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.	ESOA notes that, in the 3800-4200 MHz frequency band, Ofcom proposes to grant new users individual licences for fixed and nomadic usage on a per location basis, based on a coordination check. ESOA welcomes that Ofcom does not propose to open the band to mobile services, consistent with ITU, ECA and UK national allocation tables: it is instrumental that IMT consumer services are not introduced within 3800-4200 MHz, otherwise it will become impossible to ensure coordination with FSS sites (and Fixed links). Ofcom 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 above 3800 MHz. The decision to stop licensing FSS in 3600-3800 MHz is also very recent, and it will take time before the implications of this are fully visible, noting that a total Space and Satellite licensed downlink traffic of nearly 11 GHz is registered by Ofcom below 3800 MHz.[1] The 3800-4200 MHz band will have to accommodate this increased FSS traffic in an environment that might also see an enormous densification of traffic in FWA links (there were 12,000 FWA licenses in the 5.8 GHz band in 2017, as noted in Ofcom's consultation documents on FWA spectrum). Therefore, ESOA seeks clarity on how Ofcom plans to treat the existing satellite earth station sites within 3800-4200 MHz after the expiration of their current licenses, and if the renewal of the licenses for existing satellite earth station sites will be automatically granted. ESOA also believes 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, we urge Ofcom to take the increased frequency need by existing sites into account and allow frequency expansion to support this increased traffic, thereby protecting existing FSS sites across the whole 3800-4200 MHz band. It is also to be reminded that EC Decision 2008/411/EC[2], as amended by EC Decision 2014/276/EU, requires EU member states to take account of the need for protection of services in the adjacent frequency bands. The adjacent band 3800-4200 MHz is at least 4 times more heavily used by FSS earth stations in the UK[3]) so licence conditions on mobile systems operating

[1] See Ofcom Space Spectrum Strategy – interactive data from: https://www.ofcom.org.uk/consultations-and-statements/category-1/space-spectrum-strategy/interactive-data

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

[3] Same ref to Ofcom Space Spectrum Strategy – interactive data

	below 3800 MHz will be needed to ensure protection of FSS earth stations above 3800 MHz. It is therefore ESOA's view that licence conditions placed on fixed wireless access and nomadic services in the 3 600-4 200 MHz band and mobile systems operating below 3 800 MHz must ensure that stations of the Fixed Satellite Service (FSS) operating above 3 800 MHz can continue to operate to the high levels of availability planned for and are protected from undue interference. Additionally, and as previously stated by ESOA and the GVF (see https://www.ofcom.org.uk/__data/assets/pdf_file/0018/107082/ESOA-and-GVF.pdf), high-power terrestrial IMT / 5G transmissions *anywhere* in the C-band downlink could cause interference to satellite operations because they can overwhelm the ability of the earth station to receive low-power satellite transmissions *anywhere* in the band, cause intermodulation effects, and create other interference issues. The impact of interference can be effectively addressed through interference mitigation measures, such as filtering, RF screening, and imposition of power limits on base stations around receive earth station sites. There are thus implementation costs for earth station operators (e.g., costs of upgraded equipment, labour and downtime) and ongoing performance impacts (e.g., installation of a filter to shield the 3 600-3 800 MHz band would reduce performance across the entire C-band receive spectrum) that must be addressed. Ofcom should apply appropriate licensing constraints on mobile operators to ensure that their operations are compatible with earth station operations above 3 800 MHz.
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[4]. Increased interest and participation in 3GPP from the satellite communication industry implies that the 5G ecosystem is convinced of the market potential for an integrated satellite and terrestrial network infrastructure in the context of 5G. ESOA believes that Ofcom has the opportunity to remain at the forefront of regulation to ensure that the UK's citizens and consumers have access to new broadband services and do not suffer the dis-benefits associated with 'not spots'. 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 the uplink and downlink in frequency bands. Satellite solutions are ideally suited for expanding the reach of 5G networks to rural areas, which relates closely to Ofcom's commitment to provide universal coverage of communications services (Ref. section 3 of Ofcom's Annual Plan 2018/19 https://www.ofcom.org.uk/__data/assets/pdf_file/0017/112427/Final-

