

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)
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.)
Amendment of Parts 2 and 25 of the Commission's) IB Docket No. 22-273
Rules to Enable NGSO Fixed-Satellite Service)
(Space-to-Earth) Operations in the 17.3-17.8 GHz)
Band

REPORT AND ORDER AND NOTICE OF PROPOSED RULEMAKING

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I. INTRODUCTION

1. By this action, we 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 permit limited GSO FSS (space-to-Earth) use of the 17.7-17.8 GHz band on an unprotected basis with respect to fixed service operations. Permitting use of the 17.3-17.8 GHz band to include FSS downlinks increases intensive and efficient use of the band and provides additional downlink capacity for high-throughput satellite communications. With appropriate technical safeguards established herein, including coordination requirements, this band can be shared in an efficient and effective manner without harmful interference while alleviating the growing need for additional Ka-band GSO FSS downlink spectrum to support communications to earth stations, and further streamline the licensing process of certain satellite systems. Permitting use of the 17.3-17.8 GHz band to include FSS downlinks will create a contiguous band for FSS (space-to-Earth) operations, enabling greater flexibility and efficiency for advanced satellite systems operations for the benefit of American consumer.

2. In this Report and Order, we also 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 to streamline licensing of FSS earth stations in a closely harmonized regulatory framework for all similar FSS uplink transmissions in the conventional and extended Ka-bands.

3. In the Notice of Proposed Rulemaking, we seek comment on whether to allow operations of non-geostationary satellite orbit (NGSO) in the FSS (space-to-Earth) in the 17.3-17.8 GHz band, similar to our action with regard to GSO FSS operations in these bands. We seek comment on whether such an action would serve the public interest, and, if adopted, what technical rules and standards we would need to prevent harmful interference between authorized services in these bands while increasing efficient and effective use of the spectrum.

II. BACKGROUND

4. The Table of Frequency Allocations is comprised of the International Table and the United States Table of Frequency Allocations (U.S. Table).¹ In the International Table, the 17.3-17.7 GHz band is allocated, in International Telecommunication Union (ITU) Region 2,² to the fixed-satellite service (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.³ 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 basis⁴ and to the radiolocation

¹ The International Table is described in 47 CFR § 2.104 and the U.S. Table is described in 47 CFR § 2.105.

² ITU Region 2 includes North and South America and associated offshore waters and islands, including the Hawaiian Islands and Greenland. *See* 47 CFR § 2.104, fig. 1.

³ Footnote 5.516 of the International Table of Frequency Allocations 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 ITU Radio Regulations. 47 CFR § 2.106. We also note that the ITU Region 2 area includes the United States. *See* 47 CFR §§ 2.104(b) and 2.105(a).

⁴ 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, fns. US271 and NG163. In two geographic areas and frequency segments of the 17.3-17.7 GHz band, BSS earth stations may not claim protection from earth stations transmitting to Federal satellites in the Earth-to-space direction. 47 CFR § 2.106, fn. US402.

services on a secondary basis.⁵ The adjacent 17.7-17.8 GHz band is allocated internationally in ITU Region 2 to the fixed service, BSS, and 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.⁶ The 17.7-17.8 GHz band is allocated to FSS (Earth-to-space) and to the fixed service on a co-primary basis in the U.S Table.⁷ Historically, in the United States, the 17.3-17.8 GHz band has been used for FSS feeder⁸ uplinks that transmit programming to Direct Broadcast Satellite (DBS) service⁹ GSO space stations, in addition to terrestrial fixed service use of the 17.7-17.8 GHz band.¹⁰ 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.¹¹

5. In 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.¹² This service, known as the “17/24 GHz BSS,”¹³ 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.¹⁴ 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.¹⁵ When the Commission adopted rules for the 17/24 GHz BSS, it also sought comment on rules to avoid interference between DBS and 17/24 GHz BSS operations, both in-orbit (“space path”

⁵ 47 CFR § 2.106.

⁶ 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, fns. 5.515 and 5.516.

⁷ 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, fns. US271 and US334.

⁸ 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.

⁹ DBS is defined in the Commission’s rules 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.

