

Your response

Question	Your response
Question 1: Are there other trends in the space sector (or the broader spectrum environment) that we should monitor and/or take	<p>Confidential? – N</p> <p>SpaceX appreciates Ofcom’s thorough review of the space sector in the Consultation. In general, the Consultation covers the key areas of innovation and trends in the sector.</p> <p>SpaceX requests that Ofcom consider the following trends in the space sector as it formulates its revised Space Spectrum Strategy (which are also explained in more depth throughout this consultation response):</p>

<p>account of in our strategy?</p>	<ul style="list-style-type: none"> • Growing demand and immediate need for full access to co-primary higher-frequency spectrum (i.e., Ku-, Ka-, Q/V-, and E-band); • The need for sufficient spectrum to rapidly respond to emergencies (natural disasters, conflicts) without impacting current customers; • The development of more efficient sharing mechanisms between NGSO-GSO and NGSO-RAS/EESS, and NGSO-FS to replace overly conservative methodologies; • The emergence of self-coordinated light-licensing for higher-frequency satellite gateway earth stations and inter-service coordination; and • “Light-touch” NGSO-NGSO spectrum sharing policies that incentivize private, operator-to-operator coordination on a good faith, timely basis, and reward efficiency, without the need for direct regulator intervention.
<p>Question 2: Do you agree with the broad areas we have prioritised for our work?</p>	<p>Confidential? – N</p> <p>Yes. SpaceX supports including Communications as the first priority in Ofcom’s Space Spectrum Strategy. SpaceX has shown that NGSO systems can provide high-speed, low-latency broadband service to those in even the most challenging areas. Access to sufficient spectrum is critical to ensuring that UK consumers receive the best possible satellite service, particularly in rural and remote areas that lack a suitable terrestrial network or competition.</p> <p>To ensure that this work area encompasses all possible communications use cases of next-generation satellite broadband connectivity, SpaceX urges Ofcom to prioritise emergency and disaster relief as a subset of its communications work area. When providing service in emergencies or for disaster recovery, it is important to have enough spectrum available to address these spikes in demand without impacting service to existing customers.</p> <p>To that end, Ofcom should focus on the need for full spectrum access in essential co-primary satellite spectrum bands, including the Ku-, Ka-, and E-bands. Today, the lack of full access to parts of these bands, notably in the 14 GHz and 28 GHz bands, as well as general access to the E-Band threatens spectrum supply crunches in the event of natural or man-made disasters.</p>
<p>Question 3: Are there other issues and actions that are likely to be important over the next 2 – 4 years?</p>	<p>Confidential? – N</p> <p>Next-generation satellite operators are working to close the digital divide and meet the growing demand for high-speed, low-latency service for consumers and businesses across the United Kingdom, including in rural and remote areas unserved by terrestrial networks; on the move in the air, at sea, and in vehicles; and in response to emergencies. However, to meet this demand today and in the future, it is critical for satellite operators to have full access to the spectrum that has been allocated on a co-primary basis and assigned on a shared basis, including Ku-band, Ka-band, and E-band spectrum. SpaceX appreciates that Ofcom has already included Ku-band spectrum as a high priority issue for this year, as this serves many customer user terminals; however, full access to spectrum used for gateway earth stations will be essential to meeting consumer demand: the upper-Ka band (27.5-30 GHz) and the E-band (71-76 GHz/81-86 GHz).</p>

(1) Unlock E-band Spectrum for NGSO FSS Gateway Earth Stations

Consumer demand for high-speed, low-latency satellite broadband is quickly outstripping capacity within essential shared satellite backhaul bands, including the Ka-band. To keep pace with consumers' growing need for high-speed, low-latency service while ensuring adequate capacity to address emergencies, Ofcom should prioritise opening E-band spectrum to be used for FSS gateway earth stations.

There is currently a high, immediate demand for E-band spectrum within the satellite community. SpaceX's second-generation constellation will use spectrum in the E-band for gateway earth stations to meet the growing demand of consumers for next-generation satellite service. Satellite industry groups in the United States (SIA) and Australia (CA SSWG) have identified E-band as a critical band for next-generation satellite networks that are currently coming to market, which is further evidenced by a number of ITU satellite filings for access to spectrum in the band.

