

## WAIVER REQUESTS

Pursuant to Section 1.3 of the Commission’s rules, the Commission may waive its rules for good cause shown.<sup>1</sup> “Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule,” including “more effective implementation of overall policy.”<sup>2</sup> In determining whether waiver is appropriate, the Commission should “take into account considerations of hardship, equity, or more effective implementation of overall policy.”<sup>3</sup> As shown below, there is good cause for the Commission to grant a waiver of Sections 25.202(g)(1), 25.208(e), 25.146(a)(1), and, to the extent necessary, various limitations in the Commission’s Schedule S.

### **1. Waiver of Section 25.202(g)(1) for TT&C Operations in the 13.75-14.0 GHz Band**

Section 25.202(g)(1) anticipates that satellite systems will conduct telemetry, tracking and command (“TT&C”) operations using spectrum at the edge of or within their assigned bands.<sup>4</sup> SpaceX proposes to conduct its TT&C uplink transmissions using a portion of the 13.75-14.0 GHz band – specifically, 13.85-14.00 GHz. This spectrum is at the upper part of the 13.75-14.0 GHz band, which is not included in the bands for which authorization of communications transmissions has been sought in this application. This band is also immediately adjacent to the 14.0-14.5 GHz band used by the Gen2 System for user terminal uplink transmissions. To the extent necessary,

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<sup>1</sup> 47 C.F.R. § 1.3. *See also* *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969), *cert. denied*, 409 U.S. 1027 (1972); *Northeast Cellular Telephone Co., LP v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990).

<sup>2</sup> *GE American Communications, Inc.*, 16 FCC Rcd. 11038, ¶ 9 (Int’l Bur. 2001).

<sup>3</sup> *WAIT Radio*, 418 F.2d at 1159.

<sup>4</sup> *See* 47 C.F.R. § 25.202(g)(1).

and consistent with the authorization for its first-generation NGSO system,<sup>5</sup> SpaceX requests a waiver to permit its use of this spectrum for TT&C.

The Commission has restricted FSS deployment in the 13.75-14.0 GHz band to gateways only, which it has specifically defined to include TT&C operations.<sup>6</sup> In addition, under footnotes to both the U.S. and international frequency allocation tables, NGSO FSS earth stations operating in this band must have a minimum diameter of 4.5 meters and the EIRP of any emission should be at least 68 dBW and should not exceed 85 dBW.<sup>7</sup> The Gen2 System will comply with these requirements, and will not claim protection from radiolocation transmitting stations operating in accordance with the U.S. Table of Frequency Allocations. SpaceX anticipates that it will provide TT&C from only two locations in the U.S. (on the East and West Coasts, respectively), which will further minimize any potential impact.

## **2. Waiver of the Downlink PFD Limits in Section 25.208(e) and Associated Certification Requirement in Section 25.146(a)(1)**

As shown in the Technical Attachment, the Gen2 System does not comply with the Ka-band PFD limits established in Section 25.208(e) at certain elevation angles using the flawed interference calculation methodology applied in the rule. As a result, SpaceX will not be able to certify that the Gen2 System will comply with the ITU PFD limits governing NGSO FSS systems in the 17.7-19.3 GHz band.<sup>8</sup> As SpaceX has demonstrated in its previous applications, the ITU methodology for establishing the Ka-band PFD limits was not developed with capability to scale

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<sup>5</sup> See *Space Exploration Holdings, LLC*, 33 FCC Rcd. 3391, ¶ 30 (2018).

<sup>6</sup> See *Amendments 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, ¶ 29 (2000) (“*Ku-Band NGSO Order*”); 47 C.F.R. § 25.103 (definition provides that an “NGSO FSS gateway earth station may also be used for telemetry, tracking, and command transmissions and is not for the exclusive use of any customer”).

<sup>7</sup> See 47 C.F.R. § 2.106, nn.5.502 and US356.

<sup>8</sup> See *id.* § 25.146(a)(1).

up for application to dynamically controlled NGSO constellations with more than 840 satellites.<sup>9</sup> Among other things, the calculation methodology assumes downlink energy from all satellites in operation, not just those that are visible from a particular location that could meaningfully be expected to contribute to interference to a terrestrial Fixed Service (“FS”) system. SpaceX hereby incorporates the discussion from that prior application herein, as it amply demonstrates the basis for the requested waiver.

