STARLINK

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Advisor (Network, Spectrum and Licensing)
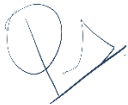**Telecom Regulatory Authority of India**

Subject: SpaceX and Starlink India's Response to Consultation Paper on
"Consultation Paper on Auction of Frequency Spectrum in 37-37.5 GHz, 37.5-40 GHz, and 42.5-43.5 GHz bands Identified for IMT"

Dear Sir,

Please find enclosed our response to the ongoing consultation on the subject of spectrum in 37-37.5 GHz, 37.5-40 GHz, and 42.5-43.5 GHz. It is essential that TRAI and the Government of India ensure availability and access to these bands for next-generation satellite services, as correctly noted in the communications between the TRAI and the Department of Telecommunications. We submit that an efficient, light-licensing regime with good-faith co-existence will enable higher quality service for all users in India.

We thank the TRAI for this opportunity to provide comments.

Sincerely,

Parnil Urdhwareshe
Director
Starlink Satellite Communications Private Limited
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SpaceX Response to TRAI Consultation on

Auction of Frequency Spectrum in 37-37.5 GHz, 37.5-40 GHz, and 42.5-43.5 GHz bands Identified for IMT

SpaceX and its local subsidiary, Starlink India, thank the TRAI for the opportunity to comment on the subject of co-existence of IMT and next generation satellite systems.

As noted across the TRAI's other consultations on assigning spectrum for space-based communication services, next-generation satellite networks will dramatically contribute to India's universal broadband goals. **It is thus critical that TRAI and the Government of India ensure frameworks and mechanisms that enable shared access to 37.5 to 40 GHz spectrum for both IMT and next generation satellite.**

The Government of India has taken numerous commendable steps towards ensuring Indian citizens can access satellite broadband affordably and quickly to a degree of quality that urban users already benefit from. These include the new *Telecom Law of 2023*, the *Indian Space Policy of 2023*, as well as the more recent *Norms, Guidelines and Procedures for Implementation of Indian Space Policy-2023*. A critical component of ensuring these services is equitable access to the spectrum that will enable high-quality service delivery.

We applaud the Department of Telecom's decision in favour of shared access to the 37.5 to 40 GHz and 42.5 to 43.5 GHz spectrum for satellite systems. As the TRAI correctly notes, the propagation characteristics of these frequencies "provides an opportunity for sharing of the same spectrum with the satellite gateway earth stations".

SpaceX and Starlink India submit that – similar to our submissions on E-band (70/80 GHz) – ensuring non-exclusive and shared access to this spectrum for next-generation satellite services –

1. Will lead to substantial improvements to service quality, enable cost-effective and efficient operations, and create equitable access to high-quality connectivity across the country;

2. Will not preclude simultaneous use by other terrestrial or satellite operators; and

3. Can be achieved through a database-assisted light licensing framework.

SpaceX currently holds a space station authorization from the United States' Federal Communications Commission for V-band frequencies (**37.5-42.5 GHz** (*space-to-Earth*); and **47.2-50.2 GHz** and **50.4-51.4 GHz** (*Earth-to-space*).[1]

India's National Frequency Allocation Plan of 2022 includes allocations for all of these frequencies to Fixed Satellite Service (for space-to-Earth with respect to 37.5-42.5 GHz, as well as Earth-to-space with respect to 47.25-50.2 GHz and 50.4-51.5 GHz.)

These frequencies will be an important part of the SpaceX satellite gateway earth station network. The SpaceX system will communicate with gateway earth stations capable of providing broadband connectivity virtually everywhere. The use of V-band frequencies of satellite gateway links will help to ensure high-speed, low-latency broadband can be a reality for all people.