Ofcom has been at the forefront of millimetre wave spectrum management, including with its innovative use of self-coordinated light-licensing in the E-band. Ofcom should take this opportunity to further modernize its policies for high-frequency spectrum management to drive rapid deployment of next-generation ground infrastructure by extending its existing self-coordinated light-licensing model for fixed links in the E-band to the entire 71-76 GHz/81-86 GHz range and accommodating fixed-satellite service gateways. Self-coordinated light-licensing between co-primary users (fixed, fixed-satellite service) is possible within these bands because high-gain, directional beams create "pencil beam" links that create small, predictable coordination zones between users.

The case for self-coordinated light-licensing is strong.

First, as with fixed links, satellite gateways in high-frequency bands use high-gain, directional beams that create small, predictable coordination zones between users of the band. Indeed, because gateways typically use relatively higher minimum elevation angles and even higher gain to close links with faraway satellites, the risk of in-line events between satellite and terrestrial main beams is vanishingly small. Moreover, through available techniques such as low sidelobes toward the horizon and shielding, satellite operators can further mitigate power toward the horizon. This low, predictable risk of interference allows satellite gateways to be included within the band without meaningfully impacting existing fixed links or foreclosing deployment of future links (including for 5G backhaul).

Second, Ofcom can readily extend its self-coordinated light-licensing process to accommodate satellite gateways in high-frequency bands such as E-band. Comsearch, the third-party that manages the United States' semi-automated link registration database in E-band, has confirmed that it can extend its database to include both fixed links and non-terrestrial gateways (including aeronautical, stratospheric, and satellite) with minor, straightforward changes,

and that the risk of interference between satellite gateways and fixed-links in the band is low. Because Ofcom is still preparing its permanent procedures for the E-band, the time is right to realize the major consumers benefits of the minor changes to the database to accommodate satellite gateways.

Third, self-coordinated light-licensing is the most administratively efficient means of taking advantage of these new higher-frequency bands to ensure that satellite operators can meet growing consumer demand. A multi-service, self-coordinated light-licensing approach in the E-band would further speed review and approval time, reducing administrative cost and labor associated with manual reviews for all but the most complex interference scenarios. Moreover, a self-coordinated approach would facilitate coordination between different co-primary services in a manner that permits efficient deployment of both services to the benefit of people and businesses alike. This model could dramatically improve the satellite earth station licensing process in the UK while providing better connectivity for consumers.

(2) Facilitate Full Access to 28 GHz Spectrum for NGSO FSS Gateways

Next-generation satellite operators such as SpaceX rely on the 28 GHz band (27.5-30 GHz) for robust gateway earth station uplink connectivity. This band has been allocated on a co-primary basis for the fixed-satellite service and is essential to enable satellite operators to meet the growing demand of consumers for spectrum access.

Today, fixed-satellite service operators lack full access to this critical spectrum in the United Kingdom because part of the band has been exclusively assigned to three terrestrial operators. As a result, satellite operators are required to negotiate for leased access to the spectrum. Unfortunately, without an obligation to negotiate in good faith or to share the spectrum on a co-equal basis, terrestrial operators seek rents costing hundreds of thousands or millions of pounds per year.

The current arrangement for 28 GHz spectrum harms satellite consumers and competition in a number of ways. First, the lack of access to sufficient spectrum in the 28 GHz band significantly reduces the ability of satellite operators to meet growing demand for satellite service. Second, because terrestrial operators are under no obligation to engage in, or complete, commercial arrangements in a timely manner or in good faith, the requirement to sublease can delay or deny critical satellite capacity necessary to serve end users. Third, because there is no obligation to share spectrum, terrestrial operators have an incentive to seek the maximum amount possible for their rent, passing on costs to satellite operators that must be assumed by the company—diverting scarce resources from innovation and customer service to unwarranted sublicensing fees—or passed onto the consumers, raises prices and reducing affordability (and consequently, consumer choice).

