Ofcom
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for everyone

Viasat is pleased to provide its views on Ofcom's proposals for enabling licensed mobile and Wi-Fi users to access the upper 6 GHz band.

1. Introduction and General Comments

Viasat is a global leading provider of communications solutions across a wide variety of technologies, both satellite and terrestrial. We provide hundreds of millions of high-speed, satellite powered broadband connections every year to households, businesses and passengers in Europe, North America, Central America, Latin America and Australia, including internet services wisth speeds up to 100 Mbps and more.

In May 2023, Viasat acquired Inmarsat. With this addition to the Viasat family, Viasat is enhancing its scale and scope of innovation in the global satellite broadband connectivity sector, offering new and improved capabilities to customers that will address the ever-increasing speed, capacity, flexibility, reliability, coverage and security. The closing of the Inmarsat acquisition enables the combined companies to bring together spectrum, satellite, and terrestrial assets, including 19 satellites in space spanning Ka-, L-, S- and C-bands. These complementary assets are already delivering connectivity and key safety services across land, maritime, aviation, government and consumer markets with the speed and reliability that our users rely on.

The company has a long track record of operating reliable global mobile satellite communications networks, sustaining business applications and mission-critical safety and operational applications globally.

2. Viasat L-band Operations

The frequency range 6425-6575 MHz (Upper 6 GHz band) is critical to Viasat's satellite operation as it is used for our Gateway uplink to the satellite which uses L-band.

Viasat's "ELERA" L-band MSS network, which operates in the 1518-1559 MHz (space-to-Earth) and 1626.5-1660.5 and 1668-1675 MHz (Earth-to-space) frequency bands, provides safety-of-life communications and mission-critical voice and data services around the globe. Viasat deploys key L-band MSS applications throughout the land, skies, and seas. Emergency responders, military users, and diverse industries including the transportation, energy, and agriculture sectors rely upon land-based mobile terminals for mission-critical voice and data applications.

The ELERA L-band MSS network supports essential maritime and aeronautical communications. For example, Inmarsat communications services such as Fleet Broadband and Swift Broadband provide broadband connectivity to ships and aircraft wherever they operate. L-Band MSS terminals enable those in the maritime industry to comply with International Maritime Organisation (IMO) Safety-of-Life At Sea (SOLAS) communications equipment requirements (including Global Maritime Distress and Safety System (GMDSS) requirements), which are mandatory for many vessels. The industry also relies on MSS terminals for compliance with EU-specific monitoring and reporting requirements, such as Consolidated European Reporting System (CERS) and Vessel Monitoring System (VMS) requirements. Ships from around the world rely upon MSS terminals to meet these obligations, including UK ships and foreign commercial vessels that come to UK.

In aviation, ELERA L-band MSS satellite communications support the Aeronautical Mobile Satellite (Route) Service (AMS(R)S) and are important for ensuring flight safety. The aeronautical industry requires satellite communications terminals to fly in high-capacity, oceanic airspace such as the North Atlantic organized tracks, and operators must ensure these terminals are operable prior to departure. Airlines expect to make greater use of L-band MSS in the future to support the Global Aeronautical Distress and Safety System (GADSS), and L-band MSS is a key component of the "Iris" next generation air traffic management system being developed by the European Space Agency. This will result in a wider range of aircraft using L-band MSS communications and using those communications routinely for operations in continental airspace.

The provision of both aviation and maritime safety services are mandated to by the IMO and ICAO, and therefore safety has always been at the core of Inmarsat services and user equipment.

The ELERA L-band MSS terminals also support essential public protection and disaster response coordination and communications. When terrestrial infrastructure is overloaded or unreliable, these terminals ensure that life-saving services are delivered when and where they are needed. Additionally, land-based MSS services support important economic sectors daily. Energy production and distribution, transportation, construction, and other industries use MSS terminals to provide mobile communications with a level of ubiquity and reliability not available over terrestrial networks.