¹⁰ See 47 CFR § 2.106, n.US271.

¹¹ 47 CFR § 25.103; see also *Amendment of the Commission’s Policies and Rules for Processing Applications in the Direct Broadcast Satellite Service*, 34 FCC Rcd 9014, 9016, para. 6 (2019) (*DBS Licensing Order*).

¹² *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*).

¹³ 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.

¹⁴ 47 CFR § 2.106.

¹⁵ 47 CFR § 25.103.

interference) and on the ground (“ground path” interference).¹⁶ 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.¹⁷ In 2017, the Commission adopted rules to address ground path interference.¹⁸

6. On November 18, 2020, the Commission adopted a Notice of Proposed Rulemaking.¹⁹ In the *17 GHz FSS Notice*, the Commission proposed to revise its rules and permit GSO FSS (space-to-Earth) communications in the 17.3-17.7 GHz on a co-primary basis.²⁰ The Commission also proposed to permit GSO FSS (space-to-Earth) communications in the 17.7-17.8 GHz band on an unprotected basis with respect to terrestrial fixed service operations in the band.²¹ This would join with current spectrum allocations to produce a contiguous band for non-Federal government space-to-Earth FSS operations in the United States, from 17.3-20.2 GHz.²²

7. The Commission also proposed a number of technical rules to prevent harmful interference between stations sharing the 17.3-17.8 GHz band. In order to facilitate sharing of the band between BSS and FSS, the Commission proposed satellite spacing requirements,²³ power-flux density (PFD) limits for transmitting (downlinking) FSS space stations,²⁴ polarization and frequency re-use requirements,²⁵ and space station antenna cross-polarization requirements.²⁶ In order to mitigate space path interference in the band,²⁷ the Commission proposed to extend the “coordination trigger” applicable

¹⁶ *17/24 GHz R&O and FNPRM*, 22 FCC Rcd at 8902-17, paras. 149-188.

¹⁷ *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*).

¹⁸ *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*). 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. See IBFS File Nos. SAT-MOD-20150428-00031, SAT-AMD-20150818-00058, and SAT-MOD-2012-03314-00045.

¹⁹ *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*, Notice of Proposed Rulemaking, 35 FCC Rcd 13239 (2020) (*17 GHz FSS Notice*).

²⁰ *Id.* at 13245, para. 16 (citing SES Petition, RM-11839 at 1).

²¹ *Id.* The Commission proposed that FSS receiving earth stations in the 17.7-17.8 GHz band, however, operate on a co-primary basis vis-à-vis primary satellite operations in the band. *Id.*

²² See 47 CFR § 2.106.

²³ *17 GHz FSS Notice* at 13249, para. 27.

²⁴ *Id.* at 13251-52, para. 33.

²⁵ *Id.* at 13252, para. 35.

²⁶ *Id.* at 13252-53, para. 36.

²⁷ Space path 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

(continued....)

to DBS and BSS space stations in the 17.3-17.8 GHz band to FSS space stations,²⁸ to require PFD calculations in the band to consider aggregate PFD from all transmitting beams on the adjacent space station.²⁹ The Commission also proposed a minimum orbital separation between FSS space stations of 0.5 degrees and amendment of the values for off-axis measurement angles,³⁰ measurement frequency requirements,³¹ and a two-part process for submission of off-axis antenna gain data.³² In order to mitigate ground path interference,³³ the Commission proposed to maintain its current rules to “grandfather” upgrades and modifications to existing DBS earth station sites,³⁴ modify the measurements and values used to establish DBS/FSS coordination zones in the 17.3-17.8 GHz band,³⁵ and permit blanket-licensed FSS receiving earth stations in the 17.3-17.8 GHz band.³⁶ The Commission also proposed certain conforming modifications to the rules in order to effectuate the proposed changes.³⁷ Finally, the Commission proposed to define the term “extended Ka-band” to include all frequency bands in the Ka-band with allocations to the GSO FSS, apart from the currently-defined “conventional Ka-band,”³⁸ and to apply the Commission’s routine license application processing procedures to applications in the “extended Ka-band.”³⁹

8. We received seven comments⁴⁰ and nine reply comments⁴¹ to the *17 GHz FSS Notice*. FSS providers, DBS providers, and terrestrial fixed service organizations filed comments and replies.

