

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of )
)
Amendment of Parts 2 and 25 of the Commission's ) IB Docket No. 20-330
Rules to Enable GSO Fixed-Satellite Service )
(Space-to-Earth) Operations in the 17.3-17.8 GHz ) RM-11839 (terminated)
Band, to Modernize Certain Rules Applicable to )
17/24 GHz BSS Space Stations, and to Establish )
Off-Axis Uplink Power Limits for Extended Ka- )
Band FSS Operations. )

NOTICE OF PROPOSED RULEMAKING

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By the Commission: Chairman Pai issuing a statement.

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I. INTRODUCTION

1. In this Notice of Proposed Rulemaking (Notice), we propose to permit use of the 17.3-17.7 GHz band by geostationary satellite orbit (GSO) space stations in the fixed-satellite service (FSS) in the space-to-Earth direction on a co-primary basis with incumbent services. We also propose to permit limited GSO FSS (space-to-Earth) use of the 17.7-17.8 GHz band on a non-protected basis with respect to fixed service operations. Permitting use of the 17.3-17.8 GHz band to include FSS downlinks would

increase intensive and efficient use of the band and provide additional downlink capacity for high-throughput satellite communications. With appropriate technical safeguards proposed herein, permitting the use of this band for GSO FSS downlink services would facilitate deployment of advanced satellite systems for the benefit of American consumers.

2. We propose to define an extended Ka-band in our rules, i.e., the 17.3-18.3 GHz (space-to-Earth), 18.8-19.4 GHz (space-to-Earth), 19.6-19.7 GHz (space-to-Earth), 27.5-28.35 GHz (Earth-to-space) and 28.6-29.1 GHz (Earth-to-space) bands. We further propose to apply certain uplink power limits currently applicable to GSO FSS transmissions in the conventional Ka-band<sup>1</sup> to GSO FSS uplink transmissions in the extended Ka-band. If adopted, these power limits will allow us to streamline licensing of FSS earth stations and will result in a closely harmonized regulatory framework for all similar FSS uplink transmissions in the conventional and extended Ka-bands.<sup>2</sup>

3. The proposals herein, if adopted with appropriate safeguards, would result in efficient and effective use of the spectrum, alleviate the growing need for additional Ka-band GSO FSS downlink spectrum to support communications to gateway earth stations, and further streamline the licensing process of certain satellite systems.<sup>3</sup>

## II. BACKGROUND

### A. Current Allocations and Use of the 17.3-17.8 GHz Band

4. The Table of Frequency Allocations is comprised of the International Table and the United States Table of Frequency Allocations (U.S. Table).<sup>4</sup> In the International Table, the 17.3-17.7 GHz band is allocated, in the International Telecommunication Union (ITU) Region 2,<sup>5</sup> to the FSS (Earth-to-space) and to the broadcasting-satellite service (BSS) on a co-primary basis, as well as to the radiolocation service on a secondary basis.<sup>6</sup> In the U.S. Table, the 17.3-17.7 GHz band is allocated to the FSS (Earth-to-space) and to the BSS on a co-primary basis<sup>7</sup> and to the radiolocation services on a

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<sup>1</sup> 47 CFR § 25.103 (defining conventional Ka-band as “[t]he 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) frequency bands, which the Commission has designated as primary for GSO FSS operation.”)

<sup>2</sup> The term “Ka-band” generally refers to the space-to-Earth (downlink) frequencies at 17.70-20.20 GHz and the corresponding Earth-to-space (uplink) frequencies at 27.50-30.00 GHz. See *Establishment of Policies and Service rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-Band*, IB Docket No. 02-19, Notice of Proposed Rulemaking, 17 FCC Rcd 2807, n.1 (2002). See also IEEE Standard 521-2019 <https://www.microwaves101.com/encyclopedias/frequency-letter-bands>.

<sup>3</sup> By initiating this rulemaking proceeding, we also grant, to the extent discussed herein, the petition for rulemaking filed by SES Americom, Inc. (SES) requesting that the Commission initiates a proceeding to authorize GSO FSS operations in the space-to-Earth direction using the 17.3-17.7 GHz frequencies. See Petition for Rulemaking of SES Americom, Inc., RM-11839, at 1 (filed Mar. 5, 2019), [https://ecfsapi.fcc.gov/file/103051358025155/Petition%20for%20Rulemaking%20for%2017%20GHz%20FSS%20\(Mar%205%202019\).pdf](https://ecfsapi.fcc.gov/file/103051358025155/Petition%20for%20Rulemaking%20for%2017%20GHz%20FSS%20(Mar%205%202019).pdf) (SES Petition).

<sup>4</sup> The International Table is described in 47 CFR § 2.104 and the U.S. Table is described in 47 CFR § 2.105.

<sup>5</sup> ITU Region 2 includes North and South America and associated offshore waters and islands, including the Hawaiian Islands and Greenland. 47 CFR § 2.104, fig. 1.

<sup>6</sup> Footnote 5.516 further limits use of the band by the FSS to feeder links for the BSS and in ITU Region 2 to geostationary satellite orbit (GSO) satellite networks. Footnote 5.515 specifies that sharing between the FSS and BSS is governed by Appendix 30A, Annex 4, paragraph 1 of the *Radio Regulations*. 47 CFR § 2.106. We note that the ITU Region 2 area includes the United States. See 47 CFR §§ 2.104(b) and 2.105(a).

<sup>7</sup> Provision of FSS in the band, however, is limited by footnote US271 to the U.S. Table to feeder links for BSS, and footnote NG163 limits BSS use of the band to geostationary satellite systems. 47 CFR § 2.106, nn. US271 and NG163.

secondary basis.<sup>8</sup> The adjacent 17.7-17.8 GHz band is allocated internationally in ITU Region 2 to the fixed service, the BSS, the FSS (in both the space-to-Earth and Earth-to-space directions) on a primary basis and to the mobile service on a secondary basis.<sup>9</sup> The 17.7-17.8 GHz band is allocated to the FSS (Earth-to-space) and to the fixed service on a co-primary basis in the U.S Table.<sup>10</sup>

5. Historically, in the United States, the 17.3-17.8 GHz band has been used for FSS feeder<sup>11</sup> uplinks that transmit programming to Direct Broadcast Satellite (DBS) service<sup>12</sup> GSO space stations. DBS feeder link operations typically involve the use of large, high-gain antennas at a limited number of individually licensed earth station locations. The DBS service satellites then downlink that video programming directly to consumers in the 12.2-12.7 GHz band.<sup>13</sup> DBS is the principal means of delivering satellite television in the United States. U.S.-licensed DBS providers include DIRECTV and DISH Network.

6. In May 2007, the Commission adopted rules for a new service that would use the 17.3-17.8 GHz band in the space-to-Earth direction to provide BSS.<sup>14</sup> This service, known as the “17/24 GHz BSS,”<sup>15</sup> provides service downlinks to customers in the same 17.3-17.8 GHz band that is used for feeder uplinks to DBS space stations, i.e., reverse band operation.<sup>16</sup> Although the 17/24 GHz BSS may use the entire 17.3-17.8 GHz band internationally, it may only provide service in the United States in the 17.3-17.7 GHz band. DBS feeder link uplinks by contrast, operate in the entire 17.3-17.8 GHz band in the United States.<sup>17</sup> At the same time that the Commission adopted rules for the 17/24 GHz BSS, it also

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<sup>8</sup> 47 CFR § 2.106.

<sup>9</sup> Footnote **5.516** further limits Earth-to-space use of the band by the FSS to feeder links for the BSS and in Region 2 to GSO satellite networks. Footnote **5.517** precludes FSS networks operating in the space-to-Earth direction from claiming protection from or causing harmful interference to BSS assignments operating in conformance with the Radio Regulations. Footnote **5.515** specifies that sharing between the FSS and BSS is governed by Appendix **30A**, Annex 4, paragraph 1 of the *Radio Regulations*. 47 CFR § 2.106, nn. 5.515 and 5.516.

<sup>10</sup> Footnote US271 further limits FSS use of the band (Earth-to-space) to feeder links for the BSS. Footnote US334 permits operation of Federal FSS space stations in the band subject to certain restrictions. 47 CFR § 2.106, nn. US271 and US334.

<sup>11</sup> A feeder link is defined as a “radio link from a fixed earth station at a given location to a space station, or vice versa, conveying information for a space radiocommunication service other than the Fixed-Satellite Service. The given location may be at a specified fixed point or at any fixed point within specified areas.” 47 CFR § 25.103.

<sup>12</sup> DBS is defined as “a radiocommunication service in which signals transmitted or retransmitted by Broadcasting-Satellite Service space stations in the 12.2-12.7 GHz band are intended for direct reception by subscribers or the general public.” 47 CFR § 25.103. DBS operations are subject to the International Radio Regulation BSS and Feeder-link Plans contained in Appendices **30** and **30A**.

<sup>13</sup> *Amendment of the Commission’s Policies and Rules for Processing Applications in the Direct Broadcast Satellite Service*, IB Docket No. 06-160, Report and Order, 34 FCC Rcd 9014, 9016, para. 6 (2019) (*DBS Licensing Order*); 47 CFR § 25.103.

<sup>14</sup> *Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, IB Docket No. 06-123, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8842 (2007) (*17/24 GHz R&O and FNPRM*).

<sup>15</sup> 17/24 GHz BSS is defined as a “radiocommunication service involving transmission from one or more feeder-link earth stations to other earth stations via geostationary satellites, in the 17.3-17.7 GHz (space-to-Earth) (domestic allocation), 17.3-17.8 GHz (space-to-Earth) (international allocation) and 24.75-25.25 GHz (Earth-to-space) bands.” 47 CFR § 25.103.

<sup>16</sup> 47 CFR § 2.106.

<sup>17</sup> 47 CFR § 25.103.

sought comment on rules to avoid interference between DBS and 17/24 GHz BSS operations, both in-orbit (“space path” interference) and on the ground (“ground path” interference).<sup>18</sup> The Commission adopted technical rules to address space path interference in 2011 that included a requirement that 17/24 GHz BSS space stations locate at least 0.2 degrees from a DBS space station.<sup>19</sup> In 2017, the Commission adopted rules to address ground path interference.<sup>20</sup> Since rules were adopted for the 17/24 GHz BSS, a number of licenses or grants of U.S. market access have been issued, but only a few of these licenses or grants remain in effect.<sup>21</sup>

## B. SES Americom Petition for Rulemaking

7. On March 5, 2019, SES<sup>22</sup> petitioned the Commission to initiate a rulemaking proceeding to amend Parts 2 and 25 of the Commission’s rules to authorize GSO FSS operations in the space-to-Earth direction within the United States using the 17.3-17.7 GHz frequencies on a protected basis.<sup>23</sup> On May 31, 2019, AT&T Services, Inc. (AT&T) and Telesat Canada (Telesat) filed comments in response to the SES Petition, and on June 17, 2019, SES filed reply comments.<sup>24</sup>

8. SES proposes we modify the U.S. Table to permit FSS downlinks on a co-primary basis in the 17.3-17.7 GHz band under its proposed technical rules.<sup>25</sup> SES contends that such an allocation would comport with Commission policies supporting flexible spectrum use.<sup>26</sup> SES also notes that the international allocation to the BSS in the 12.2-12.7 GHz band is accompanied by a footnote to the allocation that permits assignment of this spectrum to FSS downlinks, “provided that such transmissions

<sup>18</sup> *17/24 GHz R&O and FNPRM*, 22 FCC Rcd at 8902-17, paras. 149-188.

<sup>19</sup> *Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3- 17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3- 17.8 GHz Frequency Band*, IB Docket No. 06-123, Second Report and Order, 26 FCC Rcd 8927 (2011) (*17/24 GHz Space Path Report and Order*).

<sup>20</sup> *Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3- 17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3- 17.8 GHz Frequency Band*, IB Docket No. 06-123, Third Report and Order, 32 FCC Rcd 3705 (2017) (*17/24 GHz Ground Path Report and Order*).

<sup>21</sup> See IBFS File Nos. SAT-MOD-20150428-00031, SAT-AMD-20150818-00058, and SAT-MOD-2012-03314-00045.

<sup>22</sup> SES is a satellite company that, together with its affiliates, provides FSS to the United States with both GSO and non-geostationary orbit (NGSO) satellites and associated earth stations. SES affiliate, SES-17 S.à.r.l. was recently granted U.S. market access for its SES-17 satellite that will use the 17.3-17.7 GHz band for downlink communications to gateway earth stations in the United States. Operation of these FSS downlinks in the 17.3-17.7 GHz band (space-to-Earth) was granted through a waiver of the U.S. Table of Frequency Allocations and are on an unprotected, non-interference basis. See, IBFS File No. SAT-PDR-20190305-00014 (grant stamp dated May 8, 2020).

<sup>23</sup> SES Petition, RM-11839 at 1. See also *Petition for Rulemakings Filed*, Public Notice, Report No. 3126, 2019 WL 1977355 (F.C.C.) (IB May 1, 2019).

<sup>24</sup> AT&T Services, Inc. Response to Petition for Rulemaking, RM-11839, filed May 31, 2019 (AT&T Comments); Comments of Telesat Canada, RM-11839, filed May 31, 2019 (Telesat Comments); and Reply of SES Americom, Inc., RM-11839, filed June 17, 2019 (SES Reply).

<sup>25</sup> SES Petition at 7-11. See also 47 CFR § 2.106, n.5.492.

<sup>26</sup> In support of its position, SES cites the example of the Commission’s decision in 2002 to allow non-conforming satellite use of DBS spectrum, which concluded that relaxation of use restrictions would encourage the development of new telecommunications products and services. SES Petition at 7-8 (citing *Policies and Rules for the Direct Broadcast Satellite Service*, IB Docket No. 98-21, Report and Order, 17 FCC Rcd 11331, 11401 (2002)).

do not cause more interference, or require more protection from interference, than the broadcasting-satellite service transmissions operating in conformance with the Plan or the List, as appropriate.”<sup>27</sup> Finally, SES notes that the Commission recently adopted rule changes permitting more diverse use of FSS in the feeder link frequencies associated with the 17/24 GHz BSS service.<sup>28</sup> SES argues that modifying Commission rules to permit protected FSS downlinks in the 17 GHz band will achieve the same objectives, promoting more robust use of spectrum and providing flexibility for satellite networks to respond to customer demand without impairing existing authorized use of the spectrum.<sup>29</sup>

9. Telesat agrees with SES that FSS licensees will be able to use the band following the same framework for location and operation of gateway earth stations that currently regulate BSS feeder link operations in the band. Telesat also states that Innovation, Science, and Economic Development Canada is currently considering similar changes to the Canadian Table of Frequency Allocations to permit FSS downlinks in the band.<sup>30</sup>

10. AT&T urges the Commission to carefully evaluate a number of technical concerns that could impact incumbent DBS and 17/24 GHz BSS operators. AT&T states that the Commission should consider whether authorizing FSS downlinks in the 17.3-17.7 GHz band could constrain future development or modifications of existing DBS systems, and the effect it might have on new applicants to provide DBS feeder link service.<sup>31</sup> AT&T further argues that any rulemaking should consider the effect of proposed changes on other bands, such as the 24.75-25.25 GHz band, which is currently available for FSS uplinks. AT&T further suggests that we seek comment on the effect that allowing FSS downlinks in the 17.3-17.7 GHz band could have on operations that are co-located with, or near to, U.S. DBS licensees’ facilities.<sup>32</sup> Finally, AT&T contends that we should make clear that use of the 17.3-17.7 GHz band for FSS downlinks does not extend to earth stations in motion, nor to non-geostationary satellite orbit (NGSO) satellites.<sup>33</sup>

11. SES claims that none of AT&T’s contentions impede the Commission from initiating a rulemaking.<sup>34</sup> SES further disputes AT&T’s claim that authorizing FSS downlinks in the 17.3-17.7 GHz band could limit future modifications of BSS networks. According to SES, AT&T’s claims are speculative and outweighed by the potential benefits of promoting more efficient spectrum use. SES also

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<sup>27</sup> SES Petition at 8.

<sup>28</sup> SES Petition at 8-9 (stating that “[i]n its Spectrum Frontiers proceeding, the Commission responded to requests by SES and other satellite industry interests for revision of the rules governing the 24.75-25.25 GHz frequencies.”) SES notes that the Commission proposed and adjusted its rules to place FSS on the same footing as BSS feeder links in the Spectrum Frontiers proceeding, and this was consistent with the Commission’s goals: “increasing flexibility of use and spectrum efficiency,” citing *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 11017-20 (2017) and *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, 33 FCC Rcd 5576, 5586 (2018)).

<sup>29</sup> SES Petition at 9.

<sup>30</sup> Telesat Comments at 2-3. See also Innovation, Science, and Economic Development Canada, *Consultation on the Utilization of the Bands 18.8-19.3 GHz and 28.6-29.1 GHz, and the Bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz by the Fixed-Satellite Service*, available at <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11441.html>.

<sup>31</sup> AT&T Comments at 2-3.

<sup>32</sup> *Id.* at 3-4.

<sup>33</sup> *Id.* at 4.

