Your response

Question	Your response
Question 1: (Section 3) Do you agree with our proposal for a single authorisation approach for new users to access the three shared access bands and that this will be coordinated by Ofcom and authorised through individual licensing on a per location, first come first served basis? Please give reasons supported by evidence for your views.	In the 3800-4200 MHz frequency band, Ofcom proposes to grant new users individual licences on a per location basis based on a coordination check. Ofcom also considers it to be unlikely that satellite earth stations will be deployed at new locations within the UK. However, as also acknowledged by Ofcom, the removal of protections in the 3600-3800 MHz band will undoubtedly increase the traffic on this upper band. The decision to remove the protection in the 3600-3800 MHz is also very recent and it will take time before the implications of this are fully visible. We believe that increased traffic may be served either by additional frequency assignments at existing sites or possibly new sites. While Ofcom is of the view that the latter option is unlikely, is Ofcom planning to take the increased frequency need by existing sites into account by allowing frequency expansion to support this increased traffic and thereby protecting existing FSS sites across the whole 3800-4200 MHz band. Furthermore, satellite earth station operators may have only a limited or indirect ability to choose which frequencies they receive from the C-band within 3800-4200 MHz. This is because they need to connect to a transmitter, often in other continents, via a satellite. The frequencies used may be determined by the operators of the transmitting station (the satellite operator) based on the propagation characteristics of the bands or availability of satellite capacity, or due to coordination constraints with other space systems. Therefore we would like to seek clarity on how Ofcom plans to treat the existing satellite earth station sites within 3800-4200 MH after the expiration of their current licenses, is the renewal of the licenses for existing satellite earth station sites automatically granted.

	Finally EC Decision 2008/411/EC[1], as amended by EC Decision 2014/276/EU, identifies the 3400-3600 MHz and 3600-3800 MHz frequency ranges for IMT applications within Europe. However EC Decision 2008/411/EC states that sharing with FSS earth stations is considered feasible due to the extent of their deployment in Europe, geographical separation requirements and case-by-case evaluation using actual terrain topography. This decision also requires member states to take account of the need for protection of services in the adjacent frequency bands. The adjacent band 3800-4200 MHz is more heavily used by FSS earth stations in the UK and hence licence conditions on mobile systems will be needed to ensure protection of those earth stations.
Question 2: (Section 3) Are there other potential uses in the three shared access bands that we have not identified?	Satellite solutions are being developed to support 5G[2]. Increased interest and participation in 3GPP from the satellite communication industry imply that satellite companies are convinced of the market potential for an integrated satellite and terrestrial network infrastructure in the context of 5G. In order to harvest the potential to improve the reach of terrestrial 5G networks by satellite solutions, adequate spectrum resources are required for satellites in both uplink and downlink. Satellite solutions can be used for example for expanding the reach of 5G networks to rural areas which relates closely to Ofcom commitment to provide universal coverage of communications services (Annual plan 2019/2020). Intelsat has made massive investments on its C-band capacity in the last three years by launching several high-throughput satellites with C-band payload. In addition, Intelsat is actively participating in 3GPP standardization and is also a full member of GSMA. While Ofcom proposal may support the current satellite service providers to the extent it exists today, it does inhibit the possibilities for the satellite operators to make the most of these investments by exploiting opportunities on

[1] Available on the European Communications office (ECO) website at: www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF.

[2] ECC Report 280 “Satellite Solutions for 5G,” May 2018.

	these new use cases currently under standardization in 3GPP. It is envisaged that there will be demand for existing FSS teleports to continue operating in the 3800-4200 MHz band in the future. For example, if the band is re-farmed for other services on a regional basis, it may not be possible for satellite earth stations to relocate to new bands or alternative means of delivery. One option to enable such services to continue operating is to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers is continued unimpeded to ensure long term stability within this band for satellite operators.
Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?	Satellite receive stations, designed to receive signals over very long distances, are very sensitive to interference. Most of the world's coverage via C-band is anchored through FSS earth stations which are based in Europe and the UK, and is used for intercontinental links and links with high reliability requirements (including broadcast distribution and TT&C). Satellite operators rely heavily on C-band because it has a number of advantages over other frequency bands. These advantages include: • **Reach**. The large geographic coverage area of C-band satellite beams allows for whole regions or continents to be connected – resulting in a very cost-effective communications network. • **Resilience**. C-band is resistant to rain fade. While services in higher frequencies sometimes experience degradation of their signal, services provided in C-band offer extremely high reliability, even during heavy rain. These are key reasons why many UK companies (e.g. BBC, Arqiva, BT etc.) use C-band spectrum to provide services globally, particularly in equatorial regions in Asia, Africa and Latin