In granting SpaceX’s initial authorization, the Commission agreed with several points raised by SpaceX, “in particular that the ITU limits were derived for constellations up to 840 satellites and under worst case assumptions.”<sup>10</sup> Rather than grant a waiver of these PFD limits, the Commission imposed a condition under which SpaceX must provide a technical showing demonstrating that its operation will protect an FS station with the characteristics described in Recommendation ITU-R SF.1483.<sup>11</sup> Accordingly, in addition to requesting a waiver, SpaceX has also submitted in Annex 1 to the Technical Attachment such a technical showing with respect to the Gen2 System demonstrating its ability to protect FS stations. That showing further justifies relief from the flawed calculation methodology that yields apparent non-compliance with the applicable PFD limit.

### **3. Waiver of Limitations in Schedule S**

As required by the Commission’s rules,<sup>12</sup> SpaceX has submitted with this application a completed Schedule S, which contains certain technical information in a prescribed form. However, SpaceX has found that it cannot accurately describe its system in certain respects due to

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<sup>9</sup> See, e.g., Application, IBFS File No. SAT-LOA-20161115-00118, Attachment A at 29-32 (filed Nov. 15, 2016).

<sup>10</sup> See *Space Exploration Holdings, LLC*, 33 FCC Rcd. 3391, ¶ 35 (2018).

<sup>11</sup> See *id.*

<sup>12</sup> See 47 C.F.R. § 25.114(a)(1).

limitations in Schedule S itself. Below we discuss six aspects of the Gen2 System that fall into this category as well as how the Schedule S was completed under these limitations. To the extent necessary, SpaceX requests that the Commission waive these aspects of Schedule S in light of these limitations.

First, it is impracticable to submit complete orbital parameter data for the Gen2 System using the Schedule S web form. Accordingly, SpaceX will provide a sample of that data in the electronic version of Schedule S and deliver to the Commission a database with the complete information required on Schedule S, including orbital parameters, for inclusion in the record of this application.<sup>13</sup>

Second, Section 25.114(c)(4)(v) requires both the minimum and maximum saturation flux density (“SFD”) values for each space station receive antenna that is connected to transponders. The concept of SFD only applies to “bent pipe” satellite systems, and thus is not relevant to the Gen2 System. However, the Schedule S software does not allow an entry of “not applicable.” Instead, it requires a numerical entry for SFD, which must be different for the maximum and minimum values. In order to accommodate this requirement, SpaceX has entered values of “0” and “-0.1” in Schedule S with respect to these parameters.

Third, Schedule S limits entries for maximum EIRP for transmit beams to values greater than or equal to zero. However, some of SpaceX’s TT&C beams transmit at negative maximum EIRPs when expressed in the units required on the Schedule S form. Accordingly, it was not possible to enter the correct value in the web-based Schedule S. SpaceX has therefore entered a

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<sup>13</sup> Because SpaceX will provide only a portion of its orbital parameter data in the Schedule S, not all aspects of the system will be accurately captured by that software. For example, the “Total Number of Satellites in the Active Constellation” will reflect the number provided in the sample rather than the total number in the Gen2 System.

value of zero in the web-based form but included the correct value in the complete database of technical parameters.

Fourth, Schedule S requires entry of the begin and end angle for the active service arc with respect to the ascending node for each orbital plane. All satellites in the proposed system will be active for their entire orbital period. However, Schedule S does not permit entry of more than two digits for the active service arc end angle, making it impossible to enter the correct value of 360 degrees. Accordingly, SpaceX has entered a value of “0” to denote full-arc service.

Fifth, beams used by SpaceX satellites will be divided into small channels that, depending on utilization and other factors, may be bonded into channels as large 2,000 MHz in the downlink and 125 MHz in the uplink for user terminals and 5,000 MHz in each direction for gateways. However, Schedule S only permits entry of a single, static channel plan. Accordingly, SpaceX has provided an example of one possible channel plan on Schedule S, with the full range of channel configurations described more fully in the Technical Attachment and in the complete database of technical parameters.

Sixth, SpaceX intends to operate at eight different orbital altitudes with a range of antenna gains, resulting in a large number of possible combinations of transmit and receive antenna gain contours. Rather than provide all possible contours for a representative satellite at all altitudes as contemplated by Section 25.114(c)(4)(vi)(B), SpaceX has generally provided the contours for satellites at the lowest and highest relevant operating altitudes along with the lowest and highest antenna gains. Given that there is relatively little difference among the plots, this approach should illustrate the full range of values without requiring submission of contours for the very large number of possible combinations. SpaceX can supply the remaining contours to the Commission upon request.