<sup>34</sup> SES Reply at 2-3.

asserts that we should not prejudge whether FSS downlinks in the 17.3-17.7 GHz band can be used to communicate with user terminals, including terminals in motion.<sup>35</sup>

### III. DISCUSSION

12. We propose to permit GSO FSS (space-to-Earth) communications in the 17.3-17.8 GHz band. We also propose technical rules to prevent harmful interference between stations or services in this band. With appropriate technical safeguards to protect incumbents, permitting the use of this band for GSO FSS downlink services would facilitate deployment of advanced satellite systems and enable the most effective and efficient use of the spectrum. We further propose to define extended Ka-band frequencies and to establish routine licensing criteria for earth stations seeking to operate in those frequencies.

#### A. Proposed GSO FSS Allocation in the 17.3-17.8 GHz Band

13. The Ka-band is used extensively by FSS operators to provide satellite-based broadband access services using high-throughput satellites. In these systems, end user terminals uplink to space stations using one set of frequencies, and the space station downlinks traffic to earth station terminals using a separate set of frequencies (and back into the Internet backbone). The satellites in these systems typically use spot-beam technology and high-order frequency re-use to significantly increase capacity and spectral efficiency.

14. Over the last ten years there has been an increase in the number of space stations using Ka-band frequencies that serve, or intend to serve, customers in the United States.<sup>36</sup> In its petition for rulemaking, SES argues that there is a particular need for additional Ka-band spectrum for FSS gateway earth stations to support high-throughput satellite communications.<sup>37</sup> SES argues that the full benefits from these systems cannot be achieved without access to sufficient gateway spectrum to support multiple spot beams for expanded downlink connectivity.<sup>38</sup> SES states that permitting FSS downlink communications in the 17.3-17.7 GHz band would help to address the need for more spectrum and enable enhanced space station performance in communicating with gateway earth stations.<sup>39</sup> SES further states that having the additional spectrum for space-to-Earth communications in turn would allow U.S. consumers to “enjoy greater access to innovative satellite services both at home and during their travels by air and sea.”<sup>40</sup> Telesat states that it “shares the concerns expressed by SES regarding the limited availability of FSS frequencies that can be used to operate gateway earth stations to support the burgeoning development of Ka-band satellite services.”<sup>41</sup> Telesat further argues that “[t]he 17 GHz band is well-suited to supplement the frequency capacity available for this purpose, both in terms of its

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<sup>35</sup> *Id.*

<sup>36</sup> See e.g., *ViaSat, Inc. Letter of Intent for Authority to Access the U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Satellite at the Nominal 109° W.L. Orbital Location*, IBFS File Nos. SAT-LOI-20160208-00015, grant stamp dated Oct.25, 2016 (Sat.Div., IB) and *Application of Hughes Network Systems, LLC for Authority to Launch and Operate a Ka-band and Q/V-band Geostationary Fixed-Satellite Service Satellite at the Nominal 95° W. L. Orbital Location*, IBFS File Nos. SAT-LOA-20170621-00092, SAT-AMD-20170908-00128, SAT-MOD-20190212-000111 and SAT-MOD-202000612-00072 grant stamp dated Mar. 20, 2018, June 13, 2019 and Sept. 3, 2020 (Sat. Div., IB).

<sup>37</sup> SES Petition at 3. As an example, SES cites its SES-17 satellite that will use all the Ka-band spectrum allocated for FSS in the space-to-Earth direction. See, IBFS File No. SAT-PDR-20190305-00014 (grant stamp dated May 8, 2020).

<sup>38</sup> SES Petition at 3.

<sup>39</sup> *Id.* at 3-4.

<sup>40</sup> *Id.* at 4.

<sup>41</sup> Telesat Comments at 2.

functionality for FSS operators in the Ka-band, including Telesat and SES, and the compatibility of their use with other authorized uses of the band.”<sup>42</sup> Telesat emphasizes that there is increasingly limited spectrum and “providing for the expanded use of the 17 GHz band to support growing demand for FSS Ka-band downlink spectrum while not jeopardizing existing operations in the band will enhance the use of spectrum for the public good.”<sup>43</sup> AT&T does not dispute the need for additional spectrum but asks that “any rulemaking must be carefully tailored to allow the Commission and interested parties to fully consider and evaluate SES’s proposals and their potential impact on current and future DBS and BSS operators.”<sup>44</sup>

15. We propose to make the 17.3-17.8 GHz band available for more intensive use by FSS satellite operators, to meet the need for additional Ka-band GSO FSS downlink spectrum. We note that the need for additional spectrum for these services also has been recognized internationally.<sup>45</sup> We seek comment on this potential need for additional Ka-band GSO FSS downlink spectrum and on our proposed changes to the U.S. Table<sup>46</sup> and other Commission rules.

16. In particular, we propose to add a primary allocation to the FSS in the space-to-Earth direction in the U.S. Table to permit FSS downlinks from geostationary satellites to operate in the 17.3-17.7 GHz band on a co-primary (co-equal) basis<sup>47</sup> with other primary services in that band.<sup>48</sup> In addition, as discussed below, we propose certain changes to the U.S. Table to permit GSO FSS space-to-Earth operations in the adjacent 17.7-17.8 GHz band. We note that in the 17.7-17.8 GHz band a bi-directional allocation currently exists in the International Table for ITU Region 2, but not in the U.S. Table. FSS operation in the 17.7-17.8 GHz band is limited to the Earth-to-space direction in the United States. We propose to revise the allocation to permit FSS in the space-to-Earth direction. We also propose to permit authorization of FSS receiving earth stations in the 17.7-17.8 GHz band on a non-protected basis with respect to fixed service operations; such FSS receiving earth stations would operate on a co-primary basis, however, vis-à-vis primary satellite operations in the band. We seek comment on these changes and proposals.

17. *GSO FSS Transmissions in the 17.3-17.7 GHz Band.* At present, neither the International Table (for Region 2) nor the U.S. Table allows a space-to-Earth FSS transmission in the 17.3-17.7 GHz band.<sup>49</sup> To accommodate such operations in the United States, on a co-primary basis, SES requests we

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<sup>42</sup> *Id.*

<sup>43</sup> Telesat Comments at 2.

<sup>44</sup> AT&T Comments at 2.

<sup>45</sup> There is already a primary allocation to the FSS (space-to-Earth) in the 17.7-17.8 GHz in all three ITU Regions internationally. See 47 CFR § 2.106. The 2019 World Radiocommunication Conference (WRC-19) also adopted Resolution 174 (WRC-19) inviting the ITU-R to complete the sharing and compatibility studies necessary to consider a possible new primary allocation to the FSS (space-to-Earth) in Region 2 in the 17.3-17.7 GHz band. See also Innovation, Science, and Economic Development Canada, *Consultation on the Utilization of the Bands 18.8-19.3 GHz and 28.6-29.1 GHz, and the Bands 17.3-17.7 GHz, 19.3-19.7 GHz and 29.1-29.25 GHz by the Fixed-Satellite Service*, available at <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sfl1441.html>.

<sup>46</sup> The proposed changes to the U.S. Table herein refer to changes to the U.S. Non-Federal Table of Frequency Allocations in the Allocation Table. See 47 CFR § 2.105(a).

<sup>47</sup> A service designated as co-primary must share operations with other services designated as co-primary in the frequency band on a co-equal basis. See *Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite Service Use*, 13 FCC Rcd 19923 at n.4 (1998).

<sup>48</sup> We also propose a consequential modification to footnote US402. 47 CFR § 2.106.

<sup>49</sup> A 17.3-17.7 GHz space-to-Earth FSS allocation exists in ITU Region 1, and in the adjacent 17.7-17.8 GHz band in all three Regions. 47 CFR § 2.106.

revise the U.S. Table, specifically footnotes US402 and NG163.<sup>50</sup> Footnote NG163, as currently written, limits use of the 17.3-17.7 GHz band by the BSS to geostationary satellites.<sup>51</sup> SES asks that we revise this footnote to include a statement that “Space stations in this band may transmit in the fixed-satellite service (space-to-Earth) on a primary basis, provided that such transmissions do not cause more interference, or require more protection from interference, than broadcasting-satellite service transmissions operating in accordance with the Commission’s rules.”<sup>52</sup> As a consequence of this change, SES also proposes edits to footnote US402<sup>53</sup> to include non-Federal FSS receiving earth stations among those not entitled to protection from Federal earth station transmissions in specific geographic areas.<sup>54</sup> SES states that “FSS downlinks in the 17 GHz band will be fully compatible with both satellite services authorized in the spectrum: feeder links for direct broadcast satellite (“DBS”) networks and “Reverse Band” use for the downlink portion of 17/24 GHz BSS operations.”<sup>55</sup> SES points out that “[n]o party opposes the SES Petition or presents any substantial obstacles to the rule revisions sought by SES to promote robust, flexible satellite use of spectrum.”<sup>56</sup>

18. AT&T, however, states that the Commission should make clear that any use of the 17.3-17.7 GHz band for FSS downlinks would be limited to GSO satellites.<sup>57</sup> We note that the interference-mitigation regime the Commission established for the BSS and DBS feeder links in the 17.3-17.7 GHz band presupposed only GSO satellites.<sup>58</sup> In addition, Article 22 of the ITU Radio Regulations does not include equivalent power flux density limits at the Earth’s surface for the 17.3-17.8 GHz band that are necessary to protect earth stations receiving GSO transmissions from harmful interference from NGSO operations.<sup>59</sup> Accordingly, we propose to modify the U.S. Table, revise footnote US402, and adopt a new footnote NG58 to permit co-primary operation of FSS downlink transmissions in the 17.3-17.7 GHz band, while limiting FSS downlink operations to GSO satellite networks.<sup>60</sup> To streamline the applicable restrictions to the 17.3-17.8 GHz band in the U.S. Table, we further propose to incorporate the use limits found in US271 and NG163 into the new footnote NG58 and remove US271 and NG163. We also propose consequential modifications to our licensing information requirements contained in section 25.115(e). We seek comment on these proposals.

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<sup>50</sup> SES Petition at 7-10 and Rule Appendix.

<sup>51</sup> 47 CFR § 2.106, n. NG163.

<sup>52</sup> SES Petition, Rule Appendix at 1. SES models its proposed language on footnote 5.492 to the International Table of Allocations which permits FSS downlink transmissions in BSS Ku-band frequencies which are part of an ITU Appendix 30 Plan or List. *See also*, 47 CFR § 2.106, n.5.492.

<sup>53</sup> 47 CFR § 2.106, n.US402. This footnote defines two geographic areas and frequency segments in which 17/24 GHz BSS earth stations may not claim protection from earth stations transmitting to Federal satellites in the Earth-to-space direction.

<sup>54</sup> SES Petition, Rule Appendix.

<sup>55</sup> SES Petition at 2.

<sup>56</sup> SES Reply at 1.

<sup>57</sup> AT&T Comments at 4.

<sup>58</sup> *The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, IB Docket No. 06-123, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8842, para. 8 (2007) (*17/24 GHz BSS Order*).

<sup>59</sup> ITU *Radio Regulations*, Article 22.

<sup>60</sup> As a corresponding change, we also propose to similarly amend note 1 to section 25.202(a)(9) of our rules which addresses use of the 17.3-17.8 GHz band for BSS. 47 CFR § 2.202(a)(9).

19. *GSO FSS Transmissions in the 17.7-17.8 GHz Band.* In the U.S. Table, the 17.7-17.8 GHz band is allocated on a primary basis to the fixed service and to the FSS (Earth-to-space) limited, by footnote US271, to use by feeder links for the BSS.<sup>61</sup> The International Table includes primary allocations to the FSS (both Earth-to-space and space-to-Earth) in all three ITU Regions, including Region 2, in the 17.7-17.8 GHz band, and FSS operators may use this band to provide service outside of the United States.

20. With respect to sharing of the 17.7 and 17.8 GHz band with the fixed service, we note that in 2000,<sup>62</sup> the Commission designated the 17.7-18.3 GHz band for primary use by terrestrial services.<sup>63</sup> This designation was based in large part upon the conclusion, at that time, that sharing between terrestrial services and satellite services was not feasible, especially when satellite earth stations would be ubiquitously deployed.<sup>64</sup> In 2017, however, the Commission adopted a secondary allocation for the FSS (space-to-Earth) in the 17.8-18.3 GHz band and also permitted blanket earth station licensing.<sup>65</sup> In the 17.7-17.8 GHz band, we now propose to add a space-to Earth direction (to the existing primary FSS allocation) in the U.S. Table, but also to add a footnote stipulating that earth stations receiving in the 17.7-17.8 GHz band are not entitled to protection from the fixed service.<sup>66</sup> This would make these FSS downlink operations co-primary vis-à-vis other satellite operations in the band but treat them as secondary with respect to fixed service operations, consistent with the treatment of the FSS (space-to-Earth) operations vis-a-vis fixed services in the adjacent 17.8-18.3 GHz band.<sup>67</sup> Accordingly, if we permit GSO FSS (space-to-Earth) operations in the 17.7-17.8 GHz band, we propose these operations would be conducted on a non-protected basis vis-a-vis the fixed service.<sup>68</sup> We seek comment on these proposals and conclusions.

21. We note that allowing use of the 17.7-17.8 GHz band by the FSS (space-to-Earth) would provide a contiguous band for FSS downlink operations at 17.3-18.3 GHz, along with the existing FSS use in the 18.3-18.8 GHz band.<sup>69</sup> This would facilitate operational efficiencies and flexibility to avoid

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<sup>61</sup> 47 CFR § 2.106 and footnote US271. The use of the band 17.3-17.8 GHz by the FSS (Earth-to-space) is limited to feeder links for BSS.

<sup>62</sup> *Redesignation of Portions of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, IB Docket No. 98-172, Report and Order, 15 FCC Rcd 13430 (2000) (*18 GHz Order*).

<sup>63</sup> Prior to 2000, the 17.7-18.3 GHz band was designated for shared co-primary use by GSO FSS and fixed service operations. See *18 GHz Order*, 15 FCC Rcd 13430. In 2000, in addition to designating the 17.7-18.3 GHz band for primary use by terrestrial services, the Commission also designated the 18.3-18.58 GHz band for co-primary use by GSO FSS and terrestrial fixed services, and the 18.58-18.8 GHz band for primary use by GSO FSS.

<sup>64</sup> *18 GHz Order*, 15 FCC Rcd at 13434, para. 8.

<sup>65</sup> *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket 16-408, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809, 7812 (2017).

<sup>66</sup> See *infra* at paras. 23-24.

<sup>67</sup> *Id.*

<sup>68</sup> In addition, the fixed service stations would be protected from harmful interference from GSO FSS downlink operations, given the existing power flux density (PFD) limits for GSO space stations in section 25.208(c) of the Commission rules. 47 CFR § 25.208(c). These PFD limits comport with established international standards for preventing harmful interference to fixed service stations and are applicable in the entire 17.7-19.7 GHz band. See *also infra* at para. 24.

<sup>69</sup> In 2000, the Commission also designated the 18.3-18.58 GHz band for co-primary use by GSO FSS and fixed service and the 18.58-18.8 GHz band for primary use by GSO FSS. See *18 GHz Order*, 15 FCC Rcd at 13432, 13445, paras. 4 and 31.

interference and to use this contiguous spectrum in the most effective and efficient manner. We seek comment on our proposals and these conclusions. As discussed further below, we also seek comment on how our proposals would affect the existing operations of the incumbent fixed services in the 17.7-17.8 GHz band as well as the potential for the future development and deployment of other terrestrial services in this band.<sup>70</sup> To the extent that commenters assert that our proposal would negatively impact existing and future terrestrial services in the 17.7-17.8 GHz band, these commenters should explain whether such impacts could be mitigated by any modifications to our proposals herein.

22. With respect to FSS operations vis-a-vis other satellite operations in the 17.7-17.8 GHz band, we propose to treat FSS (space-to-Earth) operations on a co-primary basis vis-à-vis the primary FSS (Earth-to-space) allocation in the 17.7-17.8 GHz band. Treating satellite operations on co-primary basis would be consistent with the International Table and our proposed co-primary treatment of satellite operations in the adjacent 17.3-17.7 GHz band. This would facilitate the use of the 17.3-17.7 GHz and 17.7-17.8 GHz frequencies as a contiguous band, governed by the same streamlined rules, allowing flexibility to the FSS space-to-Earth systems to operate efficiently. Accordingly, allowing FSS downlink operations in the 17.7-17.8 GHz band would serve the public interest, provided such FSS operations comply with other proposed revisions to the technical requirements intended to protect the operations of incumbent services, including 17/24 GHz BSS and DBS systems. We seek comment on these proposals and conclusions.