As the TRAI notes, the ability of fixed-satellite services and terrestrial services to exist with ease in these bands is well-recognised. Enabling NGSO satellite operators to augment their traditional Ka-band gateways with these spectrum bands will bring large, near-term benefits for Indian consumers and the broader satellite market through –

- **Improved service quality**: Robust backhaul links for consumers and businesses will be essential to meet growing demand for bandwidth-intensive applications, including

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[1] See Space Exploration Holdings, LLC, 33 FCC 11434 (2018) ("V-band Authorization"); Stamp Grant, IBFS File No. SAT-LOA_20170301-00027 (June 9, 2020) (authorizing use of the 50.4-51.4 GHz).

remote work, education, health care, and government services. It also will be critical to ensure that consumers in rural and remote areas of India can enjoy a similar quality of broadband service as their urban counterparts.

- **Increased choice**: By increasing the number of consumers who can be served and the quality of service for end users, access to this spectrum will allow satellite operators to better provide services. Providing such additional choices for consumers to meet their connectivity needs will in turn drive innovation among operators, as well as enable more affordable prices for consumers.

- **Efficient operations**: The propagation characteristics of these links result in extremely efficient "pencil beams" that can use the entire allocated bandwidth while coexisting within close proximity to other users—including terrestrial fixed links and other satellite operators.

- **Cost-effective deployment**: As an intensively used but spectrally limited band, Ka-band provides a natural limit on the number of consumers that a specific gateway can serve. Augmenting Ka-band capacity with this spectrum will allow satellite operators to connect substantially more consumers with each gateway.

Additionally, higher-capacity gateways — in conjunction with the addition of inter-satellite links — will be crucial to serve maritime and aviation customers in India with the same high-quality service that fixed site users enjoy.

We have provided responses to select questions within this consultation below.
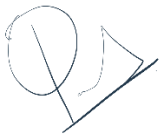
Parnil Urdhwareshe
Director
Starlink Satellite Communications Private Limited

<u>**Responses to Select Questions / Issues**</u>

Q11. Whether there could be any challenges in sharing of 37.5-40 GHz and 42.5-43.5 GHz spectrum frequency ranges between IMT and Satellite Gateway links? If yes, what challenges do you foresee and what measures could be adopted to mitigate such challenges? Kindly justify your response.

SpaceX and Starlink India are confident that this spectrum can be efficiently shared between IMT and satellite gateway links.

The most efficient approach for the band would be a light-licensing regime to allow the registration of links and coordination with other operators. Should an auction approach be adopted for IMT in LSAs SpaceX very strongly recommends that –

- IMT be required to protect satellite earth station gateways; and

- Satellite operators be allowed to add new satellite earth stations to the band, including where a mobile/IMT operator has obtained access to this spectrum at a location through auction but has not deployed in or near that location.

We submit the implementation of TRAI's previous recommendations in the case of these frequencies as well i.e. that the Department of Telecommunications should create a software defined automated process on a portal that maintains a database of coordinates of all IMT base stations.

The TRAI should adopt a database-assisted Light-Licensing framework that accommodates next-generation fixed-satellite services. To best serve the needs of consumers and businesses across India, the TRAI should adopt a database-assisted light-licensing framework for use of this spectrum, enabling all co-primary "pencil beam" services, including fixed-satellite service gateways, to register ground sites on an as-required basis through a common platform.

We reiterate our recommendations on such a light-licensing framework from our submission on TRAI's consultation with respect to E-band. Such a framework can have the following characteristics –

1. **Link Registration Database.** SpaceX recommends that the TRAI adopt policies and software-driven processes for links these bands that facilitate efficient network planning, coordination, coexistence, and rapid deployment to consumers.

   The TRAI must recommend, and the Ministry of Communications must develop and publish, a public database of links in these bands in India (including links that have been deployed under the existing assignment process as well as those that result from this consultation). This will enable meaningful analysis and self-coordination between users of this band using realistic protection parameters.[2] The TRAI can adopt a database-assisted light-licensing framework that permits operators to register new links into the database as required through an automated process This future database will also be a critical tool for TRAI and the Ministry of Communications' to verify the efficient utilization of this valuable spectrum.