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.

²⁸ *17 GHz FSS Notice* at 13253, para. 38.

²⁹ *Id.* at 13254, para. 39.

³⁰ *Id.* at 13255-56, para. 43.

³¹ *Id.* at 13256, para. 44.

³² *Id.* at 13256, para. 45.

³³ 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.

³⁴ *17 GHz FSS Notice* at 13258, para. 51.

³⁵ *Id.* at 13258-59, paras. 52-53.

³⁶ *Id.* at 13260, para. 55.

³⁷ *Id.* at 13261, paras. 59-60.

³⁸ *Id.* at 13261, para. 62.

³⁹ *Id.* at 13261-62, paras. 63-64.

⁴⁰ Comments were filed by: AT&T Services, Inc. (AT&T); CTIA – The Wireless Association (CTIA); Hughes Network Systems, LLC (Hughes); Inmarsat, Inc. (Inmarsat); Kuiper Systems LLC (Kuiper); The Satellite Companies (consisting of SES Americom, Inc.; Hughes Network Systems, LLC; Telesat Canada; Intelsat License LLC; Eutelsat S.A.; The Boeing Company; Lockheed Martin Corp.; and Thales Avionics, Inc.); and Viasat, Inc. (Viasat).

⁴¹ Reply comments were filed by: AT&T; CTIA; Hughes; Mangata Networks LLC (Mangata); Nokia; The Satellite Companies; SES/Telesat; Viasat; and WorldVu Satellites Limited (OneWeb).

III. DISCUSSION

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

9. The Ka-band⁴² is used extensively by FSS operators to provide satellite-based broadband access services using high-throughput satellites. In these high throughput systems, end user terminals uplink to space stations on one set of frequencies, and the space station downlinks traffic to earth station terminals (and back into the Internet backbone) using a separate set of frequencies. The satellites in these systems typically use spot-beam technology and high-order frequency re-use to significantly increase capacity and spectral efficiency. In this Report and Order, we permit FSS downlinks from geostationary satellites to operate in the 17.3-17.7 GHz band on a co-primary (co-equal) basis⁴³ with other primary services in that band by revising footnote US402 in the U.S. Table, and adopting a new footnote NG58.⁴⁴ In addition, as discussed below, we make certain other changes to the U.S. Table to permit GSO FSS space-to-Earth operations in the adjacent 17.7-17.8 GHz band. We revise the existing primary FSS allocation in the U.S. Table to permit GSO space-to-Earth operations. We also permit authorization of FSS receiving earth stations in the 17.7-17.8 GHz band on an unprotected 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.

1. GSO FSS Transmissions in the 17.3-17.7 GHz Band

10. The 17.3-17.7 GHz band is allocated in the U.S. Table to FSS (Earth-to-space), limited to feeder links for the BSS (DBS), and to the BSS (17/24 GHz BSS), on a co-primary basis.⁴⁵ In the *17 GHz FSS Notice*, the Commission proposed to add a co-primary allocation in the 17.3-17.7 GHz band for FSS (space-to-Earth).⁴⁶ Neither the International (Region 2) nor the U.S. Table of Frequency Allocations currently permit FSS (space-to-Earth) operations in this band.⁴⁷ In the *17 GHz FSS Notice*, the Commission proposed 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

⁴² The Ka-band is generally considered to be 17.3-20.2 GHz and 27.0-30.0 GHz. For the FSS, the conventional Ka-band is defined as 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. 47 CFR § 25.103. This order establishes an extended Ka-band for the FSS in 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.

⁴³ 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).

⁴⁴ See 47 CFR § 2.106.

⁴⁵ *Id.*, n.US271. Footnote NG163 limits BSS use of the band to geostationary satellite systems. *Id.*, n.NG163. The 17/24 GHz BSS 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. 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. See *17/24 GHz R&O and FNPRM*, 22 FCC Rcd 8842 (2007).