23. If adopted, we propose to implement our revisions to the U.S. Table by including a primary allocation to the FSS (space-to-Earth) but also including the new footnote NG58 that would permit authorization of earth stations receiving transmissions from GSO FSS space stations in the 17.7-17.8 GHz band, strictly on a non-protected basis with respect to terrestrial fixed service operations. The relevant portion of this new footnote NG58 would read: “Earth stations in the fixed-satellite service (space-to-Earth) in the 17.7-17.8 GHz band shall not claim protection from stations in the fixed service that operate in that band.” We believe this approach will provide a certain level of flexibility to GSO FSS operators while placing no additional coordination burden on fixed service operators.<sup>71</sup> This approach also is consistent with our goals to allocate increasingly scarce spectrum resources in the most efficient and effective manner possible. We also propose corresponding modifications to section 25.115 to reference these conditions in our licensing requirements, including a proposed condition that blanket licensed FSS earth stations, if authorized to receive FSS (space-to-Earth) transmissions in the 17.7-17.8 GHz band, must operate on a non-protected basis and claim protection from neither fixed service operations nor FSS earth stations providing feeder links to BSS space stations in the band.<sup>72</sup> We seek comment on these proposals.

24. With respect to protecting incumbents from harmful interference, we note that section 25.208(c) includes angle-dependent PFD limits intended to protect terrestrial services from space station transmissions in the 17.7-19.7 GHz band.<sup>73</sup> We seek comment on whether these angle-dependent PFD

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<sup>70</sup> See *infra* at paras. 23-25 and 55-57.

<sup>71</sup> We note that with respect to adjacent band operations, under the currently applicable rules, a fixed service operator in the 17.7-18.3 GHz band is required to comply with out of band emission limits contained in our rules. A fixed service operator in the 17.7-18.3 GHz band that complies with these limits would not otherwise be required to coordinate its operations with FSS receiving earth stations in the 17.3-17.7 GHz band. See Letter from Donald J. Evans, Counsel to the Fixed Wireless Communications Coalition, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 20-330 at 2 (filed Nov. 10, 2020). See also 47 CFR § 74.637, § 78.103, and § 101.111. Fixed services in the 17.8-18.3 GHz band would likewise not be subject to a coordination requirement vis-à-vis FSS receiving earth stations operating in the 17.7-17.8 GHz band.

<sup>72</sup> See *infra*, Appendix A. Unlike blanket licensed FSS earth stations, individually licensed FSS earth stations would be permitted to claim protection from earth stations providing feeder links to BSS space stations in the band. See *infra*, para. 55.

<sup>73</sup> 47 CFR § 25.208(c).

limits would adequately protect fixed service operations from harmful interference from GSO FSS operations in the 17.7-17.8 GHz band. Apart from these and the default service rules contained in section 25.217<sup>74</sup> we have no requirements specifically governing space-to-Earth FSS transmissions in the 17.7-17.8 GHz band. If commenters propose any additional rules to facilitate sharing, they also should address costs and benefits of adopting their proposals.

25. Although we believe that the above-outlined approach best achieves our goals of promoting spectrum efficiency and operational flexibility, we seek comment on alternatives and how we can protect the operations of incumbent services. AT&T asserts that when considering the entry of new FSS co-primary operations into the band, the Commission should consider the impact of these new operations on the future expansion of DBS uplinks.<sup>75</sup> Although the recent removal of the DBS freeze<sup>76</sup> should alleviate AT&T's particular concern regarding the timing of introducing these new operations,<sup>77</sup> we nonetheless seek comment on this question generally as raised by AT&T. We believe that our proposed revisions to the U.S. Table allowing co-primary FSS downlinks in the 17.3-17.8 GHz band are compatible with existing operations in the band given the accompanying revisions to the technical requirements intended to protect the operations of incumbent services. Nonetheless, we seek comment on the possible impact to current and future DBS, 17/24 GHz BSS, or terrestrial fixed service systems, and we ask if the introduction of new GSO FSS downlinks into the band might have unforeseen or unreasonably constraining consequences to these systems. If so, we ask what course of action would best protect the operations of future and existing users.

## **B. Technical Rules to Prevent Harmful Interference in the 17.3-17.8 GHz Band**

### **1. Measures to Facilitate Space-to-Earth Operations of 17/24 GHz BSS and FSS**

26. We propose various requirements intended to facilitate both intra-service operations between 17.3-17.8 GHz FSS space stations and inter-service operations between FSS and 17/24 GHz BSS space stations. Most of these requirements are already applicable to 17/24 GHz BSS space stations transmitting in the band, and we propose to extend them to 17.3-17.8 GHz FSS space stations either directly or with some modifications.

27. *Required Longitudinal Separation.* At present, the different satellite services operating in the 17.3-17.8 GHz band are subject to different orbital spacing requirements. Our rules require 17/24 GHz BSS space stations that transmit in the space-to-Earth direction in the 17.3-17.8 GHz band to be separated from each other by at least four degrees.<sup>78</sup> In contrast, DBS stations are authorized to receive feeder uplink transmissions in the 17.3-17.8 GHz band in the opposite direction (i.e., reverse-band operations), and are typically separated from each other by at least nine degrees.<sup>79</sup> Transmitting 17/24

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<sup>74</sup> 47 CFR § 25.217.

<sup>75</sup> AT&T Comments at 2-3.

<sup>76</sup> *DBS Licensing Order*, 34 FCC Rcd at 9024, para. 30.

<sup>77</sup> *Id.* at 9014-15, paras. 2-3.

<sup>78</sup> We note however, that the FSS space stations in the 24.75-25.25 GHz band, which include (but are not limited to) feeder uplinks for 17/24 GHz BSS stations may be located as close as two degrees. See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, WT Docket No. 10-112, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, 33 FCC Rcd 5576, 5586, para. 25 (2018).

<sup>79</sup> The spectrum and orbital resources for DBS are subject to planned use, on a regional basis, under the international regulations administered by the International Telecommunication Union (ITU). Under this plan, the United States is assigned eight orbital locations for the provision of DBS, spaced at least nine degrees: 61.5° West Longitude (W.L.), 101° W.L., 110° W.L., 119° W.L., 148° W.L., 157° W.L., 166° W.L., and 175° W.L. See ITU *Radio Regulations*, Art. 5, § 1.

GHz BSS space stations must also maintain at least 0.2 degrees separation from DBS space stations to minimize space path interference.<sup>80</sup> GSO FSS space stations however, have historically been subject to a two-degree spacing requirement.<sup>81</sup> Compliance with the two-degree orbital separation requirements for FSS space stations is verified by the information certifications and technical showings required by section 25.140(a) of our rules.<sup>82</sup>

28. In its Petition, SES includes proposed modifications to both rule sections 25.140, and 25.262.<sup>83</sup> Under this proposed approach, FSS space stations would be required to maintain at least two degrees of separation from each other and would also be required to maintain a default orbital separation of at least four degrees from 17/24 GHz BSS space stations.<sup>84</sup>

29. In determining what orbital separation would be most appropriate for FSS space stations seeking to operate in the 17.3-17.8 GHz band in the space-to-Earth direction, we consider not only accommodation of FSS operations in a manner most consistent with other FSS bands, but also harmonization of the operations of the three different satellite services operating bi-directionally in the same frequency band. We therefore propose changes to sections 25.140(a)-(b), (d) and 25.262 of our rules, to require GSO FSS and 17/24 GHz BSS applicants seeking to operate in the 17.3-17.8 GHz band, to demonstrate compliance with rules applicable to their service's particular orbital spacing requirements, while simultaneously accommodating adjacent neighboring space stations in other services.<sup>85</sup> We propose to adopt a two-degree orbital spacing approach for transmitting FSS space stations and require an FSS applicant to make different coordination showings depending upon the service of its adjacent neighbors. We believe that permitting two-degrees of separation between downlinking FSS space stations, while retaining four-degree separation from 17/24 GHz BSS space stations, would most efficiently use the orbital arc and associated spectrum resources. We seek comment on this proposal, and on its possible ramifications for the incumbent services.

30. We also seek comment on other alternatives, including whether we should apply the same orbital spacing requirements to downlinking FSS space stations as we currently apply to 17/24 GHz BSS stations, (i.e., four-degree spacing). While this approach might yield a more homogeneous regulatory and operating environment and could be implemented using the coordination showings per §25.140(b) for both types of applicants, it may not, however, most effectively maximize use of the orbital arc and spectral resources, nor provide maximum flexibility for FSS or 17/24 GHz BSS operators. Commenters proposing other alternatives also should discuss any cost and benefits associated with their proposals, in addition to discussing any technical advantages.

31. *Downlink Power Limits.* The Commission has typically employed downlink PFD limits for space stations transmissions in order to facilitate both inter-service and intra-service sharing. PFD

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<sup>80</sup> 47 CFR § 25.262(a). Measures to mitigate space path interference are discussed in Section B.2. See *infra* at paras. 37-58.

<sup>81</sup> 47 CFR § 25.103. Our rules define a two-degree compliant space station as a GSO FSS space station operating in the conventional or extended C-bands, the conventional or extended Ku-bands, the 24.75-25.25 GHz band, or the conventional Ka-band within the limits on downlink EIRP density or PFD specified in § 25.140(a)(3) and communicating only with earth stations operating in conformance with routine uplink parameters specified in § 25.138(a), § 25.211(d), § 25.212(c), (d), or (f), § 25.218, § 25.221(a)(1) or (a)(3), or § 25.222(a)(1) or (a)(3), § 25.226(a)(1) or (a)(3), or § 25.227(a)(1) or (a)(3).

<sup>82</sup> 47 CFR § 25.140(a).

<sup>83</sup> SES Petition, Rule Appendix.

<sup>84</sup> The minimum four-degree separation requirement between 17/24 GHz BSS space stations would be unchanged. SES Petition, Rule Appendix.

<sup>85</sup> 47 CFR §§ 25.140(a)-(b) and 26.262. We also propose conforming changes to § 25.114(d)(15) which refers to the showings applicants must provide with their applications.

limits for intra-service operations are generally imposed to ensure a relatively homogeneous transmitting environment which aids in protecting co-frequency receiving antennas from adjacent satellite interference.<sup>86</sup> PFD limits may also be imposed to facilitate inter-service operations, notably to protect terrestrial services from satellite transmissions.

32. The Commission's current rules include PFD limits for 17/24 GHz BSS systems transmitting in the 17.3-17.7 GHz band.<sup>87</sup> These PFD levels were established to accommodate four-degree spacing (i.e., intra-service sharing) between 17/24 GHz BSS networks. The regional variation was adopted, among other reasons, to account for geographic variations in rainfall characteristics.<sup>88</sup> Moreover, these limits are intended to protect BSS receiving antennas conforming to the requirements of section 25.224 of our rules and are derived from antenna patterns in Recommendation ITU-R BO.1213-1<sup>89</sup> which applies specifically to BSS receiving antennas.<sup>90</sup> FSS receiving antennas will likely exhibit different gain characteristics and may ultimately operate in an orbital spacing environment (e.g., two degrees) different from the four-degree separation approach established for 17/24 GHz BSS space stations. 17/24 GHz BSS and FSS space stations transmitting in the 17.7-17.8 GHz band are also subject to the arrival-angle-dependent PFD limits contained in section 25.208(c) that are intended to protect terrestrial systems in that band.<sup>91</sup>

33. At present, our rules do not include PFD limits for FSS space stations in the 17.3-17.7 GHz band. In its petition, SES proposes PFD limits for FSS systems based on the existing regional PFD limit scheme, with some modifications.<sup>92</sup> SES proposes that in some geographic regions FSS downlink transmissions not exceed a PFD limit of -118 dBW/m<sup>2</sup>/MHz which is more stringent than the limit imposed on 17/24 GHz BSS space stations in the same region.<sup>93</sup> Although SES offers no explicit rationale for its proposal to apply this more stringent PFD limit to FSS transmissions, we recognize that it is identical to the PFD limit our rules apply to FSS transmissions in the nearby conventional Ka-band to

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<sup>86</sup> The downlink power levels transmitted by adjacent co-frequency satellites, in combination with the sidelobe performance characteristics of the receiving earth station antenna, will determine the carrier-to-interference ratio that an operator experiences at the receive antenna as a result of adjacent satellite interference.

<sup>87</sup> 47 CFR § 25.208(w). Specifically, these PFD limits are: (1) In the region of the contiguous United States, located south of 38° North Latitude and east of 100 West Longitude: -115 dBW/m<sup>2</sup>/MHz; (2) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude: -118 dBW/m<sup>2</sup>/MHz; (3) In the region of the contiguous United States, located west of 100 West Longitude: -121 dBW/m<sup>2</sup>/MHz; and (4) For all regions outside of the contiguous United States including Alaska and Hawaii: -115 dBW/m<sup>2</sup>/MHz. *Id.*

<sup>88</sup> *17/24 GHz R&O and FNPRM*, 22 FCC Rcd at 8882-84, paras. 98-101.

<sup>89</sup> *Recommendation ITU-R BO.1213-1*.

<sup>90</sup> In contrast, FSS receiving antennas in other frequency bands are typically subject to the requirements contained in § 25.209.

<sup>91</sup> 47 CFR § 25.208(c). These limits are applicable in the 17.7-19.7 GHz band and must be met by FSS and 17/24 GHz BSS space stations.

<sup>92</sup> SES Petition at 10. SES's proposed requirements are: (1) In the region of the contiguous United States, located south of 38° North Latitude and east of 100° West Longitude: -118 dBW/m<sup>2</sup>/MHz; (2) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude: -118 dBW/m<sup>2</sup>/MHz; (3) In the region of the contiguous United States, located west of 100° West Longitude: -121 dBW/m<sup>2</sup>/MHz.; and (4) For all regions outside of the contiguous United States including Alaska and Hawaii: -118 dBW/m<sup>2</sup>/MHz.

<sup>93</sup> This limit is more stringent compared with the most restrictive PFD limit of -115 dBW/m<sup>2</sup>/MHz required in the same geographic region from BSS space stations.

allow two-degree spacing.<sup>94</sup> We propose applying regional PFD limits to 17.3-17.8 GHz FSS space station transmissions, to harmonize them with those now applicable to the 17/24 GHz BSS, and propose adopting the specific regional limits advocated by SES. We tentatively conclude that these limits, including the maximum value of -118 dBW/m<sup>2</sup>/MHz will allow transmitting FSS space stations to operate in both a two-degree FSS spacing environment as well as alongside the four-degree 17/24 GHz BSS environment.<sup>95</sup> We seek comment on these conclusions.

34. The PFD limits contained in section 25.208 are largely intended to facilitate sharing between space and terrestrial services. Most are angle-dependent and closely replicate the PFD limits contained in Article 21 of the ITU Radio Regulations. Since section 25.140(a) contains rules to facilitate FSS operations in a two-degree orbital spacing environment, we believe that this rule section is a more appropriate place to include our proposed PFD limits, as they are intended to facilitate intra-service operation. Thus, rather than amending section 25.208, we propose to include these new PFD requirements in section 25.140(a)(3). Further, to improve the organizational coherence of our Part 25 rules, we also propose to likewise move the regional PFD limits for 17/24 GHz BSS space stations now contained in section 25.208(w) to section 25.140(b)(3). As a consequence of this move, we also propose conforming updates to other paragraphs in section 25.140(b)(3)<sup>96</sup> and to rule sections that currently reference section 25.208(w) including sections 25.114(d)(15)(i)-(ii), 25.140(b)(5), and 25.262(b)(1)-(2) and (c)-(d). We seek comment on these proposed rule changes generally, and on whether the proposed PFD limits for FSS space stations are appropriate.

35. *Polarization and Full Frequency Re-Use Requirements.* Section 25.210(f) of our rules requires all space stations in the FSS operating in any portion of the bands specified therein to employ state-of-the-art full frequency reuse, either through the use of orthogonal polarizations within the same beam and/or the use of spatially independent beams.<sup>97</sup> It similarly requires full frequency reuse for BSS space stations transmissions in the 17.3-17.8 GHz band (space-to-Earth).<sup>98</sup> We propose to amend this requirement to include 17.3-17.8 GHz in the list of specified frequencies, thereby extending the requirement to FSS space-to-Earth transmissions in the band. We seek comment on this proposal.

36. *Cross-Polarization Isolation Requirements.* Section 25.210(i) requires 17/24 GHz BSS transmitting space station antennas to provide cross-polarization isolation of at least 25 dB within the primary coverage area.<sup>99</sup> We note that a similar cross-polarization isolation requirement for transmitting FSS space stations was eliminated in the *Part 25 Second Report and Order*, although at that time the Commission did not address the cross-polarization isolation requirement for 17/24 GHz BSS.<sup>100</sup> We propose to not extend the cross-polarization requirements to FSS space station antennas transmitting in the 17.3-17.8 GHz band. We seek comment on this proposal. We also seek comment on whether this

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<sup>94</sup> 47 CFR § 25.140(a)(3)(iii). The conventional downlink Ka-bands include 18.3-18.8 GHz (space-to-Earth) and 19.7-20.2 GHz (space-to-Earth).

<sup>95</sup> We note that if the -118 dBW/m<sup>2</sup>/MHz regional PFD limit is met, then the angle-dependent PFD limits contained in § 25.208(c) that are intended to protect terrestrial operations in the 17.7-17.8 GHz band will be met as well.

<sup>96</sup> We propose renumbering of section 25.140(b)(3) generally as well as conforming updates to paragraphs (b)(4), (b)(5) and a new paragraph (b)(6). See *infra* Appendix A.

