Your response

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Question 1: Do you have any comments on our assessment of the interference challenges raised by NGSO systems and their potential impact on a) service quality; and b) competition?	Confidential? – N SpaceX appreciates Ofcom's attention to the deployment of next-generation satellite systems to serve citizens and consumers in the United Kingdom (UK) and welcomes the opportunity to submit comments on this important consultation. SpaceX provides high-speed, low-latency broadband directly to over 100,000 consumers globally, with this number rapidly increasing each week and demand presently outpacing supply of user terminals. SpaceX is proud to have connected thousands of otherwise unserved consumers in the UK and looks forward to serving many more in the future. As a consequence of its experience operating in multiple countries, SpaceX has unique insight into the most effective rules to encourage coordination between operators. As a general matter, SpaceX urges Ofcom to ensure that any approach it takes does not unnecessarily delay needed service to otherwise unserved or underserved UK consumers. As Ofcom is acutely aware, the global pandemic and associated challenges have demonstrated the urgency in connecting unserved people as quickly as possible so they can better access education, work, healthcare, and other necessary services. Addressing Question 1 in particular, SpaceX is not aware of any interference challenges in the UK and does not foresee any in the near future that merit changes to the existing successful licensing framework, particularly any changes that could further delay needed service at this critical time. For that reason, Ofcom should maintain its existing successful approach to encourage operator-to-operator coordination for spectrum use. This approach is the gold standard for maximizing use of spectrum. Operators themselves are in the best position to understand how their systems can cooperate with each other to provide the best services and the most choices for UK consumers. As the consultation notes, only one NGSO operator—SpaceX—is currently serving UK consumers and only four others are currently considering offering service in the UK. Changing Ofcom's current approach now, without allowing coordination to more fully develop, risks unintentionally upsetting negotiations and slowing both coordination and deployment. Even if all four other NGSO operators do eventually deploy systems in the UK (which is far from a forgone conclusion given the technical and financial hurdles associated with such an undertaking), they should be able to coordinate under Ofcom's existing rules. Critically, coordination is enabled by operator investment in next-generation satellite systems that are designed to be efficient, flexible, and resilient.

	The best way to encourage cooperation and competition among non-geostationary satellite system operators is to allow them to coordinate without preconceived conditions that could unintentionally undermine technical discussion. To be sure, Ofcom would still maintain its critical role in monitoring coordination discussions and ensuring operators continue to engage in good faith. Maintaining Ofcom's current approach would consistent with most other regulators that have considered how best to encourage cooperation among operators. SpaceX is currently operating in 19 countries and has engaged deeply with the governments in each. While some operators have attempted to have regulators interfere in coordination discussions, each time the regulator has decided these issues are best handled by the operators directly without regulatory intervention. For example, when the Chilean government was asked to intercede in a negotiation over placement of gateways between two operators, the regulator evaluated the request and opted to issue only a brief statement summarily dismissing the request. The regulator correctly determined that it should not relieve the parties of the burden to coordinate in good faith. Ofcom and SpaceX share a common goal of providing high-speed broadband internet connectivity to as many UK consumers as possible, as quickly as possible. Long-term interference possibilities should be viewed through this prism. At this point, the concerns raised in the consultation have yet to manifest themselves, and in fact, may never come to fruition. Instead, Ofcom should prioritize more immediate encumbrances to deployment, specifically by ending the current moratorium on new applications and licences during the pendency of this consultation and making the 14.25-14.5 GHz spectrum bands available for consumer use by allowing FSS in the band alongside the existing fixed service links. These two straightforward steps would result in thousands of otherwise unserved UK consumers having access to new broadband services effective immediately. SpaceX therefore asks Ofcom to consider ending the moratorium on applications and begin a consultation to explore the use of the 14.25-14.5 GHz band for NGSO fixed satellite services while it continues to monitor the deployment of next-generation satellite systems.
Question 2: Do you have any comments on our approach to dealing with the interference challenges raised by NGSO systems?	Confidential? – N As noted above, Ofcom's current approach to licensing is successfully encouraging rapid deployment of multiple systems to serve the UK. If Ofcom nonetheless chooses to alter its current approach, SpaceX supports Ofcom's focus on encouraging cooperation and supporting competition. Ofcom should also ensure any new process both prevents operators from attempting to abuse the regulatory process, as described below, and does not impede or otherwise slow down broadband service roll-out to consumers.

Encouraging cooperation. To best encourage cooperation, 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 will split the spectrum evenly once operational. Ideally, this backstop will never be used specifically because spectrum splitting is not an ideal solution for either party, which means that the prospect of splitting will drive both operators to find a better option through coordination. In fact, the United States, one of the only countries to formally consider the issues discussed in this consultation, adopted just such an approach.

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 its 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. For example, Ofcom can give first choice of spectrum 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.