⁴⁶ *17 GHz FSS Notice* at 13245, para. 16.

⁴⁷ 47 CFR § 2.106.

FSS downlink operations to GSO satellite networks.⁴⁸ To streamline the applicable restrictions to the 17.3-17.8 GHz band in the U.S. Table, the Commission further proposed to incorporate the use limits found in US271 and NG163 into the new footnote NG58 to remove footnotes US271 and NG163 from the Commission's rules. The Commission also proposed consequential modifications to the licensing information requirements contained in section 25.115(e).⁴⁹

11. A number of commenters support permitting FSS (space-to-Earth) operations in the 17.3-17.7 GHz band.⁵⁰ These commenters argue that additional Ka-band FSS (space-to-Earth) spectrum is needed to expand the capacity to serve the public and to support faster, higher-capacity satellite broadband communications,⁵¹ in remote and underserved areas.⁵²

12. AT&T states that in order to protect the current operations and future expansion of BSS and DBS, the Commission must adopt technical rules to protect incumbents and make any new FSS (space-to-Earth) allocation secondary to BSS and DBS.⁵³ CTIA notes that the Commission currently has a proceeding open to address allocations of spectrum in the 12.2-12.7 GHz band, which is a downlink band for DBS (Earth-to-space) uplinks in the 17.3-17.8 GHz band. CTIA suggests that the Commission should consider allocations in the 12.2-12.7 GHz band and the 17.3-17.8 GHz band in the same proceeding.⁵⁴

13. We find that it would serve the public interest to allocate the 17.3-17.7 GHz band to FSS (space-to-Earth). FSS downlinks in the 17 GHz band will be compatible with the incumbent services: feeder links for DBS networks and "reverse band" use for the downlink portion of 17/24 GHz BSS operations. The majority of commenters support the Commission's proposed changes to the U.S. Table. Hughes also notes that appropriate rules to prevent harmful interference have facilitated a convergence of BSS, FSS, and MSS in the 17/24 GHz band.⁵⁵ Only CTIA opposes the allocation.⁵⁶ AT&T states that the allocation should be conditioned to protect DBS and BSS services.⁵⁷ We note that FSS (space-to-Earth) communications are technically similar to DBS/BSS communications, and we see no reason why the band, already successfully shared between DBS, BSS, and FSS (Earth-to-space), cannot be successfully shared with FSS (space-to-Earth) with the technical standards adopted herein to prevent harmful interference. We find that 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. Increasing space launch activity in the United States and decreasing satellite size and weight make more satellite-based communications feasible, and the record in this

⁴⁸ As a corresponding change, the Commission also proposed 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). *See 17 GHz FSS Notice* at 13246, para.18.

⁴⁹ *See 17 GHz FSS Notice* at 13246, para.18.

⁵⁰ Hughes Comments at 2-3, Hughes Reply at 1; Inmarsat Comments at 3; Satellite Companies Comments at 3-6, Satellite Companies Reply at 2-4; Viasat Comments at 2, Viasat Reply at 2-3. *See also* Kuiper Comments at 4-5; Mangata Reply at 3-4; OneWeb Reply at 4-5 (asking to allow non-geostationary satellite orbit (NGSO) FSS (space-to-Earth) operations in the band).

⁵¹ Hughes Comments at 2-3; Inmarsat Comments at 3; Satellite Companies Comments at 5-6; Viasat Comments at 3.

⁵² Inmarsat Comments at 2.

⁵³ AT&T Comments at 3.

⁵⁴ CTIA Comments at 3-4, CTIA Reply at 6 (citing *Expanding Flexible Use of the 12.2-12.7 GHz Band, et al.*, Notice of Proposed Rulemaking, 36 FCC Rcd 606 (2021) (*12 GHz NPRM*)).

⁵⁵ Hughes Comments at 3; Inmarsat Comments at 1-2; Satellite Companies Comments at 5-6; Viasat Comments at 1-2.

⁵⁶ CTIA Reply at 2-4.