SpaceX urges Ofcom to commence a proceeding that paves the way for next-generation satellite operators to be granted co-equal access to the co-primary spectrum in the 28 GHz band that has been unnecessarily licensed to terrestrial operators on an exclusive basis. The Italian regulator Agcom recently concluded

	<p>a proceeding that will condition exclusive licenses for 28 GHz terrestrial operators on coordinating with satellite operators in good faith and without charging sublicensing fees. Moreover, it requires terrestrial licensees to share the locations of their 28 GHz deployments in order to speed gateway siting and coordination with satellite operators. SpaceX urges Ofcom to commence a similar proceeding.</p>
<p>Question 4: Do you have any evidence on whether specific actions should be a high priority?</p>	<p>Confidential? – N</p> <p>As explained below, Ofcom should prioritize non-geostationary fixed-satellite service access to (1) the full 14-14.5 GHz band for user terminal uplinks; (2) E-band spectrum for gateways; and (3) the full Ka-band.</p> <p><u>(1) 14 GHz</u></p> <p>SpaceX strongly agrees with Ofcom’s proposal to make available the 14.25-14.5 GHz band for satellite user terminals as a “high priority action,” as lack of access to this band is an immediate need to enable next-generation satellite providers to meet current consumer demand in the UK. SpaceX agrees with Ofcom’s 2017 determination that the band “could be used more efficiently” and that doubling the available Ku-band uplink spectrum for satellite user terminals would benefit consumers in the United Kingdom, whether they are at their home or on the move.</p> <p>The demand for and benefit of access to the spectrum at 14.25-14.5 GHz is clear and growing. SpaceX’s first- and second-generation constellations rely on access to the entire 14 GHz band (14.0-14.5 GHz) in order to provide consumers with high-speed, low-latency broadband service. In addition, SpaceX’s earth stations in motion rely on the same frequencies to provide robust broadband service on aircraft, ships, and moving vehicles.</p> <p>There is little evidence of intensive use of the spectrum at 14.25-14.5 GHz currently in the UK, and if granted access, SpaceX could begin to put this spectrum to immediate use to serve customers with next-generation satellite services. As it is, access to only a portion of the band is already beginning to constrain the ability to expand service to the citizens of the UK. In most markets globally, fixed satellite services share access to the entire 14.0-14.5 GHz range of frequencies, and operators rely on this to provide satellite broadband.</p> <p>While SpaceX appreciates Ofcom’s commitment to opening a consultation in the Spring of 2022 on demand for the Ku-band and “options for . . . future use” of the band, it urges Ofcom to begin and conclude the consultation as expeditiously as possible so that consumers can benefit from this additional spectrum as soon as possible.</p> <p><u>(2) 28 GHz</u></p> <p>Strong evidence exists to support making the entirety of the 28 GHz band (27.5-30 GHz) available to fixed-satellite service on a co-primary basis by requiring existing exclusive terrestrial licensees to coordinate coexistence on a timely, good-faith, and fee-free basis with satellite licensees.</p>

	<p>As explained above, the current exclusive licensing model for 28 GHz spectrum harms satellite consumers and competition in a number of ways. First, the lack of access to these portions of the 28 GHz band significantly reduces the ability of operators to meet growing demand for satellite-delivered broadband. Second, because terrestrial operators are under no obligation to coordinate at all, much less in a timely manner or in good faith, considerable time and money is spent trying to gain access to necessary spectrum, even if it is unused. Third, because there is no obligation to share access to this spectrum, terrestrial operators have an incentive to seek the maximum amount possible for their rent, passing on costs to satellite operators that diverts scarce resources from innovation and service for customers to unwarranted subleasing fees, which in extreme cases must be passed onto the consumers, raising prices and reducing affordability (and consequently, consumer choice).</p> <p><u>(3) E-Band</u></p> <p>The evidence supports making E-band spectrum available for next-generation satellite operators as expeditiously as possible.</p> <p>As an initial matter, SpaceX’s next generation system will use E-band spectrum to serve more customers with better quality service and ensure additional capacity to address emergencies. SpaceX is poised to deploy its next-generation satellite constellation imminently, and E-band will be essential to realizing the full benefit of the constellation for UK consumers and businesses.</p> <p>This spectrum is especially suited to sharing as the very narrow and focused beams used by next generation satellite services support coexistence with other users. SpaceX is not alone in its interest in this band, with a number of other operators having already filed at the ITU for E-band spectrum. Further, there is widespread support for a self-coordinated light-licensing approach for satellite gateways in the band among the satellite community—including the Satellite Industry Association (US) and the Communications Alliance Satellite Service Working Group (Australia), in addition to individual operators—in public comments filed in consultations in the United States and in Australia, among other countries.</p> <p>Speedy access to E-band spectrum is critical to meet growing consumer needs for real-time, bandwidth-intensive applications that have become so necessary during the COVID-19 pandemic.</p>
<p>Question 5: Do you have any other issues you wish to comment on?</p>	<p>Confidential? – N</p> <p><u>(1) EESS</u></p> <p>SpaceX is a strong supporter of the earth exploration satellite service as is shown by the number of earth exploration satellites SpaceX has already launched and continues to on its Falcon 9 rockets.</p> <p>While it is important to ensure that earth exploration satellites have access to the spectrum necessary to conduct their important work, SpaceX agrees with</p>