<sup>97</sup> 47 CFR § 25.210(f). The FSS bands listed include 3600-4200 MHz, 5091-5250 MHz, 5850-7025 MHz, 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, 15.43-15.63 GHz, 18.3-20.2 GHz, 24.75-25.25 GHz, or 27.5-30.0 GHz bands, including feeder links for other space services. This requirement does not apply to telemetry, tracking, and command operation.

<sup>98</sup> 47 CFR § 25.210(f). This requirement does not apply to telemetry, tracking, and command operation.

<sup>99</sup> 47 CFR § 25.210(i).

<sup>100</sup> *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, IB 12-267, Second Report and Order, 30 FCC Rcd 14713,14817, paras. 332-333 (2015) (*Part 25 Second Report and Order*).

requirement might be obsolete in the current digital transmission environment and could be eliminated for 17/24 GHz BSS space station transmissions as well.<sup>101</sup>

## 2. Measures to Mitigate Space Path Interference

37. In the 17.3-17.8 GHz reverse-band sharing environment, receiving DBS space stations are vulnerable to space path interference<sup>102</sup> from nearby co-frequency 17/24 GHz BSS space station transmissions.<sup>103</sup> In the *17/24 GHz Space Path Report and Order*, the Commission adopted requirements to mitigate such space path interference.<sup>104</sup> If we opt to permit FSS space-to-Earth transmissions in the 17.3-17.8 GHz band, analogous requirements will need to be adopted to mitigate space path interference from FSS space station transmissions into DBS satellite receivers. We propose to apply to FSS space stations the same antenna off-axis power flux density coordination trigger, antenna off-axis gain measurement requirements, two-part information submission process, and orbital inclination and eccentricity constraints that section 25.264 of our rules now applies to 17/24 GHz BSS space stations.<sup>105</sup>

38. *Off-Axis Power Flux Density Coordination Trigger.* To avoid harmful levels of space path interference into DBS space station antennas from 17/24 GHz BSS transmissions, our rules provide a coordination trigger value, i.e., a PFD of -117 dBW/m<sup>2</sup>/100 kHz at the victim DBS space station receiving antenna above which coordination is required.<sup>106</sup> To protect DBS space stations from space path interference arising from adjacent FSS space station downlinks, SES proposes modifications to section 25.264 of our rules to extend the current PFD coordination trigger of -117 dBW/m<sup>2</sup>/100 kHz to downlinking FSS space stations in the 17.3-17.7 GHz band.<sup>107</sup> We further propose applying this coordination trigger to transmissions from FSS space stations is an appropriate approach to mitigate space path interference into DBS receivers and we propose to amend sections 25.264(a)-(i) of our rules accordingly. We also propose to apply this requirement to FSS downlinking space stations in the 17.7-17.8 GHz band, which could also be a source of space path interference into DBS receivers. We seek comment on these proposals.

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<sup>101</sup> Historically, the Commission adopted its 30 dB FSS cross-polarization isolation requirement in an environment where satellites were predominantly using analog transmissions as it served to minimize the interference between adjacent satellites when both carried analog video signals with highly varying (peaked) power density levels. Although relaxed to 25 dB, a similar cross-polarization requirement, was later extended to 17/24 GHz BSS systems. *17/24 GHz R&O and FNPRM*, 22 FCC Rcd at 8888-89, para. 113.

<sup>102</sup> This type of interference may occur when the off-axis downlinked signals from one space station are detected by the receiving antenna of a nearby co-frequency space station. The severity of space path interference will depend upon the transmitted signal power level; the off-axis gain discrimination characteristics of the transmitting and receiving antennas; and on the specific orientation of, and separation between, the transmitting and receiving antennas on both space stations. This latter factor in turn depends upon various inter-dependent parameters including longitudinal separation and the inclination and eccentricity of both space station orbits. Management of space path interference is typically more challenging when a receiving DBS space station is located within a few tenths of a degree in orbital longitude from a transmitting co-frequency space station.

<sup>103</sup> Analogously, ground path interference arises between earth stations when the off-axis transmissions in the Earth-to-space direction of one service are received by a nearby co-frequency receiving earth station in another service. *See infra* at paras. 49-58.

<sup>104</sup> *See generally, Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, IB Docket No. 06-123, Second Report and Order, 26 FCC Rcd 8927 (2011) (*17/24 GHz Space Path Report and Order*).

<sup>105</sup> 47 CFR §§ 25.264(a)-(i).

<sup>106</sup> 47 CFR §§ 25.264(b)(1) and (d)(1). *See also, 17/24 GHz Space Path Report and Order* at 8934-35, para. 11.

<sup>107</sup> SES Petition, Rule Appendix at 4-7.

39. In addition, we propose to amend sections 25.264(b)(1)-(2) and (e) to require that the PFD calculations at the DBS receiver consider the *aggregate* power flux density from *all* 17.3-17.8 GHz transmitting beams on the adjacent space station. Under our proposed new rules, this requirement would apply to both FSS and any new 17/24 GHz BSS space station operations. Our space path mitigation rules were initially written considering the 17/24 GHz BSS space stations of an earlier generation as potential interference sources; at that time we did not contemplate today's space station design, that often employs multiple spot beams and may result in a cumulative interference level at the DBS receiver. We seek comment on these proposals.

40. *Requirements for Antenna Off-Axis Gain, Angular Measurement Ranges, and Minimum Longitudinal Separation.* Our current rules require that 17/24 GHz BSS space stations maintain a minimum longitudinal separation of at least 0.2° from an adjacent DBS satellite.<sup>108</sup> This angular separation, in conjunction with limits on certain orbital parameters of space stations in both the DBS and 17/24 GHz BSS services, bounds the range over which 17/24 GHz BSS applicants or licensees must provide off-axis angular gain and PFD data.<sup>109</sup> Sections 25.264(a)-(b) of our rules specify the set of angular ranges over which antenna off-axis gain data and associated PFD calculations must be provided to demonstrate whether the coordination trigger will be exceeded at planned or existing DBS satellite locations.<sup>110</sup> SES proposes that transmitting FSS space stations be required to maintain this same minimum longitudinal separation of 0.2° from adjacent DBS satellites, and would extend to them the same limits on orbital inclination and eccentricity.<sup>111</sup> It further proposes extending to transmitting FSS space stations, the requirement to provide antenna off-axis gain and PFD information over the same angular and frequency measurement ranges contained in our rules for 17/24 GHz BSS transmitting space stations.<sup>112</sup>

41. The required angular measurement ranges and associated orbital parameters including longitudinal separation, inclination and eccentricity, are inter-dependent values. Accordingly, the off-axis angle occurring between two geostationary satellites will vary as a result of changes in these inter-dependent orbital parameters. The off-axis measurement ranges specified in our rules for 17/24 GHz BSS satellites are intended to encompass the angular range arising between DBS and 17/24 GHz BSS satellites with longitudinal separations as small as 0.1 degrees,<sup>113</sup> while simultaneously accommodating operation of such space stations within typically observed orbital eccentricity and inclination values.<sup>114</sup> At the time the current values for these parameters were chosen, the Commission sought to provide 17/24 GHz BSS

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<sup>108</sup> 47 CFR §25.264(g).

<sup>109</sup> 47 CFR §§ 25.264(h)-(i). Orbital inclination is limited to less than 0.075° and orbital altitude may not exceed 35,806 km or fall below 35,766 km above the Earth's surface. Although a DBS space station may exceed these bounds, it may not claim protection from any additional space path interference arising as a result of its excessively inclined or eccentric operations and may only claim protection as if it were operating within the defined bounds. *See also, 17/24 GHz Space Path Report and Order* at 8945-47, paras. 39-41.

<sup>110</sup> 47 CFR, §25.264(a). Specifically, measurements must be made over a range of ±30° from the X axis in the X-Z plane, and over a range of ±60° in planes rotated about the Z axis. This rule section also defines the X and Z axes using a cartesian coordinate system wherein the X axis is tangent to the geostationary orbital arc with the positive direction pointing east, i.e., in the direction of travel of the satellite; the Y axis is parallel to a line passing through the geographic north and south poles of the Earth, with the positive direction pointing south; and the Z axis passes through the satellite and the center of the Earth, with the positive direction pointing toward the Earth. *See also, 17/24 GHz Space Path Report and Order* at 8941-42, paras. 30-31.

<sup>111</sup> SES Petition, Rule Appendix at 7.

<sup>112</sup> SES Petition, Rule Appendix at 4-5.

<sup>113</sup> Taking the station keeping requirements of ±0.05° into account, the required nominal separation between the two space stations is 0.2°.

<sup>114</sup> *17/24 GHz Space Path Report and Order* at 8940-41, para. 27.

operators with the flexibility to locate at the small orbital separations they then sought, while simultaneously requiring the antenna off-axis gain measurement data to be made within ranges considered to be reasonable by commenters.<sup>115</sup> We note however, that no 17/24 GHz BSS operator has yet provided service from a location separated from a U.S.-licensed DBS satellite by as little as 0.2 degrees.<sup>116</sup> Moreover, in more recent instances, 17/24 GHz BSS applicants have sought waivers of our off-axis antenna gain measurement requirements, citing difficulties making measurements over the required angular ranges and or specified frequencies.<sup>117</sup>

42. In its Petition, SES proposes FSS use in space-to-Earth direction for gateway earth stations, not direct-to-home consumer services.<sup>118</sup> For such use, FSS operators will not have the same economic incentives to locate space stations at such small longitudinal separations from DBS satellites (i.e., to make use of a single subscriber receiving antenna). Thus, we believe that the minimum longitudinal separation from DBS satellites that FSS space stations must maintain could be increased, resulting in more limited angular ranges over which antenna gain data must be measured. As demonstrated in the graph in Figure 1 of Appendix C,<sup>119</sup> requiring a minimum orbital separation between DBS and downlinking 17.3-17.8 GHz satellites of 0.5 degrees<sup>120</sup> would reduce the required angular measurement range in planes rotated about the Z axis to as little as  $\pm 20$  degrees. The corresponding reduction in measurement range in the X-Z plane would reduce from  $\pm 30$  degrees to approximately  $\pm 6$  degrees.

43. We propose to amend section 25.264(g) of our rules to apply 0.5 degrees as the minimum orbital longitude separation that transmitting FSS space stations must maintain relative to DBS space stations, and to amend section 25.264(a) to reflect the corresponding off-axis measurement angles, i.e.,  $\pm 10$  degrees in the X-Z plane and  $\pm 20$  degrees in planes rotated about the Z axis.<sup>121</sup> We propose to retain our current requirements for orbital inclination and eccentricity, and propose to amend section 25.264(h) to extend these values to FSS space stations. We seek comment on these proposals, and we ask whether 0.2 degrees or some different orbital separation value, or other orbital parameters would be more appropriate. Further, we tentatively conclude that this same change in the required minimum orbital separation value and corresponding antenna measurement angles could be extended to 17/24 GHz BSS

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<sup>115</sup> *Id.*

<sup>116</sup> Following adoption of minimum orbital separation requirements in the *17/24 GHz Second Report and Order*, Spectrum Five LLC sought to operate from an orbital location of 119.25° W.L. Spectrum Five LLC's application was granted although the grant later declared null and void. See *Petition for Declaratory Ruling Regarding 17/24 GHz Broadcasting-Satellite Service to the U.S. Market from the 119.25° W.L. Orbital Location*, 33 FCC Rcd 153 (IB, Sat. Div. 2012) (declaring null and void Spectrum Five LLC's grant of access to the U.S. market for a GSO satellite to be located at the 119.25° W.L. orbital location operating in the 17/24 BSS satellite).

<sup>117</sup> See, e.g., IBFS File Nos. SAT-MOD-20150415-00022, SAT-MOD-20140612-00067, SAT-PRL-20121228-00227, and SAT-MOD-20120314-00042.

<sup>118</sup> SES Petition at 2.

<sup>119</sup> Figure 1 in Appendix C presents the results of a basic geometric analysis that examines the range of off-axis angles occurring between two adjacent satellites at varying values of orbital eccentricity and orbital inclination. As can be seen, one approach that might permit relaxation of the required angular measurement range for off-axis antenna gain (and calculated PFD performance) would be to increase the minimum orbital separation requirement between transmitting 17.3-17.8 GHz space stations and DBS receiving space stations from 0.2 degrees to a somewhat larger value. Similarly, further restricting the limits placed on orbital inclination and eccentricity could accomplish this, although this would seem somewhat impractical.

<sup>120</sup> Taking an east/west station keeping allowance of  $\pm 0.05$  degrees into account a nominal orbital separation of 0.5 degrees results in an actual minimum orbital separation of 0.4 degrees.

<sup>121</sup> Smaller orbital separations would still be possible if a coordination agreement is achieved between the FSS and DBS operators.

space stations transmitting in the 17.3-17.8 GHz band. We propose to similarly amend sections 25.264(a) and (g) with respect to 17/24 GHz BSS space stations, and we seek comment on these options, and on alternatives that might be appropriate.

44. *Measurement Frequencies.* To account for the frequency-dependent nature of antenna gain, our current rules require off-axis angular measurements to be made at a minimum of three measurement frequencies determined with respect to the entire portion of the 17.3-17.8 GHz band over which the space station is designed to transmit.<sup>122</sup> Although we propose no changes in this requirement, we seek comment on whether our rules should be revised to permit increased flexibility in the measurement frequencies. If so, commenters should be specific regarding how such a rule should be re-structured. Comments should address how many measurement frequencies should be required, over what range, and at what separation from each other.

45. *Two-Part Data Submission Process.* At present our rules require a two-part submission process for antenna off-axis gain data and associated PFD calculations to demonstrate conformance with the off-axis PFD coordination trigger.<sup>123</sup> Under this approach at an early stage in the process, operators submit predicted antenna off-axis gain data and associated PFD calculations at any identified victim (DBS) space station receiver.<sup>124</sup> No later than two months prior to launch this predicted data is confirmed by submission of measured data and associated PFD calculations. We propose to amend sections 25.264(a)-(e) of our rules to extend this requirement to FSS applicants proposing space-to-Earth transmissions in the 17.3-17.8 GHz band. We seek comment on this approach as well as whether it would serve the public interest to adopt a modified data submission process instead. We also seek comment on whether we should retain, update, or modify any part of the process for 17/24 GHz BSS applicants.

46. In its comments to the *Part 25 Second Report and Order*, SIA argued that section 25.264(c) should be revised to permit acceptance of simulated antenna gain data in place of measured data to afford applicants additional technical flexibility.<sup>125</sup> In that Order, the Commission acknowledged that strict compliance with section 25.264(c) has proven difficult for some applicants.<sup>126</sup> At that time, however, we declined to adopt SIA's proposal to accept simulated data in place of gain measurements, as the record contained insufficient information to determine whether the simulated data would replicate the accuracy of the required measurements.<sup>127</sup> To evaluate whether to permit the use of simulated data in place of gain measurements in this instance, we seek comment on whether and how we should modify the two-part submission process to also accept simulated data in lieu of measured data. We ask what requirements we should place on the simulated data to ensure accuracy of required calculations and effectiveness of our rules. Are there specific software programs that should be specified, or certain input assumptions, conditions or other parameters that we should specify? In addition to the resulting gain and PFD levels, what information should we require applicants to include with their showing, e.g., specific input assumptions, conditions or other parameters? If the Commission decides to accept simulated off-

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<sup>122</sup> 47 CFR § 25.264(a)(4)-(5). Specifically, these are: (1) five megahertz above the lower edge of the band; (2) at the band center frequency; and (3) five megahertz below the upper edge of the band. A greater angular measurement range may be used, if necessary, to account for any planned spacecraft orientation bias or change in operating orientation relative to the reference coordinate system.

<sup>123</sup> Initially the Commission's rules required analytical data to be included at the time of application, and measured data was required nine months prior to launch. The Commission later amended §25.264 of our rules to provide 17/24 GHz BSS applicants and licensees greater flexibility, and to allow for finalization of antenna design. *See Part 25 Second Report and Order*, 30 FCC Rcd at 14816, paras. 329-330.

<sup>124</sup> 47 CFR § 25.264.

<sup>125</sup> SIA Comments at 21-22; SIA Reply, Exhibit 3 at 125-128.

<sup>126</sup> *Part 25 Second Report and Order*, 30 FCC Rcd at 14816, para. 330.

<sup>127</sup> *Id.*

axis gain and associated PFD data, what other changes to our rules may be necessary. For example, is it necessary to retain the two-part information showing, or is a single simulation output sufficient? If so, at what point in the process should this information be submitted?

47. Would accepting simulated gain and PFD data obviate a need to reduce the angular ranges over which such measurements are made, based on its ability to alleviate the difficulties applicants and licensees experience in providing measured data? Or rather, would an increased orbital separation between space-to-Earth transmitting FSS or BSS and DBS space stations alleviate concerns associated with relying upon simulated off-axis gain data for determining likelihood of inference, recognizing that at increased longitudinal separation, the likelihood for space path interference is significantly diminished?