⁵⁷ AT&T Comments at 3, Nokia Reply at 2-3.

proceeding demonstrates a need to provide additional spectrum for FSS (space-to-Earth) capacity.⁵⁸ In addition to providing greater bandwidth to FSS customers, this allocation will help to provide increased communications capability to unserved and underserved areas of the United States, assist in closing the digital divide, and ensure that this spectrum band is used and shared in the most efficient and effective manner.

14. For any new GSO FSS allocation in the 17 GHz Band, AT&T encourages the Commission to amend the U.S. Table “to reflect the secondary status of GSO FSS downlinks vis-à-vis the incumbent coprimary services.”⁵⁹ Toward this end, AT&T proposes that we expressly require “GSO FSS downlinks to protect incumbent 17/24 GHz BSS services, while not requiring future 17/24 GHz BSS to protect GSO FSS systems.”⁶⁰ We are not persuaded by these arguments. FSS (space-to-Earth) transmissions are similar to DBS/BSS transmissions, including the 17/24 GHz BSS downlinks to customers in the same band, and there is no evidence in the record of likely harmful interference among the services currently allocated in the 17.3-17.7 GHz band and FSS (space-to-Earth) if we were to add a primary FSS (space-to-Earth) allocation (GSO-only) in the band. We also are not persuaded that treating GSO FSS transmissions secondary to current and future 17/24 GHz BSS transmissions would be more appropriate here.⁶¹ In light of the technical rules adopted herein and the fact that GSO FSS (space-to-Earth) transmissions are similar to DBS/BSS transmissions, co-primary operations would ensure that all satellite services, including both current and future 17/24 GHz BSS, use scarce spectrum and orbital resources in the most efficient and effective manner, in the absence of any compelling harmful interference or undue burden concerns. Given the importance of FSS services and the need for additional FSS downlink spectrum, we find that it would serve the public interest to adopt a primary FSS downlink allocation in the band without AT&T’s requested condition. Although there is not a Region 2 allocation specifying FSS in the downlink direction, we believe that the technical rules we adopt herein will prevent harmful interference and allow successful sharing of the band among all satellite operators, and to ensure that FSS (space-to-Earth) communications cause no more interference than, nor require more protection from interference than, BSS communications in the band.

15. We also reject CTIA’s request to merge this proceeding with the *12 GHz NPRM*.⁶² We do not agree with CTIA that band sharing in the 17.3-17.8 GHz band in the space-to-Earth direction is affected by possible band sharing in the 12.2-12.7 GHz band. The technical and policy issues in these two proceedings are different, with varying complexities, and permitting GSO FSS (space-to-Earth) operations in the 17.3-17.8 GHz band will not affect the allocation or performance of services in the 12.2-12.7 GHz band. In addition, there are no efficiencies to be gained by merging these two separate

⁵⁸See *17 GHz FSS Notice* at 13244-45, paras.13-15.

⁵⁹ AT&T Comments at 3.

⁶⁰ AT&T Comments at 5-6.

⁶¹ See AT&T Comments at 5-6 (stating that “AT&T’s proposal to amend footnote NG58 to expressly require GSO FSS downlinks to protect incumbent 17/24 GHz BSS services, while not requiring future 17/24 GHz BSS to protect GSO FSS systems, would best fulfill the Commission’s objectives of not burdening, and ensuring ‘appropriate technical safeguards’ for, incumbents.”). See also AT&T Comments at 5-6 (arguing that a secondary allocation would be appropriate because “GSO FSS downlink is a non-harmonized allocation in Region 2. The viability of GSO FSS sharing in the 17 GHz Band is the subject of the ongoing international study process for WRC-23. . . . [A]ny amendments to the U.S. Table prior to the conclusion of the international study cycle should reflect this outstanding uncertainty vis-à-vis interference into and from incumbent services in the band. This can be done by incorporating the suggested language based on footnote 5.535 into proposed footnote NG58. Such an amendment would afford appropriate protections to incumbent services without burdening their own expectations for growth and expansion in the 17 GHz Band.”).

⁶² CTIA Comments at 3-4, CTIA Reply at 6.

proceedings. Rather such an action would create delays, procedural complexities, and administrative inefficiencies.

