



## TEST DESCRIPTION

Through this authorization, SpaceX seeks to evaluate the performance of its forthcoming high-performance user terminals. This testing will involve the installation of high-performance user terminals at the homes of SpaceX employees to assess the terminals' performance in the field as well as other aspects of their deployment and operation. The Commission has already granted SpaceX Services Inc. a blanket authorization for up to one million user terminals that communicate with SpaceX's NGSO constellation. However, these high-performance user terminals will operate with lower transmit power and higher gain (resulting in the same net EIRP as the currently authorized terminals), a higher scan angle, and features that ruggedize the unit for use in harsh environments.

These technical characteristics are summarized below, with the applicable EIRP mask included as a separate attachment:

Link Type	Frequency	Modulation	Emission Designator	Maximum EIRP
Broadband Downlink (space-to-Earth)	10.7-12.7 GHz	Up to 64 QAM	240MD7W	N/A
Broadband Uplink (Earth-to-space)	14.0-14.5 GHz	Up to 64 QAM	60MOD7W	38.2 dBW

In addition, SpaceX Services has submitted with this application a radiation hazard analysis to demonstrate that these earth stations are compliant with and will not result in exposure levels exceeding the applicable radiation hazard limits established by the Commission.

SpaceX seeks authority to deploy and operate 200 of these earth stations divided among four test areas.<sup>1</sup> Of the 200 total units, 85 will be tested at locations within 25 miles of SpaceX's Los Angeles, CA, office; 85 will be within 25 miles of SpaceX's Redmond, WA, office; 25 units will be within 25 miles of SpaceX's San Francisco, CA, office; and five units will be within 25 miles of a facility in Lander, WY. Exact locations are provided in the accompanying application form. The number of earth station terminals requested is necessary to enable SpaceX to fully evaluate the operational characteristics of these terminals under conditions that resemble the initial commercial rollout of these devices to the greatest possible extent.

The Commission has allocated the Ku-band that SpaceX Services proposes to use for uplink communications (14.0-14.5 GHz) from these blanket-licensed earth stations on a primary basis only to the fixed-satellite service ("FSS"). Nonetheless, SpaceX Services

---

<sup>1</sup> The Commission's rules specifically contemplate blanket licensing for earth stations operating in these frequency bands. See 47 C.F.R. § 25.115(f)(2). The overall height of these antennas above ground level (or above existing structures) will not exceed six meters.

recognizes that its earth station operations will be subject to certain sharing conditions.<sup>2</sup> Portions of the 10.7-12.7 GHz downlink band are shared with other commercial and government services. Notably, the proposed terminals would not transmit in those bands and thus could not cause any interference to other operators using them. Moreover, SpaceX has engineered its NGSO system design to achieve a high degree of flexibility to facilitate spectrum sharing with other authorized satellite and terrestrial systems. In addition, its system is capable of immediately ceasing operations in the unlikely event it is notified that harmful interference has occurred.

SpaceX is aware of its obligations under its authorization to protect terrestrial and space systems in these shared bands, and has certified that it will comply with the applicable equivalent power flux-density (“EPFD”) limits set forth in Article 22 and Resolution 76 of the ITU Radio Regulations.<sup>3</sup> SpaceX has also demonstrated that it will comply with the applicable PFD limits in the Ku-band set forth in the Commission’s rules and Article 21 of the ITU Radio Regulations.<sup>4</sup> The Commission has found that compliance with these EPFD and PFD limits is sufficient to protect GSO systems and terrestrial systems, respectively, against unacceptable interference.<sup>5</sup>

SpaceX is confident that the highly advanced and flexible capabilities of its NGSO system, including the high-performance terminals described herein, will be able to comply with the limitations discussed above. Nonetheless, in the extremely unlikely event that harmful interference should occur due to transmissions to or from these terminals, SpaceX Services can be reached at its Starlink network operations center via phone at (360) 780-3103 or email at [satellite-operators-pager@spacex.com](mailto:satellite-operators-pager@spacex.com), which links to the pagers of appropriate technical personnel with authority and ability to cease all transmissions from these HP terminals on a 24/7 basis.

---

<sup>2</sup> See, e.g., 47 C.F.R. §§ 25.115(f)(2), 25.208(o), 101.1409, 2.106 nn.5.487A & US342. In addition, pursuant to Section 25.115(i), SpaceX Services hereby certifies that it is planning to use a contention protocol (TDMA/FDMA), and such protocol usage will be reasonable.

<sup>3</sup> See Application for Modification of Authorization for the SpaceX NGSO Satellite System, IBFS File No. SAT-MOD-20200417-00037, Technical Attachment at 15 (Apr. 17, 2020) (“Modification Application”); 47 C.F.R. § 25.115(f)(1) (incorporating certification requirement in 47 C.F.R. § 25.146(a)(2)).

<sup>4</sup> See Modification Application, Technical Attachment at 10-12.

<sup>5</sup> See, e.g., *Updates to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, 32 FCC Rcd. 7809, ¶ 32 (2017) (“NGSO Update Order”) (“Any NGSO FSS system operating in compliance with these [EPFD] limits is considered as having fulfilled its obligation under Article 22 of the ITU Radio Regulations not to cause unacceptable interference to any GSO network.”); 47 C.F.R. § 25.289 (same); *Amendment of Parts 2 and 25 of the Commission’s Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, 16 FCC Rcd. 4096, ¶ 42 (2000) (observing PFD limits should protect terrestrial systems in the band).