SES
beyond frontiers

UK Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
UK

12 March 2019

Subject: **Ofcom Consultation - Enabling opportunities for innovation**
Shared access to spectrum supporting mobile technology

Dear Madam, Sir,

SES S.A. (hereafter referred to as "SES"), on behalf of its various United Kingdom interests including wholly-owned subsidiaries SES ASTRA UK, Ltd, SES Satellites (Gibraltar) Ltd. SES Satellite Leasing Ltd., and O3b Limited, hereby submits its comments on Ofcom's Consultation, "Enabling opportunities for innovation," which proposes new licensing arrangements for additional shared use of certain frequency bands, including the 3.8-4.2 GHz (the "Consultation").

SES is a leading provider of fixed satellite services in Europe, the Americas, Asia and Africa, with a fleet of over 50 satellites in geostationary Earth orbit (GEO) and 16 satellites in medium Earth orbit (MEO). Several SES satellites – including the O3b MEO constellation – are operated under U.K. ITU satellite filings, many are launched pursuant to U.K. launch authority, many have U.K.-manufactured satellite components, and many are insured by U.K. entities. SES is a provider of a wide variety of important satellite services to customers in the U.K. including for direct-to-home services, satellite news gathering, private networks, broadband services, and more. For more than a decade, SES has been an important provider of satellite capacity in the U.K. market. In particular approximately sixteen (16) million U.K. households receive television services via SES spacecraft either directly through direct-to-home services or via feeds to cable head ends.

Seven of SES's geostationary satellites have coverage of the U.K. in the 3.8-4.2 GHz band, allowing C-band connectivity from the UK to many parts of the world. SES is thus vitally interested in Ofcom's proposals in this band, and offers its views on those proposals below. SES offers no views on the other bands that are the subject of the Consultation.

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In order to guarantee the continued use of the 3.8-4.2 GHz band by the Fixed Satellite Service, SES has the following comments to make on Ofcom's proposals.

Protection of Existing FSS Assignments. SES is pleased that Ofcom will continue to protect existing Fixed Satellite Service ("FSS") assignments in the 3.8-4.2 GHz bands. SES today provides important satellite services to many U.K. customers in the 3.8-4.2 GHz band that will required continued protection. These services include:

- International communications links for the U.K. and allied governments for secure communications
- International communications links between the U.K. and Africa for UK-based telecommunications companies and financial institutions
- Communications links that support the U.K. oil and gas industry, including for offshore platforms and ships used for extraction in sea waters

C-band satellites also support the U.K. broadcast industry, which use the band for video distribution and contribution of news, sporting and other major events to and from around the globe.

Coordination of Future FSS Assignments. SES is also pleased that new FSS assignments will be allowed in the band in the future on a coordinated first-come, first-served basis vis a vis the new users in the band. This is consistent with the co-primary status of the FSS in the 3.8-4.2 GHz band. While the number of FSS assignments in this band has been fairly stable in recent years, this does not mean that there is no possibility of future growth. As Ofcom itself notes, as FSS use of the 3.6-3.8 GHz band is phased out, it is our expectation that a large part of the services in that band will have to migrate into the 3.8-4.2 GHz, resulting in increased demand for FSS frequency assignments in the higher band (in view of the C-band frequencies that are licensed by Ofcom below and above the 3800 MHz band, this increase could be 25% based on migrated traffic alone).

Coordination Methodology and Protection Criteria. SES is concerned, however, about how the existing coordination procedures and protection criteria will be applied to new users of the 3.8-4.2 GHz band.

For new medium powered licensees providing FWA in the 3.8-4.2 GHz, the situation appears fairly clear. Ofcom does not anticipate a large number of FWA operators to enter the 3.8-4.2 GHz band because medium powered licences are limited to rural areas. However, based on the number of deployments in the 5.8 GHz band, it is at least possible that a large number of new FWA licenses would request such licences in the 3.8-4.2 GHz band (perhaps encouraged by the low, cost-based fees). And as new FSS assignments in the band would have to be coordinated to avoid the prior fixed links, consistent with the co-primary status of the FS in the band, there is a concern that FSS will be further constrained in its flexibility, after already having lost its ability to provide services in the 3.6-3.8 GHz band. Further, no limitation is proposed for the FWA antenna heights, leading to potentially large coordination distances.

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For the low powered licensees, it appears that mobile services (e.g. those using the LTE or 5G NR or other suitable technologies mentioned in the Consultation) will be permitted in localized 50m-radius licence areas ("local private networks"). Within each licence area, an unlimited number of base stations and licence-exempt user stations can be deployed. In addition, multiple low powered licences can be obtained in order to cover a larger area.