2. The 17.7-17.8 GHz Band

16. The 17.7-17.8 GHz band is allocated in ITU Region 2 to the fixed service, FSS in both directions, and BSS on a primary basis, and to the mobile service on a secondary basis.⁶³ In the United States, the band is allocated for the non-Federal fixed service and FSS (Earth-to-space) on a primary basis.⁶⁴ In the *17 GHz FSS Notice*, the Commission proposed 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. The Commission noted 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, which would facilitate operational efficiencies and flexibility to avoid interference and to use this contiguous spectrum in the most effective and efficient manner.⁶⁵

17. Commenters who support the allocation of the 17.3-17.7 GHz band to FSS (space-to-Earth) generally support allocating the 17.7-17.8 GHz band as well.⁶⁶ AT&T expresses concerns and states that FSS (space-to-Earth) should be allocated secondary status in the 17.7-17.8 GHz band.⁶⁷ CTIA opposes the allocation, stating that the allocation would hinder use of the band by future terrestrial services, and that SES did not request the use of the band for FSS (space-to-Earth) in its petition.⁶⁸

18. We find that adding a space-to Earth direction to the existing primary FSS allocation in the U.S. Table and a footnote stipulating that earth stations receiving in the 17.7-17.8 GHz band are not entitled to protection from the fixed service strikes the best balance between facilitating FSS (space-to-Earth) as well as continued operations of other users of the 17.7-17.8 GHz band. The co-primary allocation allows FSS to use the band for space-to-Earth communications, while the addition of footnote NG58 to the U.S. Table ensures that interference environment is not significantly changed for the existing operations of the incumbent fixed services in the 17.7-17.8 GHz band.⁶⁹ We permit authorization of earth stations receiving transmissions from GSO FSS space stations in the 17.7-17.8 GHz band, strictly on an unprotected basis vis-a-vis the fixed service.⁷⁰ This approach is consistent with our goals to allocate

⁶³ 47 CFR § 2.106.

⁶⁴ *Id.*

⁶⁵ *17 GHz FSS Notice* at 13247, paras. 20-21.

⁶⁶ Hughes Comments at 2-3; Hughes Reply at 1; Inmarsat Comments at 3; Satellite Companies Comments at 3-6; Satellite Companies Reply at 2-4; Viasat Comments at 2; Viasat Reply at 2-3.

⁶⁷ AT&T Comments at 16.

⁶⁸ CTIA Comments at 4; CTIA Reply at 4. With respect to CTIA's argument that SES did not request the use of the 17.7-17.8 GHz segment in its petition, we note the Commission specifically sought comment on this in the *Notice*, stating 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 and this would facilitate operational efficiencies and flexibility to avoid interference and to use this contiguous spectrum in the most effective and efficient manner. *See 17 GHz FSS Notice* at 13247-48, para. 21.

⁶⁹ The proposed change to 47 CFR § 2.016, footnote NG58 reads: "(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." *17 GHz FSS Notice* at 13267, Appendix A.

⁷⁰ 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. 29. We note that with respect to adjacent band operations, a fixed service operator in the 17.7-

(continued....)

increasingly scarce spectrum resources in the most efficient and effective manner possible. Allocating the 17.7-17.8 GHz band to the FSS (space-to-Earth) under the conditions adopted herein will 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. This in turn would facilitate operational efficiencies and flexibility to avoid interference and to use this contiguous spectrum for next generation FSS services.

19. For these reasons, we adopt the proposed co-primary allocations for FSS (space-to-Earth) in the 17.3-17.8 GHz band, subject to conditions adopted herein. For the reasons stated below, we conclude that appropriate technical limitations on FSS (space-to-Earth) use of the band will allow for successful band sharing and preserve the utility of the band for incumbent services.

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

20. In order to prevent harmful interference between services in the 17.3-17.8 GHz band, the Commission proposed a number of technical rules.⁷¹ These rules were designed to allow FSS (space-to-Earth) communications flexibility in the band, while preserving the ability to both use and grow in the band for other services.