paragraph 5.44 of the Consultation that overly conservative protection of EESS can constrain the development of new communications services. Indeed, overly restrictive protection standards not only constrain development, but also restrict the capacity available to provide service to consumers.

For that reason, Ofcom should proceed with caution when considering authorization of new EESS bands that are adjacent to critical satellite communications bands, such as the upper-Ka band (27.5-30 GHz). Specifically, Ofcom should ensure that any new spectrum authorizations for EESS do not constrain satellite services from taking advantage of the full band for which they are authorized.

Similarly, Ofcom should ensure, as it opens new spectrum bands for FSS use in higher frequency bands such as E-band and terahertz spectrum, that it adopts an access framework that will support satellite communications for consumers and businesses in the UK, consistent with the first priority of the proposed space spectrum strategy.

(2) Intersatellite links

SpaceX is currently deploying satellites with optical inter-satellite links (“ISLs”) that will enable satellites to connect more people in more places while reducing the dependency on ground infrastructure.

SpaceX appreciates Ofcom’s recognition of the “need to ensure appropriate protection of existing UK services” from the intersatellite links being considered under WRC-23 Agenda Item 1.17 that propose use existing FSS spectrum bands and agrees that “this new application should not place any additional constraints to” existing systems. Specifically, SpaceX urges Ofcom to proceed cautiously with respect to inter-satellite links within traditional satellite bands such as the Ku-band and Ka-band. While studies are ongoing at the ITU, serious technical and operational questions remain about the ability of these proposed new intersatellite links to coexist with and adequately protect traditional Earth-to-space and space-to-Earth links in Ku- and Ka-band, which that have become the bedrock of modern satellite networks and are already shared between many services and users. For that reason, these new ISLs must be secondary to all other FSS satellite users.

(3) Network licensing

SpaceX understands the motivation underlying Ofcom’s proposal to shift from a license exempt regime to a network license model so that it might resolve issues of harmful interference.

However, the CEPT has already decided that where operators meet the standards set forth in ECC Dec. (17)04 and (18)05 (for NGSOs), license exemption is appropriate. SpaceX requests that Ofcom consider strategies for removing unnecessary regulatory burdens, which will simultaneously improve administrative efficiency while driving connectivity for consumers around the United Kingdom.

	<p><u>(4) Conditions on satellite downlinks to protect RAS</u></p> <p>In the Consultation, Ofcom proposes to consider adding new conditions on UK authorized ground equipment. SpaceX believes these new conditions are unwarranted and Ofcom should avoid adding them.</p> <p>Ofcom has not identified any evidence of interference that would warrant a new layer of oversight or the failure of a complaining radio astronomy site to coordinate with operators to resolve interference issues. As Ofcom has already adopted an entirely new and untested licensing regime that is proving to be extremely complex and cumbersome, it would be premature to add conditions to address a speculative issue.</p> <p>Even if there were evidence of an issue, downlink spectrum is best addressed at the satellite system level, and operators are already subject to ITU, home administration, and market access oversight that sufficiently addresses interference risks without the need for additional regulation on earth station licenses. As Ofcom notes, it already has the ability to raise issues with responsible administrations.</p>
<p>Question 6: Are there other issues and actions specifically relating to NGSO communication systems that are likely to be important over the next 2 – 4 years?</p>	<p>Confidential? – N</p> <p><u>(1) Providing adequate spectrum access to meet consumer needs</u></p> <p>As stated above in the answer to questions 2-3, the most important spectrum bands that current NGSO FSS systems use to deliver robust connectivity to end users are the Ku-band (including the full 14.0-14.5 GHz uplink band) and the Ka-band (including access to the full 27.5-30 GHz uplink band), and soon the E-band (71-76 GHz and 81-86 GHz).</p> <p>Without access to these bands, satellite operators will be constrained in their ability to connect consumers across the United Kingdom and to respond to unforeseen spikes in demand due to natural disasters and other crises. Moreover, a lack of access to sufficient spectrum will leave more operators sharing increasingly congested bands, making it more difficult for satellite operators to compete alongside terrestrial operators that have greater access to spectrum, including exclusive spectrum rights. Ofcom should prioritise full access to these bands on an expedited basis to minimize the risk that consumers will be left without adequate connectivity.</p> <p><u>(2) Creating incentives for good-faith, timely private coordination between satellite operators</u></p> <p>As SpaceX requested in response to Ofcom’s NGSO consultation in 2021, Ofcom should prioritise policies that drive timely, good faith private coordination between satellite operators. To that end, Ofcom should adopt appropriate incentives to drive efficient outcomes without the need for regulator intervention in discussions.</p>

