



21 September 2022

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[REDACTED]  
Regarding your letter of 7 September, 2022, SpaceX offers additional information regarding our application for 6 NGSO Earth Station (Gateway) licenses.

*Q1. Could you provide information regarding, but not limited to:*

*a) Any mitigations that you might have in place to protect GSO networks e.g. angular avoidance of GSO arc.*

Answer: SpaceX observes a GSO angular avoidance angle between space stations and gateway Earth stations to protect GSO networks as specified in Article 22 of the ITU Radio Regulations.

With respect to the gateway earth station application before Ofcom, the system employs operational measures to establish an appropriate exclusion zone about the geostationary-satellite orbit at all times. These measures include restrictions on antenna beam pointing directions (GSO arc avoidance) and/or e.i.r.p. reduction by reducing spectral density or overall system transmit power as needed to meet the uplink and downlink epfd limits of Article 22.

Compliance with the downlink epfd limits of No. 22.5C for the bands in use by our gateway earth stations is assured by the following two means, which are employed simultaneously:

1. All downlink spot beams on each satellite are independently steerable.
2. The maximum transmit carrier power and power spectral density levels will only be used for space station downlink beams that are angled sufficiently away from the boresight of GSO receiving earth stations such that the angular separation, as viewed

from a GSO receiving earth station located at the beam center, between the direction towards the space station and the direction towards the GSO arc, provides the required attenuation of the space-to-Earth transmissions. For space station downlink beams that are angled closer to the boresight of GSO receiving earth stations, where the maximum transmit carrier power and power spectral density levels would cause an exceedance of the downlink epfd limits of in Article 22, the levels are correspondingly reduced such that the system fully meets the corresponding downlink epfd limits.

Compliance with the uplink epfd limits of No. 22.5D is assured by the following two means, which are employed simultaneously:

1. All uplink spot beams on each satellite are independently steerable.
2. The maximum transmit carrier power and power spectral density levels will only be used for uplink beams from gateway earth stations that are angled sufficiently away from the geostationary orbit (GSO) such that the angular separation between the main beam of a transmitting gateway earth station antenna in the system and the GSO arc provides the required attenuation of the Earth-to-space transmissions towards any GSO satellite. For transmitting gateway earth stations uplink beams pointed closer to the GSO arc, for which the maximum transmit carrier power and power spectral density levels would cause an exceedance of the uplink epfd limits in Article 22, the levels are correspondingly reduced such that the system fully meets the corresponding uplink epfd limits.

*b) Compliance with the EPFD limits in Article 22 of the ITU-R Radio Regulations (single entry and aggregate interference) at the 6 proposed gateway locations. This is because one respondent raised the fact that the ITU examination software may not identify the worst geometry in terms of long-term interference to GSO networks, and that the Article 22 downlink epfd limits could be breached at the gateway locations if operating with the filed parameters.*

[REDACTED]

Q2. Could you provide information confirming:

- a. *the expected size of your future constellation and how long it will take to deploy the full constellation*

Answer: SpaceX has a pending application before the FCC for a second-generation satellite system of 29,998 satellites. Deployment is planned to begin after authorization and will likely take several years to complete.

- b. *whether this would change cooperation with existing licencees or flexibility regarding future licencees;*

Answer: SpaceX will continue to cooperate with existing licensees and our second-generation system will have advanced technologies to allow efficient sharing.

- c. *whether you have engaged with other licence-holders regarding any potential changes to cooperation agreements?*

Answer: While the Gen2 system has not yet been licenced, SpaceX has already been engaging in good-faith coordination with other licence-holders regarding the system. In fact, SpaceX already reached an historic NGSO-NGSO coordination agreement with OneWeb with regard to both companies' Gen1 and Gen2 systems.

*Q3. [Regarding E-band] If we were to make this change to our NGSO gateway authorisations, please could you confirm how this might change your use of Ka band in the UK? Eg*

- (a) If this would decrease the number of Ka band gateways you would use?*

Answer: SpaceX still plans to rely on its Ka band gateways even after E-band authorization is granted. Having access to both spectrum bands for gateway traffic will allow SpaceX to better serve more customers with even higher speeds.

- (b) If you would seek to use Ka band for terminals instead?*

Answer: SpaceX plans to continue to use Ka band for gateway earth stations, but its application for the Gen2 system in the US contemplates potentially using Ka for user terminals to better serve customers in the future.

Sincerely,