To support growing demand in the 1.5 GHz band, Viasat launched its first Inmarsat-6 ("I-6") F1 satellite in December 2021 and Inmarsat-6 ("I-6") F2 satellite in 2023. I-6 is the first hybrid MSS satellite operating in the L-band (1525-1559 MHz and 1626.5-1660.5 MHz), Extended L-band (1518-1525 MHz and 1668-1675 MHz), and Ka-band (GX), which demonstrates our continued investment and anticipated growth in L-band MSS services globally. Viasat's I-6 satellites will deliver 50% more capacity per beam, allowing more data to be carried over the same geographic area, and will offer greatly improved beam routing flexibility. With the addition of new carrier aggregation capabilities, users will be able to connect to multiple beams at once and access bandwidth speeds reaching up to 1.7 Mbit/s on their L-band terminals. With high reliability and small terminal size, L-band MSS will continue to drive industrial IoT in sectors such as energy, mining and transportation. Furthermore, L-band MSS will continue to support connectivity solutions essential to public safety, disaster response, telemedicine, remote education, and various other applications. The L-band MSS network could also provide UAS operators with the ability to send and receive data beyond visual line of sight, which is important for safe and efficient air traffic management.

All of the above L-band operations rely on the use of the upper 6 GHz band and specifically Viasat operates in the range 6425-6575 MHz in the uplink of the feeder link as shown in Figure 1 below.

Any interference into the upper 6 GHz uplink will reduce our uplink throughput and degrade, all the Land, air and sea services that L-band provides. This degradation would lead to unacceptable outrage of safety of life services of both aviation and maritime safety systems.

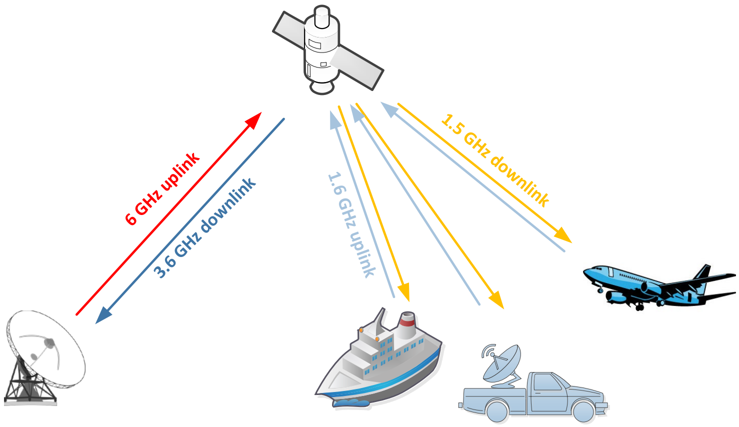

Figure 1 – ELERA service links and feeder links

3. Regulatory Measures to Protect MSS Operations from IMT Systems

Ofcom's conclusion in Section 1.15 is that coexistence between fixed links and licensed mobile base stations deployed outdoors is likely to be a challenge and that unconstrained, licensed mobile use may have some level of impact on fixed satellite services and other incumbent uses depending, for example, on power levels. Use of low power Wi-Fi indoors is much less likely to pose a risk of harmful interference to incumbent services.

It is important that Ofcom adopts appropriate and necessary regulatory measures to protect the FSS satellite receivers operating in the upper 6 GHz from IMT stations interference in order to ensure to the protection of current and future Viasat MSS services operating in the L-band.

We propose protection measures to be applied to IMT stations in order to ensure protection of FSS satellite receivers in response to Q9a below.

Your response

Question	Your response
Question 1: Hybrid sharing could mean that the upper 6 GHz band will be used for mobile outdoors and Wi-Fi indoors. What are your views on the priorities for each of these two services, assuming that suitable coexistence mechanisms are developed?	*Is this response confidential? – N* Viasat has a major concern about Ofcom's proposal for enabling licensed mobile outdoor systems to access the upper 6 GHz band. There is a real issue about the feasibility of coexistence between outdoor IMT and FSS satellite receivers, which would require significant constraints on IMT stations to ensure coexistence with FSS satellite receivers. Studies conducted in ITU-R during the WRC-23 study cycle based on parameters and assumptions agreed by WP5D have already shown excessive level of interference into FSS satellite receivers. Similarly, previous ITU-R studies (Report ITU-R S.2367) showed very little potential for IMT operations while protecting FSS satellite receivers (indoor use only, 10-15 dBm EIRP limit necessary). Previous studies conducted at CEPT level have demonstrated that sharing with unlicensed Wi-Fi indoor could be more feasible than sharing with IMT. If Ofcom is to adopt and proceed with the proposal, there will need to be a significant constraint on IMT outdoor deployment in the upper 6 GHz in order to ensure the protection of FSS satellite receivers. We propose therefore that Ofcom prioritises use of the upper 6 GHz band for Wi-Fi applications, which have much greater potential for sharing the band with FSS uplinks.