48. To demonstrate that the coordination trigger is not exceeded, sections 25.264(a)(6) and (b)(4) of our rules require submission of PFD information calculated from the antenna off-axis gain data.<sup>128</sup> The timing of PFD data submission is tied to the critical design review (CDR) process,<sup>129</sup> a former satellite milestone requirement that was defined to be two years after the license grant.<sup>130</sup> In the *Part 25 Second Report and Order*, however, the Commission eliminated all interim milestone requirements,<sup>131</sup> including CDR, thereby creating some uncertainty with regard to the timing of PFD submission requirements. To correct this, we propose to replace the phrase “within 60 days after completion of critical design review” with a requirement to submit information “within two years after license grant” in these rule sections. We seek comment on our proposed changes.

### 3. Measures to Mitigate Ground Path Interference

49. In the 17.3-17.8 GHz band, receiving FSS earth stations will be vulnerable to ground path interference from the Earth-to-space transmissions from nearby co-frequency DBS feeder link earth stations.<sup>132</sup> Section 25.203(m) of our rules contains requirements to mitigate ground path interference from DBS feeder links into BSS earth stations operating in the 17/24 GHz BSS.<sup>133</sup> If FSS receiving earth stations are permitted to operate in the band with protected status with respect to DBS feeder link earth stations, then we will need to adopt analogous protection requirements. Below, we propose generally to apply the same coordination approach that the Commission adopted to facilitate operations between DBS and 17/24 GHz FSS earth stations to receiving FSS earth stations. We propose to apply this coordination approach to FSS earth stations in the entire 17.3-17.8 GHz band, although in the 17.7-17.8 GHz band such earth stations will not be entitled to protection from fixed service stations. As discussed below, we seek comment on modifications to the parameters used with the ITU Radio Regulations Appendix 7

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<sup>128</sup> 47 CFR § 25.264(a)(6) and (b)(4).

<sup>129</sup> In bounding the timing of PFD information submissions by the critical design review process, the Commission sought to permit licensees to provide gain and PFD predictions at a point when spacecraft design would be more mature, believing that predictions made at that point would generally be more reliable than predictions made at the application stage. *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, IB Docket No. 12-267, Further Notice of Proposed Rulemaking, 29 FCC Rcd 12116, 12166, para. 177 (2014) (*Part 25 Further Notice*).

<sup>130</sup> 47 CFR § 25.164 (Sept. 16, 2016).

<sup>131</sup> *Part 25 Second Report and Order*, 30 FCC Rcd at 14738, para. 59.

<sup>132</sup> Ground path interference arises in reverse-band sharing scenarios when the off-axis uplinked signals transmitted by one earth station are detected by the receiving antenna of a nearby co-frequency earth station. It is analogous to space path interference which arising between co-frequency space stations as discussed above. As with space path interference, the severity of ground path interference will depend upon the transmitted signal power level, the off-axis gain discrimination characteristics of the transmitting and receiving antennas, and the specific orientation of, and separation between, the transmitting and receiving antennas on both earth stations. In addition, local geography can also influence ground path interference levels.

<sup>133</sup> 47 CFR § 25.203(m).

coordination methodology<sup>134</sup> to account for differences between the receiving antennas in the two services.

50. SES argues that 17 GHz FSS downlinks readily fit into the existing 17/24 GHz BSS regulatory structure and will not constrain the placement of additional future DBS feeder link facilities.<sup>135</sup> SES points out that all existing DBS feeder link sites are grandfathered and permitted to make modest changes, and that entities seeking to establish protected 17 GHz FSS receiving earth stations would select locations well away from current DBS feeder link facilities.<sup>136</sup> We propose generally to amend section 25.203(m) of our rules to include receiving FSS earth stations in the rules. We seek comment on this approach and on any unforeseen effects it may have on incumbent DBS operations. We also recognize that there are some differences between BSS receiving earth stations and those FSS stations that may operate in the band, and we ask commenters for input on if, and how, these differences might need to be accounted for in any rule modifications. We recognize, for example, that receiving FSS and BSS earth stations will have different antenna performance characteristics,<sup>137</sup> and unlike 17/24 GHz BSS earth stations, FSS earth stations entitled to protection from DBS feeder link earth stations will not be ubiquitously deployed.

51. *Upgrades and Modifications to Grandfathered DBS Facilities.* In the *17/24 GHz Ground Path Report and Order* the Commission grandfathered existing DBS earth station sites and adopted a two-pronged approach to allow existing DBS feeder link operators to modify or add antennas to their networks at these sites.<sup>138</sup> Under that approach, the aggregate PFD resulting from the new or modified operations cannot exceed the PFD generated by the existing station measured at any point between three and ten meters above the ground. In addition, any new earth station antenna must be located within one kilometer of an existing authorized DBS feeder link earth station antenna.<sup>139</sup> Otherwise, the new or modified earth station is subject to the coordination procedures in section 25.203(m)<sup>140</sup> of our rules, which are discussed below. We propose to retain this grandfathered status for existing DBS feeder link earth stations relative to FSS receiving earth stations, and to apply to FSS the same criteria for permitting DBS operators to modify or add antennas to their existing networks.<sup>141</sup> We seek comment on these proposals.

52. *Coordination between DBS and FSS Receiving Earth Stations.* The Commission's rules include a coordination methodology to permit licensing of new DBS feeder link earth stations in the 17.3-17.8 GHz band while protecting co-frequency receiving BSS earth stations in the 17.3-17.7 GHz band.<sup>142</sup> This rule requires a DBS operator with a new or modified earth station to complete frequency coordination with existing and planned 17/24 GHz BSS receive earth stations within an established coordination zone around its proposed site using the methodology outlined in Appendix 7 of the ITU

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<sup>134</sup> ITU *Radio Regulations*, Appendix 7 at § 3; Table 9b of Annex 7.

<sup>135</sup> SES Petition at 6-7.

<sup>136</sup> SES Petition at 6-7. SES further argues that the gateway-type receiving FSS earth stations it contemplates would be fewer in number and more resistant to interference than the ubiquitously deployed 17/24 GHz BSS earth stations now permitted in the band. *Id.*

<sup>137</sup> 17/24 GHz BSS receiving antennas no smaller than 45 cm in diameter are protected from interference only to the extent that they conform to the criteria stated in ITU-R Recommendation BO.1213-1. 47 CFR § 25.224(a).

<sup>138</sup> *17/24 GHz Ground Path Report and Order*, 32 FCC Rcd at 3708, para. 13.

<sup>139</sup> 47 CFR § 25.203(m)(1).

<sup>140</sup> 47 CFR § 25.203(m).

<sup>141</sup> *Id.*

<sup>142</sup> *17/24 GHz Ground Path Report and Order*, 32 FCC Rcd at 3707-08, paras. 5-9; 47 CFR § 25.203(m).

Radio Regulations.<sup>143</sup> Section 25.203(m) of our rules contains specific parameter values to be used in determining this coordination zone.<sup>144</sup> These parameters however, were adopted based on the characteristics of BSS receiving earth stations, and we do not believe that they are necessarily appropriate to use in calculating the coordination zone relative to receiving FSS earth stations. Thus, we propose to modify section 25.203(m)(1) to include new values for use in coordination of DBS feeder link earth stations relative to FSS earth stations. We seek comment on this conclusion and on whether different parameter values should be included in our rules, and on what these values should be. For example, parameters such as the link performance margin ( $M_s$ ), receiver noise temperature ( $T_e$ ) and receiving antenna gain parameters ( $G_m$ ,  $G_r$ ) are specific to BSS systems.

53. In addition, our rules identify certain information that applicants proposing new DBS feeder link earth station must provide to a third-party coordinator to resolve any potential interference issues with affected 17/24 GHz BSS receiving stations prior to licensing.<sup>145</sup> We believe that the same information should also be provided to a third-party coordinator to enable coordination with affected FSS receiving earth stations in the 17.3-17.8 GHz band. Accordingly, we propose to apply section 25.203(m)(2) to FSS with no additional changes to the requested information. We seek comment on this proposal. The requested information is as follows:

- The geographical coordinates of the proposed earth station antenna(s);
- Proposed operating frequency band(s) and emission(s);
- Antenna diameter (meters);
- Antenna center height above ground and ground elevation above mean sea level;
- Antenna gain pattern(s) in the plane of the main beam;
- Longitude range of geostationary satellite orbit (GSO) satellites at which an antenna may be pointed;
- Horizon elevation plot;
- Antenna horizon gain plot(s) determined in accordance with the procedure in section 2.1 of Annex 5 to Appendix 7 of the ITU Radio Regulations;
- Minimum elevation angle;
- Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any one-megahertz band;
- Maximum available RF transmit power density in any one-megahertz band at the input terminals of the antenna(s); and
- A plot of the coordination distance contour(s) and rain scatter coordination distance contour(s) as determined by Table 2 of section 3 to Appendix 7 of the ITU Radio Regulations.

54. DBS operators needing to coordinate with 17.3-17.8 GHz receiving FSS earth station operations must be able to determine those locations at which coordination is required. Receive-only earth stations are generally not required to apply for a license or to be registered with the Commission,

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<sup>143</sup> *17/24 GHz Ground Path Report and Order*, 32 FCC Rcd at 3710-11, paras. 15-17, and 47 CFR § 25.203(m)(1). The ITU methodologies are described in section 2-3 to Annex 5 of Appendix 7 of the ITU Radio Regulations and define techniques for calculating a coordination area around a transmitting earth station. The methodologies make use of additional parameters defined in Table 9b to Annex 7, which includes the modulation type of the receiving earth station, various receiving earth station interference parameters and criteria, receiving earth station physical characteristics, reference bandwidth and permissible interference power levels.

<sup>144</sup> 47 CFR § 25.203(m)(1). These parameters were adopted in the *17/24 GHz Ground Path Report and Order*, 32 FCC Rcd at 3710-11, paras. 15-17, as Table 9b of Annex 7 to Appendix 7 did not include all the values necessary to make the required calculations.

<sup>145</sup> 47 CFR § 25.203(m)(2).

although they may do so in accordance with the provisions of section 25.115(b) of our rules, to receive interference protection from terrestrial service in bands shared co-equally with the fixed service.<sup>146</sup> We seek comment on how to facilitate coordination with DBS operators and to ensure protection from DBS feeder link earth station ground path interference. We propose that interference protection will be afforded to individual FSS receiving earth stations from DBS feeder link transmissions only if they have been licensed with the Commission, and we propose to amend section 25.203(m)(3) of our rules to reflect this requirement. We seek comment on these proposals.

55. We propose, however, to allow blanket licensed FSS earth stations (other than earth stations in motion (ESIMs)) on a non-protected basis in the 17.3-17.8 GHz band and propose to amend section 25.115(e) to reflect this. We seek comment on this proposal. SES asserts that the 17.3-17.7 GHz FSS downlink spectrum is needed to accommodate gateway operations, while other FSS bands would be used for ubiquitously deployed user terminals.<sup>147</sup> SES further argues that sharing with incumbent services in the 17.3-17.7 GHz band is feasible in part because such gateway-type FSS earth stations would be fewer in number and more resistant to interference than the widely-dispersed consumer terminals.<sup>148</sup> Given the already complex reverse-band sharing situation in the band, we seek comment on whether extending protection to ubiquitously deployed earth stations in yet another service could unduly constrain incumbent users. Commenters should discuss any consequences that may unduly constrain incumbent services as well as any benefits of allowing non-protected blanket licensed earth stations in the 17.3-17.8 GHz band.

56. In its comments AT&T asserts that we should make clear that any use of the 17.3-17.7 GHz band for FSS downlinks would be limited to fixed earth stations.<sup>149</sup> In reply, SES argues that the Commission should decline to prejudge this issue at the Notice stage, but rather should invite comment on the range of services that can effectively be provided by FSS in the band while remaining consistent with reasonable requirements to protect incumbent 17/24 GHz BSS and DBS operations.<sup>150</sup> While receiving FSS earth stations in the 17.3-17.8 GHz band should not pose an interference threat to incumbent DBS, 17/24 GHz BSS, or fixed service operations in the band, ESIMs could unduly constrain incumbent services if there is a requirement to protect receiving ESIM stations in the band.

57. At this time, we do not propose to amend sections 25.202(a)(8) or (10) of our rules to permit operation of ESIMs in the 17.3-17.8 GHz band. We ask, however, whether such a modification could increase FSS operators' flexibility to use the band more efficiently, while still protecting and allowing sufficient flexibility for the operations of incumbent services. If so, what other modifications to our rules might be required to permit operation of ESIMs while protecting incumbent services and not imposing any undue constraints on their current and future operations in the band. The U.S. Table now includes footnotes in certain frequency bands that expressly preclude ESIMs from claiming protection from the transmissions of non-Federal stations in the fixed service.<sup>151</sup> Would it be reasonable, for example, to allow ESIMs to receive FSS transmissions in the band if they were similarly denied protection from co-frequency DBS feeder link transmissions? We seek comment on this possibility, and on any consequences that may result to incumbent services. Commenter should discuss any benefits and costs of allowing ESIMs, including consequences affecting current and future use of the band by the incumbent satellite and fixed services.

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<sup>146</sup> 47 CFR § 25.115(b).

<sup>147</sup> SES Petition at 3-4.

<sup>148</sup> SES Petition at 6.

<sup>149</sup> AT&T Comments at 4.

<sup>150</sup> SES Reply Comments at 3.

<sup>151</sup> See e.g., 47 CFR § 2.106, nn. NG457A and NG527A.

58. Finally, we ask whether there are any other measures we should adopt in this proceeding to protect FSS receiving earth stations from DBS feeder link transmissions in the 17.3-17.8 GHz band.

#### 4. Other Proposed Rule Changes

59. Various conforming modifications to our rules are required as a result of the changes proposed above. We propose to modify the definition of a two-degree compliant space station in section 25.103 to include FSS satellites transmitting in the 17.3-17.8 GHz band. In addition, we propose to modify section 25.114 to identify 17.3-17.8 GHz space-to-Earth FSS applicants alongside information requirements applicable to such applications, specifically in sections 25.114(d)(7), (d)(15) and (d)(18). We similarly propose to modify section 25.115(e) to identify the information required for receiving earth station applicants in this band. Finally, we modify section 25.117(d)(2)(v) to permit 17.3-17.8 GHz FSS operators to modify certain restrictions that might be associated with their licenses according to the same procedures afforded to 17/24 GHz BSS operators. We seek comment on these and any other needed rule changes.

60. *Radio Astronomy.* We note that current Part 25 rules include some rules to coordinate with radio astronomy in various bands. Section 25.203(f), for example, requires any applicant for a transmitting earth station in the vicinity of certain radio astronomy observatory sites, including Green Bank, West Virginia, to notify the National Radio Astronomy Observatory.<sup>152</sup> We seek comment on whether there is a need for any measures, other than those in the current rules, that the Commission should consider with respect to radio astronomy in the adjacent 17.2-17.3 GHz band.

#### C. Defining the Extended Ka-Band and Creating Rules for Routine License Application Processing in this Band

61. In the *Part 25 Second Report and Order*, the Commission adopted definitions for conventional and extended C-bands, conventional and extended Ku-bands and the conventional Ka-band.<sup>153</sup> At the same time, the Commission extended routine licensing processing criteria with respect to off-axis EIRP density limits for conventional C- and Ku-band earth stations in section 25.218 to earth station operations in the extended C- and Ku-bands.<sup>154</sup> Although at that time the Commission neither defined the extended Ka-band nor extended routine licensing processing criteria to any such frequencies,<sup>155</sup> we propose to do so now.

62. *Definition of Extended Ka-band.* We propose to define the extended Ka-band in section 25.103 as 17.3-18.3 GHz (space-to-Earth), 18.8-19.4 GHz (space-to-Earth), 19.6-19.7 GHz (space-to-Earth), 27.5-28.35 GHz (Earth-to-space) and 28.6-29.1 GHz, (Earth-to-space). These are frequency bands that include either primary or secondary allocations to the GSO FSS, apart from the conventional Ka-band<sup>156</sup> and those bands where FSS use is limited solely to MSS feeder links.<sup>157</sup> We seek comment on this proposal.

63. *Routine License Application Processing Criteria for Extended Ka-band Earth Stations.* Our current rules contain no provisions to afford “routine” license application processing to earth stations

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<sup>152</sup> See e.g., 47 CFR § 25.203(f).

<sup>153</sup> *Part 25 Second Report and Order*, 30 FCC Rcd at 14791-93, paras. 236-243.

<sup>154</sup> *Id.*

<sup>155</sup> *Part 25 Second Order*, 30 FCC Rcd at 14780-81, paras. 202-205.

<sup>156</sup> The conventional Ka-band includes the 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) frequency bands.