	America. More than 50 satellites with C Band frequencies cover Europe, the majority of which relies on the 3800-4200 MHz band for communications within Europe and between Europe and the rest of the world. C-band also enables coverage of almost one third of the Earth with a single beam. A customer with sites all over Africa can use one broadcast outbound carrier to cover all sites, reducing costs of having to uplink onto multiple beams. Ofcom claims that the reduction in the availability of spectrum for satellite receive stations at some locations in the future could also be a consequence of sharing with fixed links and UK Broadband (UKB). However, due to directivity of the fixed links and frequency limitation of the UKB, the reduction of locations resulting from introduction of 5G applications and FWA would be multi-fold compared to the existing sharing arrangements . In general, Ofcom claims to protect existing users' rights in the band, while limiting the satellite service into • Currently licensed frequency bands, • Current locations, and • Current use cases. In addition, it is not clear how the existing satellite earth station sites will be dealt with after the current license expires.
Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?	We caution against the use of the term DSA, as this is broadly understood to imply opportunistic (statistical) access to spectrum, including at very small time scales (e.g., down to milliseconds or less) and has strong linkages to general authorisation. As such, DSA is not strictly appropriate for the licensed spectrum access approach proposed in this consultation. If anything, DSA represents a disincentive for important use cases which require guaranteed quality of service and ultra-reliable low latency communications, including industrial automation. We consider that "database assisted access to spectrum" is a more descriptive and accurate term in the context of shared use of licensed spectrum.
Question 5: (Section 4) Do you agree with our proposal for the low power and medium power	In accordance to the proposal from Ofcom, there is no maximum limit set to the EIRP

licence? Please give reasons supported by evidence for your views.	for the low power per area licence. In accordance to the proposal, the usage within the licensed area can consist of multiple base stations and it can take place either indoor or outdoor depending on the license type. **How is Ofcom going to determine the coordination distance to such area license if there is no maximum limit to the number of transmitters of the total EIRP?** In clause 5.58 it is stated that an additional 2dB EIRP could compensate the effect of multiple BSs, however depending on the 5G use case considered there could be much higher density of BSs required as in traditional mobile cell structure. For example the number of devices could be extremely high, e.g. massive IoT, or alternatively the required bitrate could be high, e.g. autonomous industry applications, requiring several BSs per license area. There should be a maximum EIRP per area defined to ensure that there is no harmful interference to other usage. Defining a maximum EIRP per area would allow the same level of flexibility to move and add devices to be maintained.
Question 6: (Section 4) Are there potential uses that may not be enabled by our proposals? Please give reasons supported by evidence for your views.	C-band frequencies 3800-4200 MHz (space-to-Earth), have been shared with terrestrial applications throughout the entire satellite era. Traditionally, the terrestrial applications were microwave links providing connectivity for a limited numbers of stations at fixed, well defined locations and using directional antennas with controlled emissions and well designed ground equipment. However, the new applications which now are threatening C-band Fixed Satellite Service are different in nature in that they are deployed ubiquitously, using non-directional antennas and often without individual licensing of stations, in particular user terminals. As a result, the interference scenario and the capability for FSS to take into account and co-exist with these is completely different from that of the earlier terrestrial applications using the same band. In addition, the lack of regulatory acknowledgment of the existence of the C-band FSS by new terrestrial applications worsens the sharing situation. For example, for some terrestrial communications, instead of

	having their antenna pointing down on the surface and improving isolation to building tops, terrestrial operators choose to put their antennas on high grounds to service wider coverage. These terrestrial applications no longer have a sharing desire but a ground strategy to dominate the satellite FSS C-band frequencies. Furthermore, Ofcom proposal disregards the possible new satellite use cases under standardization in 3GPP, as well as possible UAV usage in this band studied in CEPT in PT1 and FM59. The cost of the lost opportunity to satellite operators with regards to emerging satellite use cases is overlooked by the proposal from Ofcom. The current proposal from Ofcom to use the C-band by UKB will cause significant interference and disruption of satellite networks. Further identifying C-band for IMT type technology would mean even more disruption to all these vital services which would have a huge impact on international links connected in the receive downlink within the UK, which will impact the socio-economic development of many countries. To protect the vital FSS services operating in C-band 3800-4200 MHz and to avoid the detrimental impact due to the loss of these services, it is instrumental that Ofcom does not introduce IMT technology within 3800-4200 MHz.
Question 7: (Section 4) Do you agree with our proposal to limit the locations in which medium power licences are available? Please give reasons supported by evidence for your views.	No comments to Question 7.
Question 8: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?	No comments to Question 8.
Question 9: (Section 4) Do you agree that our standard approach to non-technical licence conditions is appropriate? Please give reasons supported by evidence for your views.	In Clause 4.24, Ofcom states that the licence given to new users is for an indefinite duration. Satellite industry is currently in the process of standardizing new integrated 5G solutions in 3GPP, therefore the proposal to grant indefinite licenses in this vital downlink satellite spectrum could make all these efforts and related investments void. Our industry depends heavily on regulatory certainty and the ability to design