Question 2(a): Hybrid sharing could mean that the upper 6 GHz ban will be used for mobile in some locations, and Wi-Fi in others. We would like feedback on the priorities for each of these two services, assuming that suitable coexistence mechanisms are developed. From the point of view of mobile, is the upper 6 GHz band most useful to provide outdoor coverage, or indoor coverage? Is it most useful in urban areas, or in those base stations that are currently carrying more traffic, or some other split?	*Is this response confidential? – N* Viasat believes, as stated in response to Q1, that any outdoor IMT deployment would require significant constraints on both IMT power levels to limit the strength of the interference level (main beam or side lobes) and density and their aggregated interference levels into satellite receiver, given the aggregate interference into FSS satellites receivers depends on the IMT station density. Given the international nature of the interference from IMT stations into FSS satellite receivers, the power and density limits on IMT stations should consider interference from IMT stations deployed internationally.
Question 2(b): Similarly, what are the priorities from the point of view of Wi-Fi deployments?	*Is this response confidential? – N* For the protection of satellite receivers, it is necessary that Wi-Fi deployments in the upper 6 GHz band respect the technical limits applied in the CEPT for Wi-Fi in the lower 6 GHz band. This means use by "low power" indoor devices and "very low power" outdoor devices.
Question 3: What are your views on a modified AFC or SAS-type approach to enable hybrid sharing? What additional work do you think would be required?	*Is this response confidential? – N* Viasat believes Wi-Fi will not be feasible to share with IMT if coexistence is based on in-door/outdoor separation. Ofcom should avoid a repeat of the coexistence between 5 GHz Wi-Fi and meteorological radars which is well documented on the CEPT website[1]. Wi-Fi is a device purchased and setup by members of the public and can easily be installed outside a house like seen in the 5 GHz band. Issues with different software which can be loaded onto the devices or even different configuration across the world makes it very difficult to ensure that UK's specific regulation is complied with. Due to the large number of devices, Ofcom

[1] https://cept.org/ecc/topics/wireless-access-systems-and-radiolan-wasrlan

	will not have the resources to investigate all cases of interference raised. Standardisation didn't solve the issue of user misconduct either. In any case, an AFC or SAS system is intended to provide a mechanism for sharing between Wi-Fi and IMT or sharing between either of those mobile technologies and other terrestrial systems, including fixed links and earth stations. These tools are not intended to address interference with FSS satellites. If the upper 6 GHz band was to be used for IMT systems, it is conceivable that a modified SAS system could be used to limit the number of base stations and other characteristics so as to control on the aggregate uplink interference. However, we are not aware of the concept being implemented in other countries and if pursued this would require a more detailed analysis. In general, we consider that IMT systems should not be implemented in the upper 6 GHz band. Implementation of an AFC or similar system for Wi-Fi devices should not relax the power limits, which are necessary to protect satellite uplinks.
Question 4: How could existing access protocols and sensing mechanisms be leveraged (i.e., those in Wi-Fi or 5G NR-U) to enable hybrid sharing?	*Is this response confidential? – N* To date there is no evidence that LTE-U (unlicensed LTE) has been deployed commercially and consequently, 3GPP bands 252 (SDL- LTE-U) and 255 SDL (LTE-U) are now obsolete. The mobile industry's position2 is that Spectrum sharing frameworks and licence exempt spectrum can play a complementary role to 5G and that, prospective bands for sharing must be harmonised and available in the right amounts, in the right areas and at the right times to support 5G. To justify widespread heavy network investments, mobile operators need certainty of access to significant amounts of licensed spectrum for a sufficient duration (e.g. 20-year licences). 6 GHz doesn't meet the mobile industry's needs.
Question 5: What mechanisms could potentially enable device-to-device connectivity?	*Is this response confidential? – N* Any use of the upper 6 GHz band by Wi-Fi devices will likely require limitation on outdoor devices, to conform to the "very low power" limits. Hence, a capability to detect when a device is used outdoors may be required in any case.
Question 6: If hybrid sharing is eventually adopted, and requires licensed mobile to operate at medium power, in what way would mobile networks use the upper 6 GHz band?	Is this response confidential? – N Viasat believes that if hybrid sharing is adopted, then in order to ensure coexistence with FSS satellite receivers, there will be a need to significantly constrain IMT stations power and density. Coexistence between FSS satellite receivers and IMT stations of course depends on what is meant by "medium" power. In the context of studies under WRC-23 agenda item 1.2, Viasat supports a reduction in IMT base station power of 21 dB, compared with the baseline parameters proposed by the IMT industry and agreed in WP 5D. A limit on the radiated power above the horizon may be needed. If "medium power" IMT use is consistent with such limits, it could be supported by Viasat. Mobile operator will likely use 6GHz to complement existing high demand areas only which will further increase the digital gap.
Question 7: How would you suggest that the mechanisms presented here can	*Is this response confidential? – N* In section 1.16, Ofcom indicates that "hybrid sharing mechanisms could help facilitate coexistence with some incumbents, for example with databases. However, there is a risk that at least a partial clearance of fixed links from the band may be needed if Ofcom was to allow licensed mobile use in particular areas."