In contrast, some operators may suggest that they should be given total protection based only on the date their applications were submitted to the ITU, but such an arbitrary approach would discourage cooperation and prevent successful coordination, undermining the core goals of this proceeding. Specifically, operators that claim total protection based solely on ITU "priority" have a strong incentive not to invest in spectrally efficient systems, under the misplaced belief that they need not be concerned with how to share the spectrum or cooperate with others. For example, an earlier-in-date system could create interference to others through massive non-steerable beams that effectively block any other operators from providing service to UK customers. Further, these operators could then refuse to accommodate other systems during

coordination, claiming the newer operator bares the sole responsibility of finding ways to work around their inefficient system. Again, the end result is that UK consumers are denied needed services.

For these reasons, this "date priority" approach runs counter to the very approach and guidance of the ITU, in the WRC-19 Report of the Radio Bureau Director, which has explicitly explained that

> "[t[his cooperative system is often referred as 'first-come-first-served' but it should be noted that this expression tends to oversimplify the actual system, which relies on a 'first-come-first-served' approach only for the identification of the satellite networks with which a newcomer has to discuss/coordinate." (WRC-19 BR Director's Report at 7)

In fact, the BR Director's report went on to clarify that "the requesting ***and responding*** administrations shall make every possible mutual effort to overcome the difficulties, in a manner acceptable to the parties concerned." (Emphasis added).

The few national regulators that have addressed the issue agree. As Ofcom correctly notes at paragraph 2.18 of this consultation, "regardless of the date of . . . filing, *all* operators need to make every effort to accommodate these coordination discussions, working in good faith to reach coordination agreements." (Emphasis added). Similarly, the U.S. FCC has considered and rejected an interpretation of "priority" that would give absolute rights of protection, noting

> "This regime could unduly chill investment in competing systems. If the first [date] priority system is not ultimately deployed, it could delay the provision of NGSO FSS broadband by lower-priority systems fearful of a hypothetical sharing environment. And it gives the highest priority system weaker incentives to accommodate competing NGSO FSS systems."

Managing Interference. Adopting the spectrum-splitting approach described above as rules would obviate the need for the proposed new conditions on licences. But if Ofcom does decide to adopt new conditions, they should be specific and designed to encourage private coordination to alleviate interference in the first instance. Conditions should make clear that Ofcom will 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.

Supporting Competition. While adding the proposed "competition check"—i.e., analysing and addressing the risks that earlier systems will

	hinder deployment of competing systems—likely is unnecessary at this stage and will be difficult to administer, SpaceX supports the general approach described in the consultation. Specifically, Ofcom's competition check should take into account the technical 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. The need for ground equipment in the UK will scale with demand and service. As more consumers require more throughput, they will also require more user terminals and more gateways to provide this 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 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. Separation distances between gateway sites—especially at distances as wide as 100 km—could unintentionally limit competition and service to consumers. Because access to fibre in the UK is limited in some of the remote locations where gateway sites tend to be located, large separation distances will greatly reduce the number of available site locations and will favour early market entrants while discouraging newcomers. Moreover, as Ofcom notes in the consultation, a separation distance will likely contribute to the scarcity of gateway site locations in the UK and will prevent new operators from entering the market or existing operators from expanding capacity. **Open and Transparent Process**. Ofcom's existing process has successfully encouraged new deployment and services and any reforms at this point would be premature. The consultation nonetheless asks whether to adopt a new public comment period for NGSO applications. If Ofcom moves away from its current process by implementing such a comment period, it should ensure this review period does not result in unnecessary delays in critical deployment. While the consultation notes that Ofcom will take this added time to assess whether coexistence is possible, this assessment would benefit from a presumption that deployment of new infrastructure will result in more service to consumers and should therefore be approved quickly.
Question 3: Do you have any comments on the proposed updates to our process for NGSO gateway and network licences?	Confidential? – N If Ofcom determines it must change its existing successful approach to NGSO network and gateway licences, SpaceX agrees any changes must focus on supporting competition and managing interference. Specifically, any new rules should encourage operators to coordinate privately, which should result in the optimal use of spectrum to serve