	our network based on known spectrum requirement is critical for long term planning and investment. We would like to seek clarification for the reasons behind Ofcom proposal to grant three-year licenses for new users in the awarded mobile spectrum, while the license length proposed for new users in the 3800-4200 MHz band is indefinite. Considering recent reduction in the amount of C-band spectrum available for current satellite services as well as all investments made by the satellite industry to C-band services it seems unreasonable to prevent the satellite industry to stabilize their current service offering in the reduced bandwidth and to explore the opportunity of the emerging use cases in the future.
Question 10: (Section 4) Are you aware of any issues regarding numbering resources and Mobile Network Codes raised by our proposals which we have not considered here?	No comments to Question 10.
Question 11: (Section 5) Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported by evidence for your views.	In the case of the 3800-4200 MHz band, Ofcom proposes to align the technical conditions to the ECC Decision for use of the adjacent 3400-3800 MHz band, with the distinction that medium power base stations will support a fixed service only and will be permitted in rural areas. Satellite bands are already shared among satellite operators through careful coordination agreements. Due to the architecture of satellite networks and its services, the protocols for accessing shared spectrum mentioned in Ofcom's spectrum sharing framework[3] would not apply to terrestrial services wishing to operate in bands used by satellite services. For receiving satellite earth stations within 3800-4200 MHz, the wanted signal is transmitted from a satellite in geostationary orbit. It is not practical for other devices to detect the wanted signal or to determine where it is being received. When the satellite is receiving, the wanted signal is transmitted from an earth station which may be on the other side

[3] http://stakeholders.ofcom.org.uk/consultations/spectrum-sharing-framework/statement/

	of the earth. It is not possible for the terrestrial service to detect such a signal.
Question 12: (Section 5) Are there other uses that these bands could enable which could not be facilitated by the proposed technical licence conditions? Please give reasons supported by evidence for your views.	No comments to Question 12.
Question 13: (Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.	An additional 2dB EIRP proposed to compensate the effect of multiple BSs may be adequate when considering traditional mobile applications. However, 5G consists of a variety of use cases where high density of BSs may be required due to either massive amount of devices, e.g. massive IoT, or extremely high bitrates, e.g. autonomous industry. Therefore, there should be a maximum EIRP per license area defined to ensure that the coordination is successful. Furthermore, Satellite LNAs and LNBs are designed for reception of very low satellite signals and the dynamic range is set accordingly. BWA or IMT signals can produce much higher power (e.g. 45dB higher) than the satellite signals at the LNA/LNB input and can thus overdrive or bring it into non-linear operation. This can block reception of signals anywhere in the entire 3800-4200 MHz band, even if the terrestrial signal is not overlapping with the FSS signal.
Question 14: (Section 5) What is your view on the potential use of equipment with adaptive antenna technology (AAS) in the 3.8-4.2 GHz band? What additional considerations would we need to take into account in the technical conditions and coordination methodology to support this technology and to ensure that incumbent users remain protected?	Adaptive antenna technology (AAS) makes the coordination more difficult as there is no control over the directivity of the beam. The risk of harmful interference to the incumbent user is increased by the use of AAS, therefore it should not be considered.
Question 15: (Section 5) Do you agree with our proposal not to assign spectrum to new users in the 3800-3805 MHz band and the 4195-4200 MHz band?	No comments to Question 15.
Question 16: (Section 6) Do you agree with our fee proposal for the new shared access licence? Please give reasons supported by evidence for your views.	Intelsat disagrees with the approach to place on the existing users higher AIP-based fee purely because of excess demand created by opening the band for new users with much lower cost-based fee.

	In 6.6, Ofcom acknowledges that demand by new users might not be as high if all were charged the same AIP-based fee as the existing users. With this approach the existing users are paying for Ofcom decision to give out the spectrum to new users on a low price. This approach proposed by Ofcom seems unreasonable taking into account that after removing the protection from 3400-3800 MHz band this is the only remaining C-band resource for satellite industry, which with this proposal is already facing severe limitations in their future use cases and locations.
Question 17: (Section 7) Do you agree with our proposal to change the approach to authorising existing CSA licensees in the 1800 MHz shared spectrum? Please give reasons supported by evidence for your views.	No comments to Question 17.
Question 18: (Section 8) Do you agree with our proposal for the Local Access licence? Please give reasons supported by evidence for your views.	No comments to Question 18.
Question 19: (Section 8) Do you have any other comments on our proposal?	No comments to Question 19.
Question 20: (Section 8) What information should Ofcom consider providing for potential applicants in the future and why would this be of use?	No comments to Question 20.
Question 21: (Section 8) Do you agree with our proposal to have a defined licence period and do you have any comments on the proposed licence term of three years?	No comments to Question 21.
Question 22: (Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?	No comments to Question 22.
Question 23: (Section 8) Do you agree with our fee proposal for the new local access licence? Please give reasons supported by evidence for your views.	No comments to Question 23.