This raises a question of how coordination procedures that were developed for fixed links to protect FSS assignments can be applied to these new "local private networks" without modification. The indefinite number of base stations and user stations, and the possibility of multiple low powered licences being issued side-by-side, means that aggregate interference must be taken into account. Ofcom proposes to simply add 2 dB to the maximum EIRP of a "proxy" base station at the center of the licence area to account for both aggregate effects and smaller separation distance when coordinating new low powered licences (see Consultation at ¶¶ 5.55-5.58). SES takes no view on whether 2 dB is enough to capture these effects. But for such a method to provide assured protection for primary FSS assignments in the band, the EIRP of the "proxy" base station +2 dB must then be made an enforceable total EIRP envelope for all emissions coming from that low powered licence area. After all, if the conclusion of no interference that arises from the coordination process is based on that EIRP, then the low powered licensee must be held to that total EIRP.

Secondary Status of the Mobile Service. Clarification of the coordination methodology is especially important because the Mobile Service is only a secondary service in the 3.8-4.2 GHz band under both the U.K. Frequency Allocation Table, the European Common Allocation (CEPT-ECA) table and the ITU Radio Regulations. In contrast, the FSS and FS are both co-primary services in the band. Under ITU Radio Regulation No. 5.29, stations of a secondary service "shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date." This implies that (a) the coordination procedures for new FSS assignments need not take into account any mobile services previously deployed under low powered licences, and (b) previously deployed mobile services under low powered licences must protect future FSS assignments from harmful interference, including ceasing operations if necessary.

The secondary status of mobile services also implies that co-primary services (FSS and FS) should enjoy greater interference protection from such services than from other co-primary services, and not the same level of protection as suggested in para. 5.63 of the Consultation. ITU Rec. S.1432, for example, provides that FSS can expect to receive up to a 6% delta T/T from co-primary services, but only a 1% delta T/T from secondary services. This should be reflected in heightened protection criteria for FSS and FS vs. mobile services deployed under low-powered licences.

Fee Arrangements. Ofcom proposes to set low, cost-based fees for new users in the 3.8-4.2 GHz band, while maintaining high Administered Incentive Pricing (AIP) for the FSS and FS. According to the Consultation, (at ¶ 6.12), "[w]e continue to consider that demand for spectrum fixed links and satellite Earth stations is likely to lead to excess demand in the locations where they deploy, given the larger sterilization areas resulting from these users."

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In contrast, Ofcom provisionally conclude that implementing AIP for the proposed new licences would not be appropriate, based on likely low demand for medium powered FWA licences and notwithstanding the "possibility of localized excess demand, particularly in urban areas" for low powered licences.

The appropriate fees to be charged for all services in a given band should be based on the same yard stick. However, there are several aspects of Ofcom's fee proposal that suggest the contrary. First, the "excess demand" caused by the sterilization areas created by FSS and FS licences will come (at least in part) from these new users that Ofcom is proposing to introduce into the band. Yet, for some reason, Ofcom does not find that these new users will create "excess demand" for themselves for purposes of determining the appropriate charging mechanism.

Indeed, it is hard to distinguish the fixed links that will be installed under the proposed cost-based, medium powered licences from the fixed links that are currently subject to AIP-based licence fees. They both create sterilization areas in proportion to their number, EIRP and length, and yet Ofcom is proposing a different charging mechanism. In the case of the low-powered licences, Ofcom acknowledges the possibility of localized "excess demand" but then concludes that a cost-based fee is appropriate because it does not know how likely or where this would occur. SES recalls that AIP was imposed on FSS earth stations based on no better evidence of "excess demand." Of course, if low powered licences were truly "secondary," as described above, then low cost-based pricing may be appropriate as such licences would not create "excess demand" from other services.

Furthermore, the choice of pricing mechanism – cost-based vs. AIP-based – is not independent of the likelihood of "excess demand." The low cost of the proposed new licences will obviously increase demand for such licences, and this can bring about an actual situation of "excess demand" that would not have otherwise occurred if such licences were subject to much higher AIP-based fees. Conversely, the high cost of an AIP-based fee can depress demand for a particular service, and bring about a more limited deployment.

At the end, Ofcom's choice of licence fee mechanism should not become a surrogate for an undisclosed policy that favors one kind of service or technology over another.

Transitional Arrangements. SES requests transitional arrangements for the anticipated migration of FSS services currently operating in the 3.6-3.8 GHz band into the 3.8-4.2 GHz band. As a reminder, Ofcom has decided to revoke all Permanent satellite earth station licences and grants of RSA in the 3.6-3.8 GHz band, with an effective date of 1 June 2020, whilst the effective date to revoke all fixed links licences in the band is to be effective on 23 December 2022. To an extent, the decision to phase out FSS stations in 3.6-3.8 GHz was predicated upon the ability to accommodate those services in higher frequency bands, including the 3.8-4.2 GHz. That should not be precluded by overly rapid deployment of new stations requiring protection in the 3.8-4.2 GHz band.