	UK consumers. Use of the spectrum-splitting approach outlined above would both create the appropriate incentives to coordinate and provide the maximum flexibility to deploy multiple systems in the UK. **Gateways.** SpaceX agrees with the proposal to continue considering licence applications in the order received, and that earlier licence applications should not have the ability to block later systems if it is reasonable for them to coexist. But this approach should not mandate minimum separation distances for gateways, which are often not necessary and could inhibit competition. As noted above, well designed and spectrally efficient NGSO systems should be able to collocate (or operate in reasonably close proximity) and use other tools to avoid interference. As stated earlier, given the disbursement of population and fibre access points, any operator requesting separation distance, especially those as great as 100 km, is not deploying a spectrally efficient system. These sorts of separation distances will likely limit future deployments, reducing service and competition. Deference to systems designed to be more spectrally efficient is critical to incentivise systems that utilize technical solutions that enhance, rather than detract from, competition. SpaceX also supports a requirement for commencing and maintaining transmissions within 12 months. If the public comment period approach is adopted, modifications such as applications to increase the number of antennas at a gateway site should not be subject to this requirement, as such a change will not have any effect on other operators but would slow enhancement of service to UK consumers. This will encourage the rapid deployment and enhancement of critical infrastructure to provide UK consumers with options for connectivity. **Network licences.** If Ofcom changes its existing successful approach to network licensing, SpaceX supports Ofcom's approach to consider what interference mitigation techniques the operator has employed. For instance, SpaceX has invested in developing advanced phased array antennas that allow it to use narrow, steerable beams to avoid interference. In contrast, systems with wide, non-steerable beams are less able to coexist and may prevent future deployments. As noted above, adopting a spectrum-splitting approach could obviate the need for additional conditions on licences and save Ofcom from having to use scarce resources by getting involved in operator-to-operator coordination discussions. **Order of processing.** Ofcom should consider prioritizing and expediting the processing any pending NGSO gateway and network licences that were impacted by the Ofcom-imposed licensing moratorium while awaiting the conclusion of the consultation. Halting all gateway licensing for a period of over six months significantly hinders the provision of service to customers as it effectively "freezes" networks from increasing capacity. By lifting the moratorium and prioritizing pending applications,

	Ofcom has the opportunity to immediately enable more service to otherwise unserved UK consumers.
Question 4: Do you have any comments on the proposed updates to existing and new NGSO network licences?	Confidential? – N As noted above, SpaceX does not anticipate interference issues between NGSOs that would require changes to Ofcom's existing successful licensing approach. If Ofcom does choose to alter its current approach, any new rules or conditions should be carefully crafted to encourage private coordination in the first instance. In the event that private coordination is not complete, Ofcom should adopt default rules that enforce spectrum splitting on the basis of technological capabilities. This approach should be based on technological efficiency in order to create a "race to the top" effect that will promote innovation and competition, directly benefiting the end user and the entire UK market. There should be a presumption in favour of operators that have designed their systems to be efficient, flexible, and robust. Regarding NGSO user terminals, Ofcom could help alleviate pressure on the coordination of these devices by allocating 14.25-14.5 GHz to Fixed Satellite Services (FSS) and allowing for a blanket licensing regime. This would minimize the regulatory burden placed on Ofcom and would allow operators to increase their capacity drastically. Currently, NGSO operators are severely constrained by the lack of access to this band and, according to the Ofcom licence database, it contains only a small number of fixed links that FSS can avoid. If Ofcom opened these bands to FSS users, it would immediately permit the provision of high-speed, reliable service to customers in the most rural parts of the country. Use of these bands will enable operators such as SpaceX to serve more UK customers.
Question 5: Do you have any comments on the proposed updates to existing and new NGSO gateway licences?	Confidential? – N As stated above, SpaceX supports Ofcom's current licensing framework for NGSO gateway licences, even as more operators enter the market. Changing the existing approach is premature without actual evidence of how future gateways could be inhibited. As previously stated, SpaceX believes competition and cooperation are best served by maintaining the existing framework, as Ofcom's current process has been successful in encouraging deployment. At this point, no evidence has been presented of any interference challenges, making alterations to the existing successful approach premature. However, if Ofcom chooses to adopt new licence conditions, it would be helpful to operators and would enhance the incentive effect for efficient operation if Ofcom published guidelines indicating how it would apply remedies if they were ever required. It would promote cooperation

	between operators and push them to adopt the most spectrally efficient technology if any guidelines: 1. Adopt a spectrum-splitting approach to interference challenges. This approach would encourage swift coordination and cooperation, leading to more competition, and ultimately better service to consumers. As an example, the U.S. FCC has already considered interference issues and has adopted a similar system that has resulted in better cooperation, and therefore, better service. For instance, in the U.S., operators have been allowed to successfully operate gateways with minimal separation distance and no diminishment of service. 2. Adopt a spectrum-sharing approach that gives preference to systems that are more efficient spectrum users. Specifically, systems should be preferred if they are designed to be more resilient to interference and more adaptable to avoid interference. The drafting of guidelines should not result in any pause in licensing. As noted earlier, removing the current moratorium on applications and licensing can unlock competition and quickly result in greater connectivity to those UK consumers who need it the most.
Question 6: Do you agree with our proposal regarding NGSO terminals operating in Ka band?	Confidential? – N SpaceX agrees that NGSO terminals operating in the Ka band should be treated the same as user terminals in the Ku band. Operations in the two bands are operationally the same, operators in both bands are under the same requirements to coordinate in good faith, and the technical approaches to cooperation are the same. As such, Ka band user terminals should operate under the same type of network licence as Ku band. While additional conditions on network licences are not necessary at this time in either Ku band or Ka band, if Ofcom does adopt new conditions, they should apply equally to Ku band and Ka band user terminals.