For example, SpaceX asks Ofcom to consider a spectrum-splitting backstop in the event operator-to-operator coordination is not completed by the time both operators have commenced service in the UK. Under this approach, operators should strive to reach a coordination agreement before both systems have commenced service in the UK. But in the event that such an agreement is not reached, the operators would be required to split the spectrum evenly in the case of inline events. As this approach is not an ideal solution for either party it not only drives both parties to find a better option through coordination, but also provides a basis for operation in the case of an inline event where a coordination agreement doesn't exist, avoiding one party from stonewalling coordination to prevent the other from operating. This spectrum-splitting approach has already been adopted in the United States.

This "Solomonic" spectrum-splitting approach presents certain advantages. First, because no operator desires to operate with access to less than a full allotment of spectrum, all operators will have the incentive to reach a coordination agreement quickly that is better suited to their particular system. Second, this straightforward resolution limits the degree to which Ofcom will need to involve itself in operator-to-operator negotiations. Of course, Ofcom also has the opportunity to improve upon the U.S. approach by maximizing preferred public policy outcomes (e.g., rapid deployment to consumers, competition, and efficient use of scarce spectrum resources). For example, Ofcom can give first choice of spectrum in a splitting event to the operator with the more efficient system, creating an incentive to invest in spectral efficiency. Alternatively, Ofcom could require both operators to split any encumbered spectrum evenly once operational, making all spectrum truly fungible. If Ofcom does alter its current approach, it should consider the spectrum-splitting model.

This approach is consistent with Article 3(2)(a), which looks to ensure "the optimal use for wireless telegraphy of the electro-magnetic spectrum." The approach outlined above would ensure the most optimal use of the spectrum by encouraging operators to coordinate swiftly and in good faith based on the specific technical details of each system. This approach is also consistent with Ofcom's duties set out under sections 4, 24, and 25 of the Communications Act of 2003. The compatibility of this proposed remedy with public policy goals is witnessed by it already having been adopted in other jurisdictions, such as the U.S.

To further drive competition consistent with its new licensing framework, when evaluating new applications, Ofcom should carefully consider the technical and operational constraints that specific gateways and user terminals could create on future licences. Gateways that can only operate if afforded large protection zones and separation distances will necessarily limit competition. For high-speed services, the need for ground equipment in the UK will scale with demand for service. As more consumers require more throughput, operators will require more gateways to support their service. Gateways that require large separation distances will limit competitors' ability to scale their systems to meet demand. Moreover, while spatial separation is one way to limit interference, operators have a large number of other options that will not result in decreased competition. For instance, the spectrum-splitting approach described above could allow operators to co-locate gateways. Operators could