<sup>157</sup> These include the 19.4-19.6 GHz (space-to-Earth) and 29.1-29.25 GHz (Earth-to-space) frequency bands.

seeking to operate in extended Ka-band frequencies.<sup>158</sup> We propose to extend the routine license application processing criteria for conventional Ka-band earth stations contained in section 25.218(i)<sup>159</sup> to extended Ka-band earth stations communicating with GSO space stations. We propose modifications to sections 25.218(a) and (j) consistent with this approach.<sup>160</sup> Routine license application processing criteria with respect to off-axis EIRP density limits specified in the rules will expedite processing of earth station applications for these bands and are consistent with our earlier decision to adopt such routine processing limits for space station transmissions in the extended C- and Ku-bands.<sup>161</sup> We seek comment on this proposal.<sup>162</sup>

64. In addition, section 25.212(e)<sup>163</sup> affords an alternative approach to routine license application processing of FSS earth stations transmitting to GSO satellites in the conventional Ka-band that permits such applicants to demonstrate compliance with off-axis gain and accompanying input power density levels. Accordingly, we propose to extend this approach to earth station applicants seeking to operate in the extended Ka-bands by modifying section 25.212(e) and (h)<sup>164</sup> to permit such applicants to similarly demonstrate compliance with the off-axis gain requirements in sections 25.209(a)-(b)<sup>165</sup> combined with an input power density limit of 3.5 dBW/MHz. We also propose modifications to section 25.209(a)-(b) to extend the Ka-band off-axis antenna gain requirements across the full 27.5-30 GHz band, and to reference these alternative routine license application processing requirements in sections 25.115(g), (k), and 25.220(a).<sup>166</sup> We seek comment on these proposals.

#### IV. PROCEDURAL MATTERS

65. *Paperwork Reduction Act Analysis.* This document contains proposed modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

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<sup>158</sup> *See* 47 CFR § 25.218 (allowing certain earth station applications to be “routinely” processed in certain frequency bands if the applicant certifies that the aggregate off-axis EIRP density will not exceed the off-axis EIRP density limits specified in this rule).

<sup>159</sup> 47 CFR § 25.218(i).

<sup>160</sup> 47 CFR §§ 25.218(a) and (j).

<sup>161</sup> *Part 25 Second Report and Order*, 30 FCC Rcd at 14791-93, paras. 236-243.

<sup>162</sup> We note that nothing in this “routine” license application process proposal should be construed as affecting or modifying any other applicable rules and obligations, including for example the criteria in Section 25.136 governing earth station siting rules applicable to FSS earth stations in the 27.5-28.35 GHz band. *See* 47 CFR § 25.136.

<sup>163</sup> 47 CFR § 25.212(e).

<sup>164</sup> 47 CFR § 25.212(h). This section addresses an alternative rules section for earth station applications that do not qualify for routine licensing. It requires a consequential modification to include reference to the extended Ka-band.

<sup>165</sup> 47 CFR §§ 25.209(a)-(b).

<sup>166</sup> 47 CFR §§ 25.115(g), (k) and 25.220(a).

66. *Initial Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act of 1980 (RFA)<sup>167</sup> the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) relating to this Notice of Proposed Rulemaking. The IRFA is contained in Appendix B.

67. *Filing Instructions.* Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). See Electronic Filing of Documents in Rulemaking Proceedings, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://apps.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing.
  - Filings can be sent by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.
  - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701. U.S. Postal Service first-class, Express, and Priority mail must be addressed to 45 L Street NE, Washington, DC 20554.
  - Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. See FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy, Public Notice, DA 20-304 (March 19, 2020). <https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy>.

68. *People with Disabilities.* To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

69. *Ex Parte Information.* This proceeding shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's ex parte rules.<sup>168</sup> Persons making ex parte presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral ex parte presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the ex parte presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda, or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during ex parte meetings are deemed to be written ex parte presentations and must be filed consistent

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<sup>167</sup> See 5 U.S.C. § 603. The RFA, see 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 847 (1996). The SBREFA was enacted as Title II of the Contract with America Advancement Act of 1996 (CWAAA).

<sup>168</sup> 47 C.F.R. §§ 1.1200 et seq.

with section 1.1206(b) of the Commission's rules. In proceedings governed by section 1.49(f) of the Commission's rules or for which the Commission has made available a method of electronic filing, written ex parte presentations and memoranda summarizing oral ex parte presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's ex parte rules.

**V. ORDERING CLAUSES**

70. Accordingly, **IT IS ORDERED** that, pursuant to Sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 157(a), 303(c), 303(f), 303(g), 303(r), this Notice of Proposed Rulemaking **IS HEREBY ADOPTED**.

71. **IT IS FURTHER ORDERED** that the Petition for Rulemaking filed by SES in the Commission's rulemaking proceeding RM-11839 **IS GRANTED** to the extent specified herein, that RM-11839 is incorporated into this proceeding, IB Docket No. 20-330, and that RM-11839 is **TERMINATED**.

72. **IT IS FURTHER ORDERED** that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center will send a copy of this Notice of Proposed Rulemaking, including the initial regulatory flexibility analysis, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with Section 603(a) of the Regulatory Flexibility Act, 5 U.S.C. § 601 *et seq.*

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

**APPENDIX A**  
**Proposed Rules**

The Federal Communications Commission proposes to amend 47 CFR parts 2 and 25, as follows:

**PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL  
RULES AND REGULATIONS**

1. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:

- a. Revise page 52.

- b. In the list of United States (US) Footnotes, remove footnote US271 and revise footnote US402.

- c. In the list of Non-Federal Government (NG) Footnotes, add footnote NG58 and remove footnote NG163.

The additions and revisions read as follows:

**§ 2.106 Table of Frequency Allocations.**

\* \* \* \* \*

15.63-15.7 RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION			15.63-15.7 RADIOLOCATION 5.511E 5.511F US511E AERONAUTICAL RADIONAVIGATION US260 US211	15.63-15.7 AERONAUTICAL RADIONAVIGATION US260  US211 US511E	Aviation (87)
15.7-16.6 RADIOLOCATION 5.512 5.513			15.7-16.6 RADIOLOCATION G59	15.7-17.2 Radiolocation	Private Land Mobile (90)
16.6-17.1 RADIOLOCATION Space research (deep space) (Earth-to-space) 5.512 5.513			16.6-17.1 RADIOLOCATION G59 Space research (deep space) (Earth-to-space)		
17.1-17.2 RADIOLOCATION 5.512 5.513			17.1-17.2 RADIOLOCATION G59		
17.2-17.3 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.512 5.513 5.513A			17.2-17.3 EARTH EXPLORATION- SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH (active)	17.2-17.3 Earth exploration-satellite (active) Radiolocation Space research (active)	
17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B Radiolocation 5.514	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation 5.514 5.515	17.3-17.7 FIXED-SATELLITE (Earth-to-space) 5.516 Radiolocation 5.514	17.3-17.7 Radiolocation US259 G59  US402 G117	17.3-17.7 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) BROADCASTING-SATELLITE  US259 US402 NG58	Satellite Communications (25)
17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8 FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	17.7-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE	17.7-17.8  US334 G117	17.7-17.8 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth)  US334 NG58	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
	17.8-18.1 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE 5.519		17.8-18.3 FIXED-SATELLITE (space-to- Earth) US334 G117	17.8-18.3 FIXED Fixed-satellite (space-to-Earth)	
18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521			US519	US334 US519 NG527A	
18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE			18.3-18.6 FIXED-SATELLITE (space-to- Earth) US334 G117  US139	18.3-18.6 FIXED-SATELLITE (space-to-Earth) NG527A  US139 US334	Satellite Communications (25)

\* \* \* \* \*

**UNITED STATES (US) FOOTNOTES**

\* \* \* \* \*

US402 In the band 17.3-17.7 GHz, existing Federal satellites and associated earth stations in the fixed-satellite service (Earth-to-space) are authorized to operate on a primary basis in the frequency bands and areas listed below. Non-Federal receiving earth stations in the broadcasting-satellite and fixed-satellite services within the bands and areas listed below shall not claim protection from Federal earth stations in the fixed-satellite service.

(a) 17.600-17.700 GHz for stations within a 120 km radius of 38°49' N latitude and 76°52' W longitude.

(b) 17.375-17.475 GHz for stations within a 160 km radius of 39°42' N latitude and 104°45' W longitude.

\* \* \* \* \*

**NON-FEDERAL GOVERNMENT (NG) FOOTNOTES**

\* \* \* \* \*

NG58 In the band 17.3-17.8 GHz, the following provisions shall apply to the broadcasting-satellite and fixed-satellite services:

(a) The use of the band 17.3-17.8 GHz by the broadcasting-satellite and fixed-satellite (space-to-Earth) services is limited to geostationary satellites.

(b) The use of the 17.7-17.8 GHz band by the broadcasting-satellite service is limited to receiving earth stations located outside of the United States and its insular areas.

(c) The use of the band 17.3-17.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for broadcasting-satellite service.

(d) Earth stations in the fixed-satellite service (space-to-Earth) in the 17.7-17.8 GHz band shall not claim protection from stations in the fixed service that operate in that band.

\* \* \* \* \*

**PART 25 – SATELLITE COMMUNICATIONS**

3. The authority citation for part 25 continues to read as follows:

Authority: Interprets or applies 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721 unless otherwise noted.

4. Amend § 25.103 by adding a new definition for Extended Ka-Band and revising the definition of a two-degree compliant space station to read as follows:

§ 25.103 Definitions.

\* \* \* \* \*

*Extended Ka-band.* The 17.3-18.3 GHz (space-to-Earth), 18.8-19.4 GHz (space-to-Earth), 19.6-19.7 GHz (space-to-Earth), 27.5-28.35 GHz (Earth-to-space), and 28.6-29.1 GHz (Earth-to-space) FSS frequency bands.

\* \* \* \* \*

*Two-degree-compliant space station.* A GSO FSS space station operating in the conventional or extended C-bands, the conventional or extended Ku-bands, the 24.75-25.25 GHz band, or the conventional or extended Ka-bands within the limits on downlink EIRP density or PFD specified in § 25.140(a)(3) or (b)(3) and communicating only with earth stations operating in conformance with routine uplink parameters specified in § 25.211(d), § 25.212(c), (d), or (f), or § 25.218.

\* \* \* \* \*

5. Amend § 25.114 by revising paragraphs (d)(7), (d)(15) and (d)(18) to read as follows:

§ 25.114 Applications for space station authorizations.

\* \* \* \* \*

(d) \* \* \*

(7) Applicants for authorizations for space stations in the Fixed-Satellite Service, including applicants proposing feeder links for space stations operating in the 17/24 GHz Broadcasting-Satellite Service, must also include the information specified in § 25.140(a). Applicants for authorizations for space stations in the 17/24 GHz Broadcasting-Satellite Service or applicants seeking authorization for FSS space stations transmitting in the 17.3-17.8 GHz band (space-to-Earth), must also include the information specified in § 25.140(b);

\* \* \*

(15) Each applicant for a space station license in the 17/24 GHz Broadcasting-Satellite Service or the FSS transmitting in the 17.3-17.8 GHz band, shall include the following information as an attachment to its application:

(i) If the applicant proposes to operate in the 17.3-17.8 GHz band, a demonstration that the proposed space station will comply with the applicable power flux density limits in §25.140(a)(3)(iii) or (b)(3) unless the applicant provides a certification under paragraph (d)(15)(ii) of this section.

(ii) In cases where the proposed space station will not comply with the applicable power flux density limits set forth in § 25.140(a)(3)(iii) or (b)(3), the applicant will be required to provide a certification that all potentially affected parties acknowledge and do not object to the use of the applicant's higher power flux densities. The affected parties with whom the applicant must coordinate are those GSO 17/24 GHz BSS satellite networks or FSS satellite networks with space stations transmitting in the 17.3-17.8 GHz band that are located up to  $\pm 6^\circ$  away. Excesses of more than 3 dB above the applicable power flux density levels specified in § 25.140(a)(3)(iii) or (b)(3) of this part, must also be coordinated with 17/24 GHz BSS satellite networks located up to  $\pm 10^\circ$  away.

(iii) Any information required by § 25.264(a)(6), 25.264(b)(4), or 25.264(d).

\* \* \* \* \*

(18) For space stations in the Direct Broadcast Satellite service, the 17/24 GHz Broadcasting-Satellite Service, or FSS space stations transmitting in the 17.3-17.8 GHz band, maximum orbital eccentricity.

\* \* \* \* \*

6. Amend § 25.115 by revising paragraphs (e), (g) and (k)(1) to read as follows:

§ 25.115 Applications for earth station authorizations.

\* \* \* \* \*

(e)(1) *GSO FSS earth stations in 17.3-30 GHz.* (1) An application for a GSO FSS earth station license in the 17.3-19.4 GHz, 19.6-20.2 GHz, 27.5-29.1 GHz, or 29.25-30 GHz bands not filed on FCC Form 312EZ pursuant to paragraph (a)(2) of this section must be filed on FCC Form 312, Main Form and Schedule B, and must include any information required by paragraphs (a)(5) through (10) or (g) or (j) of this section.

(2) Individual or blanket license applications may be filed for operation in the 17.3-17.8 GHz band; however, blanket licensed earth stations shall operate on an unprotected basis with respect to DBS feeder link earth stations. All receiving FSS earth stations shall operate on an unprotected basis with respect to the Fixed Service in the 17.7-17.8 GHz band.

\* \* \* \* \*

(g) Applications for earth stations that will transmit to GSO space stations in any portion of the 5850-6725 MHz, 13.75-14.5 GHz, 24.75-25.25 GHz, 27.5-29.1 GHz, or 29.25-30.0 GHz bands must include, in addition to the particulars of operation identified on FCC Form 312 and associated Schedule B, the information specified in either paragraph (g)(1) or (g)(2) of this section for each earth station antenna type.

\* \* \* \* \*

(k)(1) Applicants for FSS earth stations that qualify for routine processing in the conventional or extended C-bands, the conventional or extended Ku-bands, the conventional or extended Ka-bands, or the 24.75-25.25 GHz band, including ESV applications filed pursuant to paragraph (m)(1) or (n)(1) of this section, VMES applications filed pursuant to paragraph (m)(1) or (n)(1) of this section, and ESAA applications filed pursuant to paragraph (m)(1) or (n)(1) of this section, may designate the Permitted Space Station List as a point of communication. Once such an application is granted, the earth station operator may communicate with any space station on the Permitted Space Station List, provided that the operation is consistent with the technical parameters and conditions in the earth station license and any limitations placed on the space station authorization or noted in the Permitted Space Station List.

(2) Notwithstanding paragraph (k)(1) of this section, an earth station that would receive signals in the 17.7-20.2 GHz band may not communicate with a space station on the Permitted Space Station List in that band until the space station operator has completed coordination under Footnote US334 to § 2.106 of this chapter.

\* \* \* \* \*

7. Amend § 25.117 by revising paragraph (d)(2)(v) to read as follows:

§ 25.117 Modification of station license.

\* \* \* \* \*

(d) \* \* \*

(2) \* \* \*

(v) Any operator of a space station transmitting in the 17.3-17.8 GHz band, whose license is conditioned to operate at less than the power level otherwise permitted by § 25.140(a)(3)(iii) and/or (b)(3) of this part, and is conditioned to accept interference from a neighboring 17/24 GHz BSS space station, may file a modification application to remove those two conditions in the event that the license for that neighboring space station is cancelled or surrendered. In the event that two or more such modification applications are filed, and those applications are mutually exclusive, the modification applications will be considered on a first-come, first-served basis pursuant to the procedure set forth in § 25.158 of this part.

\* \* \* \* \*

8. Amend § 25.140 by modifying paragraphs (a)(2), (a)(3)(iii); modifying paragraphs (b)(3), (b)(4), (b)(5), and modifying paragraph (d) to read as follows:

§ 25.140 Further requirements for license applications for GSO space station operation in the FSS and the 17/24 GHz BSS.

(a) \* \* \*

(2) In addition to the information required by § 25.114, an applicant for GSO FSS space station operation, including applicants proposing feeder links for space stations operating in the 17/24 GHz BSS, that will be located at an orbital location less than two degrees from the assigned location of an authorized co-frequency GSO space station, must either certify that the proposed operation has been coordinated with the operator of the co-frequency space station or submit an interference analysis demonstrating the compatibility of the proposed system with the co-frequency space station. Such an analysis must include, for each type of radio frequency carrier, the link noise budget, modulation parameters, and overall link performance analysis. (See Appendices B and C to Licensing of Space Stations in the Domestic Fixed-Satellite Service, FCC 83-184, and the following public notices, copies of which are available in the Commission's EDOCS database, available at <https://www.fcc.gov/edocs>: DA 03-3863 and DA 04-1708.) The provisions in this paragraph do not apply to proposed analog video operation, which is subject to the requirement in paragraph (a)(1) of this section. Proposed GSO FSS space-to-Earth transmissions in the 17.3-17.8 GHz band are subject to the requirements of paragraphs (b)(4)-(5) of this section with respect to possible interference into 17/24 GHz BSS networks. Proposed GSO FSS space-to-Earth transmissions in the 17.3-17.8 GHz band are subject to the requirements of § 25.264 with respect to possible interference to the reception of DBS feeder link transmissions (Earth-to-space) in this band.

(3) \* \* \*

(iii) With respect to proposed operation in the conventional or extended Ka-bands, a certification that the proposed space station will not generate power flux density at the Earth's surface in excess of the limits in paragraphs (a)(iii)(A) and (B) of this section, and that associated uplink operation will not exceed applicable EIRP density envelopes in § 25.218(i) unless the non-routine uplink and/or downlink operation is coordinated with operators of authorized co-frequency space stations

at assigned locations within six degrees of the orbital location and except as provided in paragraph (d) of this section.