SES would therefore recommend that all existing 3.6-3.8 GHz FSS assignment locations be protected for the full 3.8-4.2 GHz range and for all pointings towards the geostationary arc in order to provide the flexibility for such migrations to occur before the end of the period for the phase out of FSS assignments in the 3.6-3.8 GHz band.

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SES offers hereattached comments on specific questions raised in the Consultation that are pertinent to the 3.8-4.2 GHz band. SES remains at Ofcom's disposal for any question or discussion for clarification of our comments, and we'll stand ready to look at Ofcom's follow-up decisions.

Yours Sincerely,

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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.	No comment
Question 2: (Section 3) Are there other potential uses in the three shared access bands that we have not identified?	No comment
Question 3: (Section 3) Do you have any other comments on our authorisation proposal for the three shared access bands?	No comment
Question 4: (Section 3) What is your view on the status of equipment availability that could support DSA and how should DSA be implemented?	SES would support the establishment of an industry group to consider the technical requirements for Dynamic Spectrum Access (DSA) technologies, and would be eager to participate in one. Experience with DSA technologies as means of managing spectrum between different users is still relatively new, and lessons are still being learned about their effectiveness. Some DSA technologies, such as spectrum sensing, will not be effective in protecting FSS earth station receivers due to the weak signals being received from space. Database-based methods would not only need to have sound algorithms; they would also need to be secure to ensure database integrity and prevent bypass. Queries to the database for permission to transmit in a DSA-controlled frequency band must also take place in a different communications channel in order to avoid causing interference in the act of checking whether interference would be caused. This in turn raises the question of how often the database must be queried to ensure effective compliance, and the impact of such repetitive queries on power consumption.
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.	No comments

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.	No comments
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
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.	No comments
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 by evidence for your views.	No comments
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.	See discussion in the Cover Letter. For medium-powered licences in 3.8-4.2 GHz, which will consist only of fixed links, the proposal to apply existing coordination methodology and protection criteria to protect FSS from the FS would appear adequate. However, SES is concerned that the number of new FWA licensees entering the band will create significant deployment constraints, especially given the lack of a maximum specified height for the FWA stations. For low-powered licences in the 3.8-4.2 GHz, it is unclear how the existing methodology can be applied without modification (or what modifications may be necessary) to protect prior FSS assignments from new mobile services deployed under such licences. Aggregate interference from an indefinite number of base stations and user terminals will have to be taken

	into account. Ofcom's proposal of coordinating based on adding 2 dB to the EIRP of a "proxy" base station at the center of the low powered licence might provide adequate assurance of protection for prior FSS assignments if that EIRP+2 dB level then becomes an enforceable total EIRP envelope or cap for all emissions under that licence. SES also notes that the Mobile Service is only a secondary service in the 3.8-4.2 GHz band while the FSS is a primary service. This means that mobile services in the band must protect not just prior FSS assignments but also later FSS assignments, since the FSS is a primary service in the band. The secondary status of the Mobile Service also implies that primary services should receive a greater level of protection from such services than from other co-primary services. This should be reflected in the protection criteria used during any modified coordination process.
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?	SES is not in favor of allowing AAS technology in the 3.8-4.2 GHz band, in particular with respect to the FWA service. Ofcom will have no control over the directivity of the transmitted signals, and due to lack of antenna pattern recommendations it is not clear how Ofcom would ensure the protection of incumbent services. For low powered licences, AAS technology would further complicate an already uncertain coordination methodology (see above). Even with an enforceable total EIRP envelope the use of AAS technology would make monitoring, compliance and enforcement of such a cap very difficult.
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?	SES notes Ofcom's detailed work to assess and take measures necessary to prevent adjacent band interference into anticipated IMT base stations below 3800 MHz and radio altimeters above 4200 MHz, and would urge that Ofcom take another serious look at adjacent band effects from IMT stations below 3800 MHz into sensitive FSS receivers above 3800 MHz.
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.	As discussed in more detail in our Cover Letter, Ofcom's proposal for cost-based fees for the new services contrasts sharply with the AIP-based fees that Ofcom proposes to retain for FSS and FS licensee in the 3.8-4.2 GHz band. It is incongruous for Ofcom to find that the sterilization areas created by FSS and FS licences create "excess demand" from these new services, while finding that these new services would not create any "excess demand". The FWA services contemplated under the medium powered licences consist of fixed links that will create sterilization areas in much the same way as existing FS links in the band, while Ofcom itself acknowledges the possibility of localized contention among low-powered licensees. SES would urge Ofcom to take a more consistent approach to setting fees.
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
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?	See the Cover Letter generally.
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