	<p>also employ alternative options when separation is not possible. For instance, operators can use angular antenna discrimination to ensure antennas are pointed in divergent directions to avoid interference. These are matters that are best suited to private coordination amongst operators.</p> <p>Finally, in the event that Ofcom intervenes in coordination discussions, it should adopt a presumption in favour of more efficient and flexible systems, such as those that use narrow steerable beams, that are designed to mitigate potential for degradation into other systems. In contrast, systems with wide, non-steerable beams make cooperation more difficult and should be presumed to be the primary cause of degradation. This presumption is fair and accurate. The goal of spectrum sharing needs to be promoted actively through rules that encourage and reward spectrum sharing technologies.</p>
<p>Question 7: Do you have any evidence on whether specific actions relating to NGSO communication systems should be a high priority?</p>	<p>Confidential? – N</p> <p>In support of its request for expedited access to critical spectrum bands (including to the full 14.0-14.5, 27.5-30 GHz, and E-band), SpaceX has provided its rationale in the answers to questions 3 and 4 above.</p>
<p>Question 8: Do you have any other comments relating to NGSO systems?</p>	<p>Confidential? – N</p> <p>SpaceX appreciates the opportunity to provide additional comments on Ofcom’s Space Spectrum Strategy.</p> <p><u>(1) Adopt a light-touch NGSO licensing regime that prioritises private operator-to-operator coordination</u></p> <p>In paragraph 6.28 of the Consultation, Ofcom notes that its “role is not to prescribe how NGSO systems should share with each other” and asks how it might “create the conditions for operators to reach agreements with each other that support efficient use of spectrum, and to act as a back stop if harmful interference should arise.” As described above in the answer to Question 6, the best way to achieve this important goal is to establish default spectrum sharing policies that encourage timely, good faith coordination discussions—such as spectrum-splitting—and reward more efficient systems, rather than intervening in private coordination.</p> <p>To that end, SpaceX urges Ofcom to reconsider its recently adopted NGSO licensing framework and adopt a light-touch regulatory model that prioritizes private operator-to-operator coordination with default policies that reward efficiency and timely completion of coordination discussions. This model—which had been successfully deployed in the United Kingdom until months ago—has been successfully deployed in the United States leading to efficient</p>

coordination discussions between operators without the need for direct regulator intervention.

(2) Make additional spectrum available for NGSO systems to ensure that those systems can meet growing consumers demands for high-speed, low-latency broadband wherever they are

SpaceX supports Ofcom's proposal to "consider whether NGSO systems should be able to access the same spectrum in the same way as GSO systems," as set forth in paragraph 6.18 of the Consultation. As a general matter, greater spectrum access for NGSO systems through more efficient licensing mechanisms will provide those systems will greater ability to deploy networks to meet the growing demand of consumers for high-speed, low-latency broadband service wherever they are—including on ships and aircraft. At the same time, however, Ofcom should explore more efficient ways of authorizing satellite ground equipment, including through models such as blanket licensing and unified light-licensing, which will enable even more efficient coordination and coexistence between satellite networks and terrestrial fixed services.

(3) Adopt efficient sharing and licensing mechanisms that reflect the true risk of interference without imposing significant new administrative overhead and regulatory delays

(a) Satellite interference modelling

In the Consultation, Ofcom suggests requesting that operators submit receivers to conduct lab measurements and inform more efficient spectrum sharing. SpaceX appreciates Ofcom's motivation to find more efficient means of enabling spectrum sharing among NGSOs and between NGSO and GSO systems, but urges caution. For example, Ofcom should make clear that while it may request receivers from operators to conduct lab measurements, it will not require operators to submit receivers and will not delay licensing to conduct such measurements.

(b) International coordination framework

SpaceX appreciates Ofcom's recognition that coordination is a two-way street and that all NGSO systems should negotiate in good faith to reach timely, efficient coordination agreements.

However, in SpaceX's experience, the best way to achieve this outcome is to develop incentives that encourage operators to work bilaterally and privately in good faith, as described above in the answer to Question 6. Indeed, well-designed, light-touch spectrum sharing policies with appropriate backstops will alleviate the concerns that Ofcom raises.

First, with respect to information sharing, SpaceX's experience is that operators faced with the prospect of a less than desirable outcome, e.g. application of a default spectrum-splitting rule, are likely to work collaboratively to avoid that outcome, sharing necessary confidential information in order to enable both

systems to reach an agreement. To the extent that later-filed systems may need to coordinate with a system that is not—and in fact may not even end up ever being—deployed in practice, the solution is straightforward: allow operators to deploy their system during good faith coordination discussions and require a regulatory backstop (e.g. spectrum-splitting) only during in-line events between similarly situated operational systems. Ofcom should not permit “paper” systems to hold up the deployment of networks and thereby harm UK consumers and businesses. In SpaceX’s experience, some later-filed and non-yet-operational system operators use the guise of information sharing requests to seek access to confidential proprietary system design information outside of information that is strictly necessary for facilitating coordination. Ofcom should avoid any requirement that could encourage these “fishing expeditions” by requiring operators to make unnecessary proprietary and sensitive information available to firms who could use it to gain a competitive advantage during their system design phase.