[2] https://www.gsma.com/spectrum/wp-content/uploads/2022/06/5G-Spectrum-Positions.pdf

be used, enhanced, or combined to enable hybrid sharing or are there any other mechanisms that would be suitable that we have not addressed?	Use of databases to protect incumbent services are reliant on the information to be accurate. Due to the dynamic nature of IMT and Wi-Fi deployment, new earth station planning will be complex. This proposal would impact our ability to grow our gateway use of the band thus our network speeds. CEPT produced a lot of work on the use of spectrum databases. At that time, IMT operators wanted to have access to the 2.3 GHz band via licenced shared access with possible use of spectrum databases- sadly very little use was ever made despite localised use of spectrum from the Defence industry and the wide range of possibility for IMT (CEPT.ORG - ECC - Topics - Spectrum sharing - LSA Implementation). Standardisation of the sharing features as proposed in section 1.18 have also been produced for 2.3 GHz LSA but failed to generate any deployment in the band. This again is aligned with the mobile industry's position on spectrum sharing - it's at best a complement to their own spectrum[3].
Question 8(a): Assuming the future of the band includes indoor use for Wi-Fi and outdoors use for mobile: How could this be achieved without creating or suffering interference?	*Is this response confidential? – N* Wi-Fi services are available for installation by the general public and indoor restrictions are not enforceable. High power Wi-Fi systems are widely used in some countries and easily accessible online. The level of enforcement required will be larger than the ones seen for 5GHz Wi-Fi sharing with the meteorological sector. History shows that consumer applications like Wi-Fi are popular and the chipset costs will be very low thanks to economies of scale. Wi-Fi was originally envisaged to provide connectivity indoor but can be seen used for outdoor wireless camera systems, car-play devices connectivity etc… Restricting Wi-Fi use indoor is not enforceable.
Question 8(b): Could there be a combination of technical adjustments such as power limits and other mechanisms (including databases or sensing mechanisms)?	*Is this response confidential? – N* No comment.
Question 9(a): We are interested in input about the importance of the upper 6 GHz band for its incumbent users, and on the potential impact of hybrid sharing of the band.	*Is this response confidential? – N* Regarding the importance of the upper 6 GHz band for incumbent FSS services, please refer to the introduction and general comments provided as the top of this document. Regarding the potential impact of hybrid sharing of the band on the incumbent FSS service, unless the necessary constraints are applied to the IMT stations, harmful interference would occur to the FSS service.

[3] https://www.gsma.com/spectrum/wp-content/uploads/2022/06/5G-Spectrum-Positions.pdf

What evidence do you have on whether incumbents are likely to coexist with hybrid sharing of the band with mobile and Wi-Fi? Are there unique advantages of the upper 6 GHz band for these uses?

6GHz is envisaged for 5G services and more. Beamforming antenna used for 5G will make any database sharing solution challenging or overprotective (assuming the maximum power in all directions).