(A)  $-118 \text{ dBW/m}^2/\text{MHz}$ , except as provided in paragraph (a)(iii)(B) of this section:

(B) For space-to-Earth FSS transmissions in the 17.3-18.8 GHz band in the region of the contiguous United States, located west of 100 West Longitude:  $-121 \text{ dBW/m}^2/\text{MHz}$ .

\* \* \* \* \*

(b) \* \* \*

(3) An applicant for a license to operate a 17/24 GHz BSS space station transmitting in the 17.3-17.8 GHz band must certify that the downlink power flux density on the Earth's surface will not exceed the regional power flux density limits given in paragraphs (b)(3)(i)-(iv) of this section, or must provide the certification specified in § 25.114(d)(15)(ii):

(i) In the region of the contiguous United States, located south of 38° North Latitude and east of 100° West Longitude:  $-115 \text{ dBW/m}^2/\text{MHz}$ .

(ii) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude:  $-118 \text{ dBW/m}^2/\text{MHz}$ .

(iii) In the region of the contiguous United States, located west of 100° West Longitude:  $-121 \text{ dBW/m}^2/\text{MHz}$ .

(iv) For all regions outside of the contiguous United States including Alaska and Hawaii:  $-115 \text{ dBW/m}^2/\text{MHz}$ .

(4) Except among applicants for FSS space-to-Earth transmissions in the 17.3-17.8 GHz band, where the requirements of paragraph (a)(2) of this section apply, a 17/24 GHz BSS or FSS applicant for a space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously authorized or proposed space station transmitting in the 17.3-17.8 GHz band, must either certify that the proposed operation has been coordinated with the operator of the co-frequency space station or provide an interference analysis of the kind described in paragraph (a) of this section, except that the applicant must demonstrate that its proposed network will not cause more interference to the adjacent space station transmitting in the 17.3-17.8 GHz band operating in compliance with the technical requirements of this part, than if the applicant were located at an orbital separation of four degrees from the previously licensed or proposed space station.

(5) In addition to the requirements of paragraphs (b)(3) and (4) of this section, the link budget for any satellite transmitting in the 17.3-17.8 GHz band (space-to-Earth) must take into account longitudinal station-keeping tolerances. Any applicant for a space station transmitting in the 17.3-17.8 GHz band that has reached a coordination agreement with an operator of another space station to allow that operator to exceed the pfd levels specified in §25.140(a)(3)(iii) or (b)(3), must use those higher pfd levels for the purpose of this showing.

\* \* \* \* \*

(d) An operator of a GSO FSS space station in the conventional or extended C-bands, conventional or extended Ku-bands, 24.75-25.25 GHz band (Earth-to-space), or conventional or extended Ka-bands may notify the Commission of its non-routine transmission levels and be relieved of the obligation to coordinate such levels with later applicants and petitioners.

\* \* \* \* \*

9. Amend § 25.203 by modifying paragraphs (m)(1) and (m)(3) to read as follows:

§ 25.203 Choice of sites and frequencies.

\* \* \* \* \*

(m) \* \* \*

(1) \* \* \*

Space service designation in which the transmitting earth station operates	Fixed-Satellite				
Frequency bands (GHz)	17.3-17.7			17.3-17.8	
Space service designation in which the receiving earth station operates	Broadcasting-Satellite			Fixed-Satellite	
Orbit	GSO			GSO	
Modulation at receiving earth station	N (digital)			N (digital)	
Receiving earth station interference parameters and criteria:	17/24 GHZ BSS			FSS	
$p_0$ (%)	0.015			TBD	
$n$	2			TBD	
$p$ (%)	0.015			TBD	
$N_L$ (dB)	1			TBD	
$M_s$ (dB)	In the area specified in 47 CFR § 25.140(b)(3)			In the area specified in 47 CFR § 25.140(a)(3)(iii)	
	(i) and (iv)	(ii)	(iii)	(A)	(B)
	4.8	3.0	1.8	TBD	TBD
$W$ (dB)	4			TBD	

Receiving earth station parameters:	17/24 GHz BSS			FSS	
$G_m$ (dBi)	36			TBD	
$G_r$	0			TBD	
$\epsilon_{min}$	20°			TBD	
$T_e$ (K)	150			TBD	
Reference bandwidth: $B$ (Hz)	10 <sup>6</sup>				
Permissible interference power: $P_r(p)$ (dBW) in B	In the area specified in 47 CFR § 25.140(b)(3)			In the area specified in 47 CFR § 25.140(a)(3)(iii)	
	(i) and (iv)	(ii)	(iii)	(A)	(B)
	-146.8	-149.8	-152.8	TBD	TBD

\* \* \* \* \*

(3) Each applicant for such new or modified feeder-link earth stations shall file with its application memoranda of coordination with each co-frequency licensee authorized to construct BSS receive earth stations or an individually licensed FSS receive earth station within the coordination zone. Feeder link earth station applicants are not required to complete coordination with blanket-licensed receiving FSS earth stations in the 17.3-17.8 GHz band.

\* \* \* \* \*

10. Amend § 25.208 by deleting and reserving paragraph (w) as follows:

§ 25.208 Power flux-density limits.

\* \* \* \* \*

(w) [Reserved]

\* \* \* \* \*

11. Amend § 25.209 by modifying paragraphs (a)(1), (a)(3), (a)(4), (a)(6), (b)(1), (b)(2) and (b)(3) to read as follows:

§ 25.209 Earth station antenna performance standards.

(a) \* \* \*

(1) In the plane tangent to the GSO arc, as defined in § 25.103, for earth stations not operating in the conventional Ku-band, the 24.75-25.25 GHz band, or the 27.5-30 GHz band:

\* \* \*

(3) In the plane tangent to the GSO arc, for earth stations operating in the 24.75-25.25 GHz or 27.5-30 GHz bands:

\* \* \*

(4) In the plane perpendicular to the GSO arc, as defined in § 25.103, for earth stations not operating in the conventional Ku-band, the 24.75-25.25 GHz band, or the 27.5-30 GHz band:

\* \* \*

(6) In the plane perpendicular to the GSO arc, for earth stations operating in the 24.75-25.25 GHz or 27.5-30 GHz bands:

\* \* \*

\* \* \* \* \*

(b) \* \* \*

(1) In the plane tangent to the GSO arc, for earth stations not operating in the 24.75-25.25 GHz or 27.5-30 GHz bands:

\* \* \*

(2) In the plane perpendicular to the GSO arc, for earth stations not operating in the 24.75-25.25 GHz or 27.5-30 GHz bands:

\* \* \*

(3) In the plane tangent to the GSO arc or in the plane perpendicular to the GSO arc, for earth stations operating in the 24.75-25.25 GHz or 27.5-30 GHz bands:

\* \* \* \* \*

12. Amend § 25.210 by modifying paragraphs (f) to read as follows:

§ 25.210 Technical Requirements for Space Stations.

\* \* \* \* \*

(f) All space stations in the Fixed-Satellite Service operating in any portion of the 3600-4200 MHz, 5091-5250 MHz, 5850-7025 MHz, 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, 15.43-15.63 GHz, 17.3-17.8 GHz (space-to-Earth), 18.3-20.2 GHz, 24.75-25.25 GHz, or 27.5-30.0 GHz bands, including feeder links for other space services, and in the Broadcasting-Satellite Service in the 17.3-17.8 GHz band (space-to-Earth), shall employ state-of-the-art full frequency reuse, either through the use of orthogonal polarizations within the same beam and/or the use of spatially independent beams. This requirement does not apply to telemetry, tracking, and command operation.

\* \* \* \* \*

13. Amend § 25.212 by modifying paragraphs (e) and (h) to read as follows:

§ 25.212 Narrowband analog transmissions and digital transmissions in the GSO FSS.

\* \* \* \* \*

(e) An earth station may be routinely licensed for digital transmission in the conventional or extended Ka-bands if the input power spectral density into the antenna will not exceed 3.5 dBW/MHz and the application includes certification pursuant to §25.132(a)(1) of conformance with the antenna gain performance requirements in §25.209(a) and (b).

\* \* \* \* \*

(h) Applications for authority for fixed earth station operation in the conventional C-band, the extended C-band, the conventional Ku-band, the extended Ku-band, the conventional Ka-band or the extended Ka-band that do not qualify for routine processing under relevant criteria in this section, §25.211, or §25.218 are subject to the requirements in §25.220.

\* \* \* \* \*

14. Amend § 25.218 by modifying paragraphs (a), (i) and (j) to read as follows:

§ 25.218 Off-axis EIRP density envelopes for FSS earth stations transmitting in certain frequency bands.

(a) This section applies to applications for fixed and temporary-fixed FSS earth stations transmitting to geostationary space stations in the conventional C-band, extended C-band, conventional Ku-band, extended Ku-band, conventional Ka-band, extended Ka-band, or 24.75-25.25 GHz, and applications for ESIMs transmitting in the conventional C-band, conventional Ku-band, conventional Ka-band, except for applications proposing transmission of analog command signals at a band edge with bandwidths greater than 1 MHz or transmission of any other type of analog signal with bandwidths greater than 200 kHz.

\* \* \* \* \*

(i) *Digital earth station operation in the conventional or extended Ka-band.* (1) For co-polarized transmissions in the plane tangent to the GSO arc:

\* \* \* \* \*

(j) Applications for authority for fixed earth station operation in the conventional C-band, extended C-band, conventional Ku-band, extended Ku-band, conventional Ka-band, extended Ka-band, or 24.75-25.25 GHz, that do not qualify for routine processing under relevant criteria in this section, § 25.211, or § 25.212 are subject to the requirements in § 25.220.

\* \* \* \* \*

15. Amend § 25.220 by modifying paragraph (a) to read as follows:

§ 25.220 Non-routine transmit/receive earth station operations.

- (a) The requirements in this section apply to applications for, and operation of, earth stations transmitting in the conventional or extended C-bands, the conventional or extended Ku-bands, or the conventional or extended Ka -bands that do not qualify for routine licensing under relevant criteria in § 25.211, § 25.212, or § 25.218.

\* \* \* \* \*

16. Amend § 25.262 by modifying the title and paragraphs (a)-(d), and by adding new paragraph (e) to read as follows:

§ 25.262 Licensing and domestic coordination requirements for 17/24 GHz BSS space stations and FSS space stations transmitting in the 17.3-17.8 GHz band.

- (a) A 17/24 GHz BSS or FSS applicant seeking to transmit in the 17.3-17.8 GHz band may be authorized to operate a space station at levels up to the maximum power flux density limits defined below without coordinating its power flux density levels with adjacent licensed or permitted operators, as follows:
- (i) For 17/24 GHz BSS applicants, up to the power flux density levels specified in § 25.140(b)(3) only if there is no licensed space station, or prior-filed application for a space station transmitting in the 17.3-17.8 GHz band at a location less than four degrees from the orbital location at which the applicant proposes to operate; and
  - (ii) For FSS space station applicants transmitting in the 17.3-17.8 GHz band, up to the maximum power flux density levels in § 25.140(a)(3)(iii), only if there is no licensed 17/24 GHz BSS space station, or prior-filed application for a 17/24 GHz BSS space station, at a location less than four degrees from the orbital location at which the FSS applicant proposes to operate, and there is no licensed FSS space station, or prior-filed application for an FSS space station transmitting in the 17.3-17.8 GHz band, at a location less than two degrees from the orbital location at which the applicant proposes to operate.
- (b) Any U.S. licensee or permittee authorized to transmit in the 17.3-17.8 GHz band that does not comply with the applicable power flux-density limits set forth in § 25.140(a)(3)(iii) and/or § 25.140(b)(3) shall bear the burden of coordinating with any future co-frequency licensees and permittees of a space station transmitting in the 17.3-17.8 GHz band as required in § 25.114(d)(15)(ii).
- (c) If no good faith agreement can be reached, the operator of the FSS space station transmitting in the 17.3-17.8 GHz band that does not comply with § 25.140(a)(3)(iii) or the operator of the 17/24 GHz BSS space station that does not comply with § 25.140(b)(3), shall reduce its power flux-density levels to be compliant with those specified in § 25.140(a)(3)(iii) and/or § 25.140(b)(3) as appropriate.
- (d) Any U.S. licensee or permittee of a space station transmitting in the 17.3-17.8 GHz band that is required to provide information in its application pursuant to § 25.140(a)(2) or (b)(4) must accept any increased interference that may result from adjacent space stations transmitting in the 17.3-17.8 GHz band that are operating in compliance with the rules for such space stations specified in §§ 25.140(a)-(b), 25.202(a)(9) and (e)-(g), 25.210(i)-(j), 25.224, 25.262, 25.264(h), and 25.273(a)(3).

- (e) Notwithstanding the provisions of this sections, licensees and permittees will be allowed to apply for a license or authorization for a replacement satellite that will be operated at the same power level and interference protection as the satellite to be replaced.

\* \* \* \* \*

17. Amend § 25.264 by modifying the title and paragraphs (a)-(d) to read as follows:

§ 25.264 Requirements to facilitate reverse-band operation in the 17.3-17.8 GHz Band.

(a) Each applicant or licensee for a space station transmitting in the 17.3-17.8 GHz band must submit a series of tables or graphs containing predicted off-axis gain data for each antenna that will transmit in any portion of the 17.3-17.8 GHz band, in accordance with the following specifications. Using a Cartesian coordinate system wherein the X axis is tangent to the geostationary orbital arc with the positive direction pointing east, *i.e.*, in the direction of travel of the satellite; the Y axis is parallel to a line passing through the geographic north and south poles of the Earth, with the positive direction pointing south; and the Z axis passes through the satellite and the center of the Earth, with the positive direction pointing toward the Earth, the applicant or licensee must provide the predicted transmitting antenna off-axis antenna gain information:

(1) In the X-Z plane, *i.e.*, the plane of the geostationary orbit, over a range of  $\pm 10$  degrees from the positive and negative X axes in increments of 5 degrees or less.

(2) In planes rotated from the X-Z plane about the Z axis, over a range of  $\pm 20$  degrees relative to the equatorial plane, in increments of 10 degrees or less.

\* \* \*

(6) The predictive gain information must be submitted to the Commission for each license application that is filed for a space station transmitting in any portion of the 17.3-18.8 GHz band no later than two years after license grant for the space station.

(b) A space station applicant or licensee transmitting in any portion of the 17.3-17.8 GHz band must submit power flux density (pfd) calculations based on the predicted gain data submitted in accordance with paragraph (a) of this section, as follows:

\* \* \*

(2) The calculations must take into account the aggregate pfd levels at the DBS receiver at each measurement frequency arising from all antenna beams on the space station transmitting in the 17.3-17.8 GHz band. They must also take into account the maximum permitted longitudinal station-keeping tolerance, orbital inclination and orbital eccentricity of both the space station transmitting in the 17.3-17.8 GHz band and DBS space stations, and must:

(i) \* \* \*

(ii) Indicate the extent to which the calculated pfd of the space station's transmissions in the 17.3-17.8 GHz band exceed the threshold pfd level of  $-117$  dBW/m<sup>2</sup>/100 kHz at those prior-filed U.S. DBS space station locations.

(3) If the calculated pfd exceeds the threshold level of  $-117$  dBW/m<sup>2</sup>/100 kHz at the location of any prior-filed U.S. DBS space station, the applicant or licensee must also provide with the pfd calculations a certification that all affected DBS operators acknowledge and do not object to such higher off-axis pfd levels. No such certification is required in cases where the frequencies assigned to the DBS and to the space station transmitting in the 17.3-17.8 GHz band do not overlap.

(4) The information and any certification required by paragraph (b) of this section must be submitted to the Commission for each license application that is filed for a space station transmitting in any portion of the 17.3-17.8 GHz band no later than two years after license grant for the space station..

(c) No later than two months prior to launch, each licensee of a space station transmitting in any portion of the 17.3-17.8 GHz band must update the predicted transmitting antenna off-axis gain information provided in accordance with paragraph (a) of this section by submitting measured transmitting antenna off-axis gain information over the angular ranges, measurement frequencies and polarizations specified in paragraphs (a)(1) through (5) of this section. The transmitting antenna off-axis gain information should be measured under conditions as close to flight configuration as possible.

(d) No later than two months prior to launch, or when applying for authority to change the location of a space station transmitting in any portion of the 17.3-17.8 GHz band that is already in orbit, each such space station licensee must provide pfd calculations based on the measured off-axis gain data submitted in accordance with paragraph (c) of this section, as follows:

(1) \* \* \*

(ii) At the location of any subsequently filed U.S. DBS space station where the pfd level in the 17.3-17.8 GHz band calculated on the basis of measured gain data exceeds  $-117$  dBW/m<sup>2</sup>/100 kHz. In this rule, the term "subsequently filed U.S. DBS space station" refers to any co-frequency Direct Broadcast Satellite service space station proposed in a license application filed with the Commission after the operator of a space station transmitting in any portion of the 17.3-17.8 GHz band submitted the predicted data required by paragraphs (a) through (b) of this section but before submission of the measured data required by this paragraph. Subsequently filed U.S. DBS space stations may include foreign-licensed DBS space stations seeking authority to serve the United States market. The term does not include any applications (or authorizations) that have been denied, dismissed, or are otherwise no longer valid, nor does it include foreign-licensed DBS space stations that have not filed applications with the Commission for market access in the United States.