Second, while earlier-filed systems can in theory demand very high levels of protection against later filed systems, in practice operators are likely to moderate their demands to avoid jeopardizing their own modifications and new systems in the future. Moreover, default rules will drive earlier-filed systems to reach an efficient result to avoid losing access to critical spectrum when a later-filed system deploys.

Third, there is a serious risk that by adopting interference guidance beyond what the ITU Radio Regulations already require, Ofcom will usher in a patchwork of spectrum regulations that could further complicate the international NGSO regime and thereby introduce even greater delays into the coordination process and more difficulty in spectrum management across systems. As such, Ofcom should leave system-wide issues such as orbital characteristics, coordination status/priority, and satellite numbering to the ITU, or apply any such rules solely to UK-filed NGSO systems.

(c) Spectrum pricing

SpaceX requests that Ofcom maintain its administrative cost-recovery based pricing rather than permitting operators to pay for inefficiency by requesting large keepout zones. Allowing operators to request large-keepout zones for a fee would undermine good faith coordination, harm competition, and harm service to end users without any offsetting benefit. Indeed, well-designed NGSO systems can allow gateways to site in close proximity without the need for massive keepout zones, making better and more intense use of valuable spectrum.

(d) NGSO sharing with GSO satellites

SpaceX supports Ofcom’s intention in paragraphs 6.43-6.45 to “avoiding inefficient constraints on the growth of NGSO systems” and welcomes efforts to develop GSO interference models that accurately reflect the interference risk (see Consultation paragraph 6.52) and can inform more efficient means of NGSO/GSO coexistence. Current EPFD rules were designed at a time when no NGSO systems were operational. These rules overly protect GSOs to the

detriment of NGSO systems and the public who uses their services. The existing rules come from a time when GSO systems were first faced with the possibility of competition from higher-speed, lower-latency NGSO operators and had an incentive to make unreasonable demands to constrain NGSO deployment when no NGSO systems were developed to provide any balance to the rules.

(e) NGSO sharing with RAS

SpaceX appreciates Ofcom's recognition that current protection criteria for radio astronomy and other passive services can unduly constrain consumer-focused NGSO broadband systems. To the extent that Ofcom develops a new approach to coexistence between NGSO systems and radio astronomy sites, Ofcom should ensure that NGSO systems are able to participate in the process.

SpaceX urges Ofcom to avoid imposing new license conditions or prescriptive rules regarding coexistence between NGSO systems and radio astronomy, but instead to rely on the ITU Radio Regulations as a baseline. As Ofcom notes, it already has the capability to raise downlink interference concerns with the filing administration of NGSO constellations. As such, a better way to avoid interference challenges is to establish efficient rules and encourage private coordination to resolve interference concerns.

(f) NGSO sharing with fixed links

SpaceX agrees with paragraphs 6.59-60 of the Consultation that due to high elevation angles and narrow beams using angular separation, NGSO gateways can coexist with fixed links without the need for large separation distances. This is particularly true in higher-frequency bands such as the Ka-, Q/V-, and E-band. Indeed, using common techniques such as low sidelobes toward the horizon and site shielding, NGSO gateways can coexist with terrestrial links with minimal physical separation.

For that reason, to maximize the value of these bands for consumers and businesses in the UK, Ofcom should adopt spectrum management frameworks—such as self-coordinated, database-driven light-licensing—that enable rapid siting of gateways to support next-generation satellite networks through tools such as link registration databases without impairing existing or future users of the band. These models—which drive NGSO operators limit interference toward the horizon—obviate the need for opportunity-cost based spectrum fees.

(g) NGSO sharing with mobile

SpaceX urges Ofcom to exercise extreme caution when investigating whether to permit terrestrial mobile sharing with NGSOs. The ubiquitous and omnidirectional nature of mobile services is often incompatible with satellite systems except in rare situations where there are strict limitations on terrestrial mobile antennas. Before permitting terrestrial mobile services in bands on which NGSOs rely on to serve customers, Ofcom should require those mobile proponents to demonstrate that their operations will not cause any increased interference to NGSO systems.