It is important to note that for aggregate interference from IMT stations, the density of IMT deployment is used as a parameter in the sharing studies and has a major impact on the conclusion of the studies. Therefore, it is important to limit the number of IMT stations to the value assumed in the studies, otherwise, with an uncontrolled number of IMT stations in most countries, the aggregated interference level into FSS would be higher than the studies show.

Incumbent FSS satellite receivers can only coexist with outdoor IMT deployment with significant constraints on IMT stations' radiated power and density of IMT deployment. Coexistence between FSS uplinks and Wi-Fi is potentially feasible, based on the precedent in lower 6 GHz.

The evidence for this position is that the studies done in ITU-R during WRC-23 study cycle based on parameters and assumptions agreed by WP5D have already shown excessive level of interference into FSS satellite receivers. Similarly, previous ITU-R studies (Report ITU-R S.2367) showed very little potential for IMT operations while protecting FSS satellite receivers (indoor use only, 10-15 dBm EIRP limit necessary), while previous studies conducted at CEPT level have demonstrated that sharing with unlicensed Wi-Fi indoor could be more feasible than sharing with IMT.

Additionally, Viasat has participated in the studies conducted by GSOA, on the upper 6 GHz under AI 1.2 of the WRC-23, based on the ranges of parameters provided by WP5D and considering allowance for interference from Wi-Fi and FS, shows there would be excessive interference into FSS satellite receivers (see table below) and there will need to be constraints on IMT base station deployment. Given the interference is an aggregate from large numbers of interferers, and aggregate interference depends on IMT stations density, Viasat believes that conditions on IMT to protect FSS satellite receiver should apply to both IMT base station radiated power and IMT deployment density.

Excess Interference above the protection criterion in dB

IMT deployment density	**Global beam satellite coverage**
Highest	21
Lowest	11

Based on the above results, Viasat believes the IMT base station average EIRP mask should be constrained by the exceedance depending on the density of IMT base stations assumed. In order to ensure the protection of FSS satellite receivers and give flexibility to IMT deployment, we propose two approaches, "Approach 1" is to develop conditions based only on limits on IMT BS EIRP above the horizon (assuming the highest base station density provided by WP5D) and "Approach 2" applies a condition based on both IMT BS EIRP and a BS density limit based on the lowest density provided by WP5D. The average density of base stations operating in the territory of any administration, in any bandwidth of 100 MHz, not to exceed 0.0037 base stations per square kilometre. The constraint on IMT base stations that Viasat proposes is given below.

Vertical angle measurement window $\theta_L \leq \theta < \theta_H$ (vertical angle θ above horizon)	Approach 1	Approach 2
	Average e.i.r.p. limit (dBm/MHz) (Highest BS density level) **(NOTE 1,2, 3)**	**Average e.i.r.p. limit (dBm/MHz)** (lowest BS density limit) **(NOTE 1,2, 3)**
$0° \leq \theta < 2°$	9.3	19.3
$2° \leq \theta < 5°$	2.0	12.0
$5° \leq \theta < 10°$	-0.7	9.3
$10° \leq \theta < 15°$	-4.3	5.7
$15° \leq \theta < 20°$	-6.4	3.6
$20° \leq \theta < 25°$	-8.4	1.6
$25° \leq \theta < 30°$	-10.1	-0.1
$30° \leq \theta < 40°$	-11.8	-1.8
$40° \leq \theta < 50°$	-14.2	-4.2
$50° \leq \theta < 60°$	-16.5	-6.5
$60° \leq \theta < 70°$	-18.6	-8.6
$70° \leq \theta < 80°$	-21.3	-11.3
$80° \leq \theta \leq 90°$	-23.4	-13.4

NOTE 1: For this provision, the average e.i.r.p. is defined as the mean value of the e.i.r.p., with the averaging being performed:

– over horizontal angles between –180° to +180°, and the IMT base station beamforming in a specific direction within its steering range,

– over different beamforming directions within the IMT base station steering range, and

– over the specified vertical angle measurement window $\theta_L \leq \theta < \theta_H$.

NOTE 2: An IMT base station must comply with the specified limits on expected e.i.r.p. for all mechanical tilts with which it can be deployed.