[4] ECC Report 280 "Satellite Solutions for 5G," May 2018

	Annual-Plan-2018-19.pdf, and Ofcom's consultation on the proposed Annual Plan for 2019/20, section 5 https://www.ofcom.org.uk/__data/assets/pdf_file/0020/128810/Proposed-Annual-Plan-2019-20.pdf) In this context, it is envisaged that there will be demand for existing FSS teleport services to continue operating in the 3800-4200 MHz band in the future. The maritime sector is also increasingly using C Band earth stations, some of which is connecting while in the UK territorial waters. To enable such services to continue operating, ESOA expects Ofcom to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers: as much as other spectrum users, satellite operators need long term stability within this band. Other regulators in Europe have offered guarantees to protect FSS in the 3400(3600)-3800 MHz band, and a few only very carefully consider a sharing option in the 3800-4200 MHz band. ESOA thus seeks an assurance from Ofcom that PES licences for existing and planned satellite earth stations will continue to be renewed and granted and that the protection afforded to PES operations through these licences will not be reduced if Ofcom implements its proposal to grant new users individual licences for fixed and nomadic usage in the 3 800-4 200 MHz frequency band, on a per location basis, based on a coordination check.
Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?	Several FSS earth stations which are based in Europe and the UK are used for intercontinental links and links with high reliability requirements (including broadcast distribution and TT&C). Satellite operators again rely heavily on C-band because it has many advantages over other frequency bands in terms of reach and resilience. These are key reasons why C-band satellite allocations are used to provide services globally, particularly in equatorial regions in Asia, Africa and Latin America. A customer with earth station sites all over Africa can use one outbound carrier to cover all sites, reducing costs of having to uplink onto multiple beams. Satellite C-Band earth stations, designed to receive signals over very long distances, are very sensitive to interference. These critical links need to be secured if there is reduction in the availability of spectrum for satellite reception at some locations in the future because of sharing with fixed links and nomadic usage. Because of the directivity of the fixed links and frequency limitation resulting from nomadic use, the reduction of locations resulting from Ofcom's proposals for further sharing would be multi-fold compared to existing sharing arrangements, and it is unclear from Ofcom's proposals how the existing satellite earth station sites will be dealt with after their current license expires. ESOA urges Ofcom to take into account the important sunk investment which ESOA members have made and the fact that it is not feasible to simple move satellite gateways that are central to a large international network.

Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?	No comment
Question 5: (Section 4) Do you agree with our proposal for the low power and medium power licence? Please give reasons supported by evidence for your views.	Ofcom has proposed power limits on individual base stations (BSs) and user stations for the low power per area licence (as per clauses 5.4 and 5.6). In accordance to Ofcom's 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. Massive deployment and aggregated power of terrestrial transmitters may thus create the conditions of a serious increase in interference levels. Ofcom has not presented a method for determining the coordination distance to the area licences in the absence of maximum limit to the number of transmitters or the total EIRP. In clause 5.58 it is further 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. for massive IoT, or alternatively the required bitrate could be high, e.g. for autonomous industry applications, requiring several BSs per license area. Therefore, ESOA believes 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. (See also our response to Q13 below)
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 3 800-4 200 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 number 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 FSS gateway stations, 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.
Question 7: (Section 4) Do you agree with our proposal to limit the locations in	No comments

which medium power licences are available? Please give reasons supported by evidence for your views.	
Question 8: (Section 4) Do you have other comments on our proposed new licence for the three shared access bands?	No comments
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 vibrant and expanding (incl. 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 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. Considering the recent reduction in the amount of C-band spectrum available for satellite services as well as all investments made by the satellite industry to C-band services, it is unreasonable to prevent the satellite industry from both stabilizing their current service offerings in a reduced bandwidth and exploring the opportunity of 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
Question 11: (Section 5) Do you agree with the proposed technical licence conditions for the three shared access bands? Please give reasons supported	In the case of the 3 800-4 200 MHz band, Ofcom proposes to align the technical conditions to the ECC Decision for use of the adjacent 3 400-3 800 MHz band, with the distinction that medium power base stations will support a fixed service only and will be confined to rural areas. Due to the architecture of satellite networks and their services the protocols for accessing shared spectrum mentioned in Ofcom's spectrum

by evidence for your views.	sharing framework[5] would not apply to terrestrial services wishing to operate in bands used by satellite services. For receiving satellite earth stations within 3 800-4 200 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. ESOA therefore does not agree with the conclusions that Ofcom has drawn from the ECC Decision regarding licence conditions for the three shared access bands.
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
Question 13: (Section 5) Do you agree with our proposed coordination parameters and methodology? Please give reasons supported by evidence for your views.	Ofcom's proposed additional 2dB (EIRP) to compensate for the effect of multiple BSs may be adequate when considering traditional mobile applications. However, 5G consists of a variety of use cases where a high density of BSs may be required due to either ubiquitous deployment of devices, e.g. massive IoT, or extremely high bitrates, e.g. autonomous industry. As a reminder, 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 3 800-4 200 MHz band, even if the terrestrial signal is not overlapping with the FSS signal. ESOA therefore urges Ofcom to impose a maximum EIRP of +2 dB per license area defined (as a total EIRP envelope) to compensate for the effect of multiple BSs.
Question 14: (Section 5) What is your view on the potential use of equipment with adaptive antenna	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.

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

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?	If AAS were still allowed, then measures must be put in place to ensure the total EIRP envelope is still complied with.
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
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.	ESOA 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 a much lower cost-based fee that are actually the source of interference. In clause 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 existing users are paying for Ofcom's decision to give access to spectrum to new users at a lower price. The approach proposed by Ofcom is unreasonable. ESOA seeks an assurance from Ofcom that any costs arising from Ofcom's proposals to grant new users individual licences will be met by these new users. And this includes the costs of any new coordination arrangements, considering the operational costs to be largely endorsed by the satellite industry. Ofcom should not use the introduction of new sharing and coordination arrangements as a reason for increasing the cost of PES licences.
Question 17: (Section 7) Do you agree with our proposal to change the approach to authorising existing CSA licensees in the	No comments

1800 MHz shared spectrum? Please give reasons supported by evidence for your views.	
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
Question 19: (Section 8) Do you have any other comments on our proposal?	No comments
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
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
Question 22: (Section 8) Do you have any other comments on the proposed Local Access licence terms and conditions?	No comments

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