at these levels of throughput. Therefore, to maximize the use of the 28 GHz band, Viasat recommends that Ofcom allocate the 27.8285-28.0525 GHz and 28.9485-29.0605 GHz sub-bands for land-based satellite terminals including ESIM, as well. We strongly agree with Ofcom's proposal not to auction the returned spectrum. We agree that the in-band sharing conditions between point-to-point FS links and uncoordinated FSS land-based stations has not been defined in ECC/DEC/(05)01; ECC/DEC/(13)01; and ECC/DEC/(15)04.
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?	Viasat respectfully disagrees with this proposal in the Consultation. As explained in our response to question 5, modern ultra-high throughput satellite networks operate at or near Shannon's limit and access to continuous block of spectrum enables provisioning of high-speed broadband services to increasing number of users at affordable costs. Viasat would like to highlight the need for core spectrum access and a stable spectrum access environment. We propose that Ofcom instead allocates the 27.8285-28.0525 GHz and 28.8365-29.0605 GHz bands for land-based satellite terminals, including land-based ESIM.

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.	We respectfully disagree with this proposal and urge Ofcom to allocate the 27.8285-28.0525 GHz and 28.8365-29.0605 GHz for land-based satellite terminals, including land-based ESIM. Enabling 112 MHz of paired spectrum, *i.e.*, 27.9405 - 28.0525 GHz and 28.9485 - 29.0605 GHz, for point-to-point FS systems will not result in efficient use of these portions of 28 GHz band because it will be difficult for multiple FS operators to use wideband 112 MHz channels with high throughput in the same area. Meanwhile multiple satellite operators can already access this spectrum through different NGSO systems and GSO networks. Based on WRC-15, WRC-19 (GSO ESIM) and WRC-23 (NGSO ESIM) results, the satellite industry, including Viasat, continues development of innovative satellite user terminals to maximize the use of the entire 28 GHz band proving satellite broadband service for business and public in more sizes and shapes to facilitate mobility. Viasat supports Ofcom's proposal to allow GSO fixed land-based terminals to operate in the 28 GHz band while complying with the conditions set out in Interference Requirement 2066 (IR 2066) as well as land-based ESIM based on IR 2023 under a license exemption framework. Viasat supports Ofcom's view that NGSO operators need to obtain Earth Station Network (ESN) licenses for operating satellite user terminals in the UK. Viasat notes that the current rules for Satellite Earth Station Networks for GSO networks and NGSO systems are summarised in the UK Radio Interface requirement 2077.
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?	N/A

Question 10: Do you have further views / comments that you wish to make in respect of this consultation?	Viasat kindly asks Ofcom to study the possibility of increasing the e.i.r.p. from a single earth station terminal, allowing more power to be used than the current 55 dBW e.i.r.p. limit for a single terminal on a license exempt basis. ECC/DEC/(05)01 and ECC/DEC/(13)01 allow use of e.i.r.p. up to 60 dBW. The decisions also propose that the maximum e.i.r.p. of satellite user terminals, operating within TDMA networks, must be respected after taking into consideration their duty cycles (see section 3.3 and 3.4 of ECC Report 272). By implementing this, Ofcom would increase the harmonization but also more innovative mobile and nomadic solutions.

Please complete this form in full and return to 28ghz@ofcom.org.uk.

[1] https://www.ofcom.org.uk/consultations-and-statements/category-3/consultation-arqivas-28-ghz-spectrum-access-licence