NOTE 3: Testing for compliance shall be carried out with the following configurations:

- Base station transmitting with maximum power with all resource blocks occupied
- Base station e.i.r.p measured as the sum of both polarisations
- These limits shall be met for all base station antenna beams within the following vertical and horizontal scanning angles:
  - Suburban: horizontal scanning angle set to ±65⁰ and vertical scanning angle set to 0⁰ to -10⁰
  - Urban: horizontal scanning angle set to ±65⁰ and vertical scanning angle set to 0⁰ to -30⁰
- Beam scanning shall be done with evenly distributed angles within the above vertical and horizontal scanning ranges

If multiple beams may be formed simultaneously, testing shall be based on the worst case beam configuration.

Question 9(b): What are your views on the initial analysis we have conducted around hybrid sharing and

Is this response confidential? – N

Viasat's view regarding the conclusion of the initial analysis of Wi-Fi sharing with FSS satellite receivers that Ofcom has conducted, as stated by Ofcom, FSS satellite receivers coexistence may be feasible with low power indoor Wi-Fi with negligible risk of interference.

Regarding the study Ofcom undertook to consider sharing between higher power licensed mobile and FSS satellite services in the upper 6 GHz band to protect geostationary satellite

coexistence with incumbents?	receivers which was submitted to WP 5D, that study concluded that there is interference into FSS which exceeds the FSS satellites protection criteria. The level of exceedance depends on the IMT base station density considered, i.e., D1 (a lower density) and D2 (a higher density). Figure 8 of the consultation document shows that with the higher base station density, interference exceeds the criterion for most elevation angles. In section 5.12 of the consultation document, Ofcom notes " *there is activity underway internationally to agree on base station antenna emission limits at elevations above the horizon, as a mitigation mechanism to ensure coexistence in case higher densities of base stations are deployed. If agreed internationally, it is likely that we will implement these or similar restrictions in the UK, if we were to enable high power licensed mobile in the upper 6 GHz band."* Viasat understands this to be Ofcom's engagement in the development of IMT base station antenna emission limits at elevations above the horizon to be adopted in CEPT as an ECP for the upcoming WRC-23. In this engagement, Ofcom has made a number of revisions to the study they provided to WP5D, and made a number of assumptions, selected parameters, and scenarios, many of which are favourable to IMT and hence underestimate the interference. Viasat would like to highlight the main concerns that we have regarding Ofcom's assumptions, parameters, and scenarios in the development of base station antenna emission limits. Viasat summarises its main concerns with the study Ofcom undertook which results in what we see as an incorrect conclusion that coexistence essentially requires no constraint on IMT. 1. Ofcom must consider the overall interference into the satellite receivers from multiple countries which is aggregated into satellite receiver. Ofcom, like all administrations, has a duty to provide adequate protection to current and planned satellite systems, irrespective of whether the systems are filled through the UK or not. The analysis used to support the current conclusions is only considering a small portion of the different satellite systems to protect (systems using global beam and UK registered only). o By focusing the analysis on systems with global beams in the FSS, Ofcom only considered a portion of the overall interference. This simplification does not cater for the reality which is that : ▪ The interference into a global beam is made of the aggregated level of interference across all the countries covered by the beam so UK and more. Other countries will potentially authorise IMT and therefore satellites systems will suffer from interference. ▪ The interference into smaller beams (regional or spot) of non UK registered systems is ignored despite the duty of care from Ofcom to non UK systems. 2. Ofcom is only considering the use of global beams in the FSS, which are less sensitive to interference than regional or spot beams. The rationale for this is that Ofcom's responsibility is only to protect Viasat satellites and it is up to other administrations to advocate for protection of any other more sensitive satellites. We disagree, considering that all administrations have a responsibility to provide adequate protection to current and planned satellite systems, irrespective of whether the systems are filed through the UK. 3. Ofcom's analysis only considered the least sensitive carrier parameters agreed in the ITU-R, while there are other more sensitive carrier parameters. 4. Ofcom, in its study, states that the assumptions, parameters, and scenarios are based on a realistic situation, and yet, the Ofcom study assumes IMT deployment only in ITU Region 1, excluding other regions such as Region 3. Viasat strongly believe that