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

21. In the *17 GHz FSS Notice*, the Commission proposed 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 operating in the space-to-Earth direction. Most of these requirements are already applicable to 17/24 GHz BSS space stations transmitting in the band, and the Commission generally proposed to extend them to 17.3-17.8 GHz FSS space stations either directly or with some targeted modifications.

22. *Required Longitudinal Separation between Downlinking Satellites.* The Commission proposed to adopt a two-degree orbital spacing requirement⁷² between transmitting FSS space stations and a four-degree separation requirement between FSS and 17/24 GHz BSS space stations. The Commission proposed to require an FSS applicant to make a different coordination showing depending upon the services of its adjacent space stations.⁷³ To implement this approach, the Commission proposed amending 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

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 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.

⁷¹ *17 GHz FSS Notice* at 13249-61, paras. 26-60.

⁷² 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. 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. Transmitting 17/24 GHz BSS space stations must also maintain at least 0.2 degrees separation from DBS space stations to minimize space path interference. GSO FSS space stations however, have historically been subject to a two-degree spacing requirement. Compliance with the two-degree orbital separation requirements for FSS space stations is verified by the information certifications and technical showings required by 47 CFR § 25.140(a) of our rules.

⁷³ *17 GHz FSS Notice* at 13250, para. 29.

space stations in other services.⁷⁴ While the Commission believed that this approach would use the orbital arc and associated spectrum resources most efficiently, the Commission also sought comment on other possible orbital spacing options, including the four-degree spacing regimen which we currently apply to 17/24 GHz BSS stations.⁷⁵

23. Most commenters support our proposed orbital spacing approach.⁷⁶ AT&T offers a different option, arguing that given the currently proposed power flux density (PFD) levels, we may require two degrees of separation between FSS space stations, but should require six degrees (vs. four) between FSS and 17/24 GHz BSS stations.⁷⁷ AT&T bases this choice of distance on its argument that the proposed spacing would increase the aggregate adjacent satellite interference by approximately 1.3 dB, thereby exceeding the standard 6% delta T/T coordination trigger.⁷⁸ In the alternative, AT&T asserts that should we adopt our orbital spacing proposal, then we must reduce our proposed PFD levels, particularly in the northeast and west regions, by 2.5 dB.⁷⁹

24. The Satellite Companies counter that requiring FSS satellites to either locate at least six degrees from a 17/24 GHz BSS space station or reduce their PFD levels is unnecessary, as there is no reason to suppose that the 17/24 GHz BSS system would be affected any differently by downlinking FSS transmissions than it would be from a neighboring 17/24 GHz BSS station in the current four-degree spacing environment.⁸⁰ The Satellite Companies note, however, that AT&T's concerns may arise instead from concern about potential aggregate interference that might arise if multiple satellites were positioned within six degrees on either side of a current 17/24 GHz BSS location – a situation which they point out is currently not possible.⁸¹ For this reason, the Satellite Companies argue that AT&T proposes an overly-broad solution to address an unlikely, hypothetical scenario.⁸² The Satellite Companies propose as an alternative that the Commission adopt language permitting the proposed two-degree separation between FSS space stations, and four degrees between FSS and 17/24 GHz BSS stations, with the added proviso that an applicant for an additional FSS satellite proposing to operate within six degrees of a 17/24 GHz BSS satellite must demonstrate that interference to the incumbent 17/24 GHz BSS receiver will not increase over levels expected in the four-degree spacing environment.⁸³ Hughes similarly argues that six degrees of separation between FSS and 17/24 GHz satellites is unnecessary, citing the technical analysis provided with the SES-17 application and the Commission's approval of that application.⁸⁴ As a remedy

⁷⁴ *Id* at 13250, para. 29. Under this approach, GSO FSS space stations would adhere to a two-degree separation regimen between each other, and a four degree separation from neighboring 17/24 GHz BSS space stations.

⁷⁵ *Id* at 13250, para. 30.

⁷⁶ The Satellite Companies Comments at 10; Inmarsat Comments at 3; and Hughes Comments at 4.

⁷⁷ AT&T Comments at 7. *See also* The Fixed Wireless Communications Coalition (FWCC) Ex Parte Letter, IB Docket No. 20-330, filed on Sept. 8, 2021 (FWCC Sept 8 2021 Ex Parte) (stating that it agrees with AT&T's submissions in this proceeding).