2. **Flexible Channelization.** The TRAI must recommend flexible channelization for these bands that permit operators to efficiently use licensed spectrum. This is especially important for satellite operators who may share spectrum in a geographic area and require access to larger channels to efficiently share.

   By allowing channels to be flexibly determined by operators deploying the

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[2] The database should include the latitude, longitude, altitude, and azimuth of the transmitting and receiving antennas and the radiofrequency properties of each link (e.g., center frequency, bandwidth, antenna input power density, antenna maximum gain, antenna gain pattern, receive noise figure, polarization).

technology , the TRAIwill maximize the value of the band by enabling higher capacity backhaul links without meaningfully impacting the interference environment.

3. **Technology Neutrality.** The TRAI should ensure that its recommended framework accommodates emerging co-primary services on a technology neutral basis. To do so, the TRAI should adhere to the National Frequency Allocation Plan's allocation of these bands for fixed-satellite service and include fixed-satellite service gateways in the above-mentioned light-licensing framework.[3]

This technology neutral approach would have several important benefits. A multi-service light-licensing approach would –

o speed review and approval time by automating basic compliance and coexistence checks;

o reduce administrative cost and labor associated with manual reviews for all but the most complex interference scenarios;

o facilitate coordination between different co-primary services through a common platform; and

o promote rapid deployment of ground equipment for high-speed, low-latency wireless networks, benefitting people and businesses alike.

4. **Reasonable Spectrum Fees.** Because links in these bands create small, predictable coordination areas even when they use wide channels, one link almost never excludes another link from operating. The TRAI should ensure that its light-licensing framework includes low, flat fees assessed on an administrative cost-recovery basis for satellite services who will operate in this band on a shared basis. Low fees will allow operators to focus their limited resources on serving customers through network deployment and innovative service offerings.

Together, these features will position India as a leader in spectrum management. The investment from the TRAI to adopting a light-licensing regime will also pay dividends as the TRAI embraces efficient and innovative shared use cases of higher frequency range spectrum between satellite and terrestrial users. A unified light-licensing regime will promote the rapid deployment of a range of powerful new co-primary backhaul networks, including mobile and fixed-satellite service gateways to serve consumers and businesses throughout India.

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[3] In the United States, the 70/80 GHz database manager Comsearch has noted that a light-licensing database can easily accommodate non-terrestrial gateways alongside fixed links with a low risk of interference to terrestrial links. *See* Comsearch, Aeronet Aviation and Maritime Communications Systems; Compatibility with Incumbent E-band Fixed Services and Link Registration System, at 4, 42 (May 2, 2019), attached to Letter from Samuel L. Feder, Counsel to Aeronet Global Communications Inc. to Marlene H. Dortch, Secretary, FCC, RM-11824 and RM-11825 (filed May 10, 2019); Comsearch, Loon E-Band Backhaul; Analysis of Compatibility with Incumbent Fixed Services, Use of the Link Registration System, and Review Versus Passive Services, attached to Letter from Julie M. Kearney, Loon, to Marlene H. Dortch, FCC, WT Docket No. 20-133, at 38 (Jan. 12, 2021).

Q12. In case it is decided to share (i) 37.5-40 GHz, and (ii) 42.5-43.5 GHz spectrum frequency ranges between IMT and Satellite Gateway links, -

> **(i) Whether there is a need to prescribe a protection/ keep-off distance between IMT stations and Satellite Earth Station Gateways? If yes, what should be the protection distance?**

> **(ii) What other parameters should be prescribed for the coexistence of IMT and Satellite Gateway links?**

Suggestions may kindly be made with detailed justification.

Given the narrow beams of the SpaceX system, operations in these frequencies from next-generation satellite systems can coexist with IMT earth stations. To ensure that this is optimally achieved, we strongly recommend that such co-existence be left to the parties sharing these frequencies directly (instead of imposing blanket restrictions on keep-off distance or power levels). Satellite earth stations should be allowed to operate anywhere, even near or in urban areas, as locating satellite earth station gateways near internet points of presence helps to reduce service latency.