(2) The pfd calculations must take into account the maximum permitted longitudinal station-keeping tolerance, orbital inclination and orbital eccentricity of both the transmitting 17.3-17.8 GHz and DBS space stations, and must:

\* \* \* \* \*

(e) If the aggregate pfd level calculated from the measured data submitted in accordance with paragraph (d) of this section is in excess of the threshold pfd level of  $-117$  dBW/m<sup>2</sup>/100 kHz:

(1) At the location of any prior-filed U.S. DBS space station as defined in paragraph (b)(1) of this section, then the operator of the space station transmitting in any portion of the 17.3-17.8 GHz band must either:

\* \* \* \* \*

(2) At the location of any subsequently filed U.S. DBS space station as defined in paragraph (d)(1) of this section, where the aggregate pfd level submitted in accordance with paragraph (d) of this section is also in excess of the pfd level calculated on the basis of the predicted data submitted in accordance with paragraph (a) of this section that were on file with the Commission at the time the DBS space station application was filed, then the operator of the space station transmitting in the 17.3-17.8 GHz band must either:

\* \* \* \* \*

(3) No coordination or adjustment of operating parameters is required in cases where there is no overlap in frequencies assigned to the DBS and the space station transmitting in the 17.3-17.8 GHz band.

(f) The applicant or licensee for the space station transmitting in the 17.3-17.8 GHz band must modify its license, or amend its application, as appropriate, based upon new information:

(1) \* \* \*

(2) If the operator of the space station transmitting in the 17.3-17.8 GHz band adjusts its operating parameters in accordance with paragraphs (e)(1)(ii) or (e)(2)(ii) or this section.

(g) Absent an explicit agreement between operators to permit more closely spaced operations, U.S. authorized 17/24 GHz BSS or FSS space stations transmitting in the 17.3-17.8 GHz band and U.S. authorized DBS space stations with co-frequency assignments may not be licensed to operate at locations separated by less than 0.5 degrees in orbital longitude.

(h) All operational space stations transmitting in the 17.3-17.8 GHz band must be maintained in geostationary orbits that:

\* \* \* \* \*

(i) U.S. authorized DBS networks may claim protection from space path interference arising from the reverse-band operations of U.S. authorized space stations transmitting in the 17.3-17.8 GHz band to the extent that the DBS space station operates within the bounds of inclination and eccentricity listed below. When the geostationary orbit of the DBS space station exceeds these bounds on inclination and eccentricity, it may not claim protection from any additional space path interference arising as a result of its inclined or eccentric operations and may only claim protection as if it were operating within the bounds listed below:

\* \* \* \* \*

**APPENDIX B****Initial Regulatory Flexibility Analysis**

1. As required by the Regulatory Flexibility Act (RFA),<sup>1</sup> the Commission has prepared this Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this Notice of Proposed Rulemaking (NPRM). We request written public comments on this IRFA. Commenters must identify their comments as responses to the IRFA and must file the comments by the deadlines for comments on the NPRM provided above in section IV.B. The Commission will send a copy of the NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.<sup>2</sup> In addition, summaries of the NPRM and IRFA will be published in the Federal Register.<sup>3</sup>

**A. Need for, and Objectives of, the Proposed Rules**

2. The NPRM seeks comment on several proposals relating to the Commission's allocation of frequency bands for use by the Fixed-Satellite Service (FSS) and technical rules and policies for preventing harmful interference between stations operating in the Fixed-Satellite Service and stations operating in the Digital Broadcasting Satellite (DBS) Service and the Broadcasting-Satellite Service (BSS). Adoption of the proposed changes would, among other things, permit the use of the 17.3-17.8 GHz band in the space-to-Earth direction by stations in the Fixed-Satellite Service.

**B. Legal Basis**

3. The proposed action is authorized under sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 157(a), 303(c), 303(f), 303(g), 303(r).

**C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules May Apply**

4. The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by adoption of proposed rules.<sup>4</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>5</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>6</sup> A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>7</sup> Below, we describe and estimate the number of small entity licensees that may be affected by adoption of the proposed rules.

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<sup>1</sup> See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et seq.*, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, Title II, 110 Stat. 847 (1996) (CWAAA).

<sup>2</sup> See 5 U.S.C. § 603(a).

<sup>3</sup> *Id.*

<sup>4</sup> 5 U.S.C. § 604(a)(3).

<sup>5</sup> 5 U.S.C. § 601(6).

<sup>6</sup> 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

<sup>7</sup> Small Business Act, 15 U.S.C. § 632 (1996).

5. **Satellite Telecommunications.** This category comprises firms “primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.”<sup>8</sup> Satellite telecommunications service providers include satellite and earth station operators. The category has a small business size standard of \$35 million or less in average annual receipts, under SBA rules.<sup>9</sup> For this category, U.S. Census Bureau data for 2012 show that there were a total of 333 firms that operated for the entire year.<sup>10</sup> Of this total, 299 firms had annual receipts of less than \$25 million.<sup>11</sup> Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

6. **All Other Telecommunications.** The “All Other Telecommunications” category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.<sup>12</sup> This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.<sup>13</sup> Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.<sup>14</sup> The SBA has developed a small business size standard for “All Other Telecommunications”, which consists of all such firms with annual receipts of \$35 million or less.<sup>15</sup> For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.<sup>16</sup> Of those firms, a total of 1,400 had annual receipts less than \$25 million and 15 firms had annual receipts of \$25 million to \$49, 999,999.<sup>17</sup> Thus, the Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

7. We anticipate that our proposed rule changes may have an impact on earth station and space station applicants and licensees. Space station applicants and licensees, however, rarely qualify under the definition of a small entity. Generally, space stations cost hundreds of millions of dollars to

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<sup>8</sup> See U.S. Census Bureau, *2017 NAICS Definition, “517410 Satellite Telecommunications”*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517410&search=2017+NAICS+Search&search=2017>.

<sup>9</sup> See 13 CFR § 121.201, NAICS Code 517410.

<sup>10</sup> See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012*, NAICS Code 517410, <https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=517410&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false&vintage=2012>.

<sup>11</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>12</sup> See U.S. Census Bureau, *2017 NAICS Definition, “517919 All Other Telecommunications”*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017>.

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

<sup>15</sup> See 13 CFR § 121.201, NAICS Code 517919.

<sup>16</sup> See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012*, NAICS Code 517919, <https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=517919&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false>.

<sup>17</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard of annual receipts of \$35 million or less.

construct, launch, and operate. Consequently, we do not anticipate that any space station operators are small entities that would be affected by our proposed actions.

**D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities**

8. The NPRM proposes and seeks comment on several rule changes that would affect compliance requirements for space station operators. As noted above, these parties rarely qualify as small entities.

9. For example, we propose to allow additional uses of the 17.3-17.8 GHz band, subject to compliance with technical limits designed to protect other users of the bands.

10. In total, the proposals and questions in the NPRM are designed to achieve the Commission's mandate to regulate in the public interest while imposing the lowest necessary burden on all affected parties, including small entities.

**E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered**

11. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): "(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rules for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities."<sup>18</sup>

12. The NPRM seeks comment from all interested parties. The Commission is aware that some of the proposals under consideration may impact small entities. Small entities are encouraged to bring to the Commission's attention any specific concerns they may have with the proposals outlined in the NPRM.

13. The Commission expects to consider the economic impact on small entities, as identified in comments filed in response to the NPRM, in reaching its final conclusions and taking action in this proceeding.

14. In this NPRM, the Commission invites comment on adding an allocation in the 17.3-17.8 GHz band to permit the use of the band by the Fixed-Satellite Service in the space-to-Earth direction, along with technical rules to prevent harmful interference between the FSS, DBS, and BSS. Overall, the proposals in the NPRM seek to increase the use of the 17.3-17.8 GHz band by satellite services while maintaining adequate protections against interference.

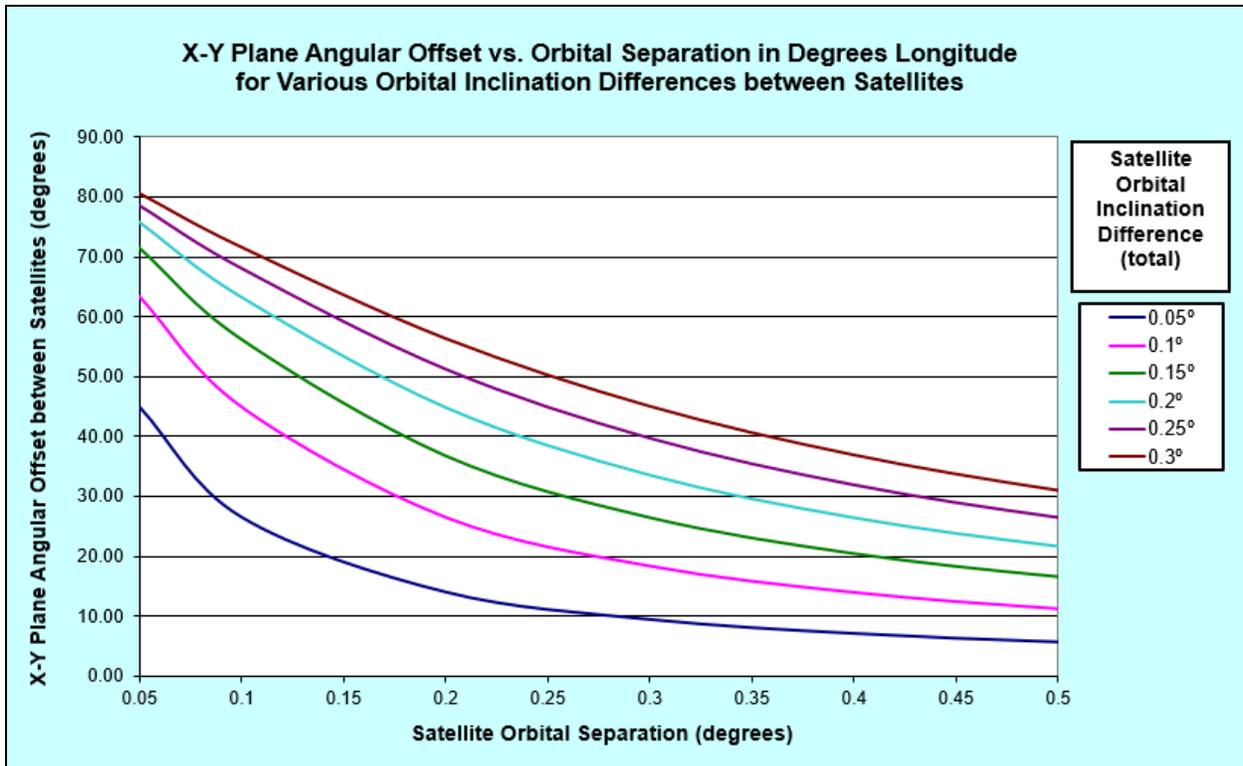
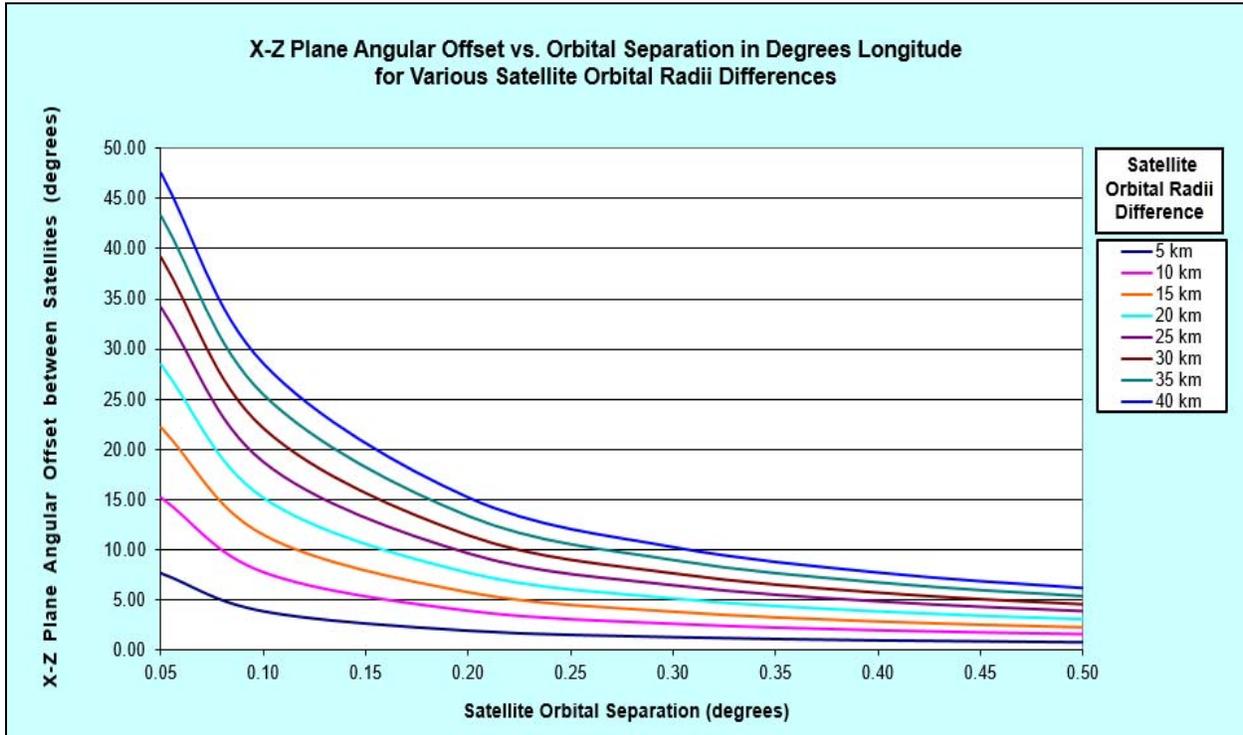
**F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules**

15. None.

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<sup>18</sup> 5 U.S.C. § 603(c)(1)-(4).

**APPENDIX C**  
**Variations in Angular Offset vs. Orbital Separation**



**STATEMENT OF  
CHAIRMAN AJIT PAI**

Re: *In the Matter of Amendment of Parts 2 and 25 of the Commission’s Rules to Enable GSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band, to Modernize Certain Rules Applicable to 17/24 GHz BSS Space Stations, and to Establish Off-Axis Uplink Power Limits for Extended Ka-Band FSS Operations*, IB Docket No. 20-330, RM-11839

The U.S. commercial satellite industry has enjoyed substantial growth in recent years, dominating market share for satellite manufacturing and launch services in 2019.<sup>1</sup> Satellite launches are on the rise, as are throughput speeds and data capacity. Indeed, as we enter a new space age, one might say that “the sky’s the limit” in terms of satellite systems’ potential for expanding connectivity and bridging the digital divide.

This investment and innovation in space-based services has led to increased demand for spectrum to be used by satellite systems. As a result, ensuring that we have efficiently allocated sufficient spectrum for satellite services is vital to this industry’s continued success. Today, we advance this objective by initiating a proceeding aimed at permitting Geostationary Orbit (or GSO) space stations in the Fixed Satellite Service to use the 17.3–17.7 GHz band on a co-primary (or co-equal) basis for downlink communications, as well as the neighboring 17.7–17.8 GHz band for FSS downlink communications on a non-protected basis. Combined, these changes would increase intensive and efficient use of the 17.3–17.8 GHz band by expanding downlink capacity for high-throughput satellite communications. This should facilitate the deployment of advanced satellite systems that will benefit all Americans.

Consumers stand to benefit from expanded use of the 17.3–17.8 GHz band and the routine processing of applications for licenses. The satellite industry is expected to continue growing at a record-setting pace, and the Commission’s proposed changes would help operators to hit the ground running with greater spectrum flexibility and a streamlined licensing process that is focused on getting Americans connected at greater speeds and lower costs.

For their hard work on this NPRM, I would like to thank—from the International Bureau: Jose Albuquerque, Curtrisha Banks, Diane Garfield, Jennifer Gilsean, Neşe Guendelsberger, Karl Kensinger, Robert Nelson, Sean O’More, Tom Sullivan, Merissa Velez, and Jay Whaley; from the Enforcement Bureau: Jason Koslofsky, Shannon Lipp, Paul Noone, Salomon Satche, and Josh Zeldis; from the Office of Economics and Analytics: Ginny Metallo and Emily Talaga; from the Office of Engineering and Technology: Michael Ha, Tom Mooring, Nick Oros, Jamison Prime, and Ron Repasi; from the Office of the General Counsel: David Konczal and Bill Richardson; from the Wireless Telecommunications Bureau: Steve Buenzow, Tim Hilfiger, John Schauble, Blaise Scinto, Joel Taubenblatt, and Steve Zak.

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<sup>1</sup> Satellite Industry Association, *Satellite Industry Grows at Record-Setting Pace* (July 2, 2020), <https://sia.org/satellite-industry-grows-at-record-setting-pace-and-dominates-global-space-economy/>.