	deployment in Region 3 should also be considered, especially as China became the first country in the world to identify the upper 6 GHz (6425-7025 MHz) for IMT in a revised version of its radio regulations which came into effect on 1 July 2023[4]. Also, other countries in Region 3 have expressed interest in IMT identification at the recent APG meeting, these are: *China, Bangladesh, Cambodia, Japan, Lao, Maldives, Myanmar, Pakistan, Philippines, Sri Lanka and Singapore.* Excluding R3 countries from IMT deployment is not realistic because even if the band is identified for IMT only in Region 1, there will be nothing to prevent Region 3 countries from deploying IMT when the equipment is available. 5. Ofcom is proposing Hybrid sharing (enabling both licensed mobile and Wi-Fi users to access the upper 6 GHz band). Some other countries have already decided to make this band available to Wi-Fi systems and some others to make this band available to IMT systems. When considering interference into FSS satellite receivers, the interference from both IMT and Wi-Fi, as well as other terrestrial services deployed globally should be considered. However, the Ofcom study makes no allowance for interference from Wi-Fi or the FS. Effectively this means that Ofcom considers that the upper 6 GHz band will be left empty in other countries and areas where IMT is not deployed. This is not realistic. If IMT is not deployed in some countries, some other terrestrial technology will be deployed, which will contribute to the aggregate interference received. 6. Ofcom has adopted an antenna efficiency factor for the satellite antenna pattern, i.e., they reduce the antenna radiation pattern based on an assumed efficiency (e.g., if the efficiency of the antenna is 63%, they reduce the pattern by 2dB. This is simply technically incorrect, since the antenna efficiency is already accounted for in the pattern, whether it is a measured pattern or based on an ITU Recommendation. 7. Ofcom has also adopted a Total Integrated Gain (TIG) factor, based on calculating the TIG of the antenna pattern (e.g. an ITU Recommendation) and reducing the antenna radiation pattern by 10log(TIG), on the assumption that the gain must integrate to 1. This is also technically incorrect. While it is of course true that the TIG cannot be >1, this doesn't affect the pattern close to the main lobe. In this region, the pattern is very close to the envelope pattern. Hence, a TIG factor is not applicable to a global beam. Based on the above 7 factors, Viasat considers that Ofcom's analysis has significantly underestimated the interference to existing and planned FSS operations. Much more stringent power limits on IMT will be required than those currently proposed by Ofcom in the CEPT discussions.
Question 9(c): For any incumbent uses that you view as unlikely to be able to coexist, what alternatives are there? What are the barriers that might prevent those alternatives?	*Is this response confidential? – N* Viasat's study based on parameters, assumptions and scenarios provided by WP5D, show that there would excessive interference from IMT deployment into FSS satellite receivers. Given the constraints required on IMT stations to ensure protection of FSS satellite receivers, Viasat's view is that it is unlikely for IMT to be able to coexist with FSS satellite receivers. On the other hand, Wi-Fi is shown to be able to coexist with incumbents, as confirmed by Ofcom's initial analysis. Viasat considers the band could be shared between FSS, FS and Wi-Fi.

[4] China first in the world to set upper 6 GHz band aside for 5G and 6G - PolicyTracker:

Question 10: Do you have any other thoughts that you would like to share about hybrid sharing in the upper 6 GHz band, or about hybrid sharing more generally and its potential for applications in other bands?	*Is this response confidential? – N* No comment.
Question 11: Do you have any other comments to make on these proposals or on the future use of the upper 6 GHz band?	*Is this response confidential? – N* In order to ensure the continued operation of the FSS service, the future use of the upper 6 GHz band should not include deployment of IMT stations. As evidence of the potential impact there are real world examples where IMT base stations have caused interference to satellite receivers in other bands. To mention just cases that have been reported to ITU: • India MSS satellite in 2.6 GHz band, approx. 3.5 dB degradation in 2019 where the signal analysis shows signature of LTE signal. • Viasat MSS satellite serving Europe in 2 GHz MSS band received interference from mobile base stations deployed in northern Europe – IMT equipment used for broad-band access. Interference experienced is many dBs above noise. Even though the ITU has been formally informed of the issue, this process has been largely ineffective to resolve the interference issue, once interference occurs. Therefore, given that that it is not feasible for IMT stations to coexist with incumbent FSS users, Viasat urges Ofcom and other administrations to consider other terrestrial technologies for this band, such as Wi-Fi, that are better suited to sharing with FSS.

Please complete this form in full and return to Hybridupper6ghz@ofcom.org.uk.