⁷⁸ AT&T Comments at 7-8.

⁷⁹ AT&T Comments at 7.

⁸⁰ Satellite Companies Reply at 12-13.

⁸¹ Satellite Companies Reply at 12-13.

⁸² Satellite Companies Reply at 12-13.

⁸³ Satellite Companies Reply at 13.

⁸⁴ Hughes Reply at 7. *See also* SES-17 S.à.r.l., IBFS File No. SAT-PDR-20190305-00014, Tech. App. at 6 (filed Mar. 5, 2019) (request for market access for the SES-17 space station), and SES-17 S.à.r.l., IBFS File No. SAT-MPL-20200609-00070 (stamp grant July 30, 2020).

to concerns of aggregate interference, Hughes proposes that only one FSS space station be permitted within six degrees of a 17/24 GHz BSS satellite.⁸⁵

25. We adopt a two-degree orbital separation requirement between transmitting FSS space stations, while simultaneously requiring that FSS space stations locate at least four degrees from adjacent 17/24 GHz BSS space stations. We do not believe that transmissions from FSS space stations at PFD levels that are either the same or reduced relative to those now required from 17/24 GHz BSS space stations in a four-degree environment will result in additional harmful interference to 17/24 GHz BSS receiving earth stations as there is no reason to suppose that the 17/24 GHz BSS system would be affected any differently by downlinking FSS transmissions than it would be from a neighboring 17/24 GHz BSS station in the current four-degree spacing environment. Accordingly, we believe that six degrees of separation between 17/24 GHz BSS and FSS satellites is unwarranted and would result in an inefficient use of scarce orbital resources.

26. We find, however, that there is some increased potential for aggregate interference into 17/24 GHz BSS systems if two transmitting FSS space stations were to locate within six degrees on either side of such an incumbent operator. Although relatively unlikely in the immediate operating environment, it remains a possibility, should future 17/24 GHz BSS space stations choose to locate at different orbital positions where two or more existing, or licensed but not yet launched, FSS space stations are within six degrees on either side of the 17/24 GHz BSS space station location. To address this concern, we will require that where an FSS satellite is located within four degrees of a previously authorized or proposed 17/24 GHz BSS satellite, and an applicant seeks to deploy another FSS satellite between four and eight degrees from the same 17/24 GHz BSS satellite in the same direction of separation as the existing FSS satellite, the applicant must either coordinate its operations with the affected incumbent 17/24 GHz BSS system or provide a showing in its application to demonstrate that aggregate interference into the 17/24 GHz BSS incumbent system will not exceed that which would be expected in a four-degree spacing environment. Hughes' proposal, as worded, would allow the second FSS satellite to locate just beyond six degrees away (e.g., 6.05°), an orbital separation unlikely to remedy AT&T's aggregate interference concerns.⁸⁶ We adopt eight degrees rather than the six degrees proposed by Hughes because we believe this orbital separation accurately represents the maximum separation that would be applicable for two transmitting satellites (FSS or 17/24 GHz BSS) in a four-degree spacing environment so that our decision is consistent with the current rules governing 17/24 GHz BSS space stations proposing to locate at separations of less than four degrees from one another.⁸⁷ To implement these rule changes, we will update sections 25.140(a)-(b), (d) and 25.262.

27. *Downlink Power Limits.* The Commission has typically employed downlink PFD limits for space stations transmissions to facilitate both inter-service and intra-service sharing. Although the Commission's current rules include PFD limits for 17/24 GHz BSS systems transmitting in the 17.3-17.7 GHz band,⁸⁸ the rules do not include PFD limits for FSS space stations in the 17.3-17.7 GHz band. To remedy this, the *17 GHz FSS Notice* proposed to apply 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. The

⁸⁵ Hughes Reply at 7.

⁸⁶ Hughes Reply at 7.

⁸⁷ 47 CFR § 25.140(b)(4). This rule requires that: "An applicant for a license to operate a space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously licensed 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 locate at an orbital separation of four degrees from the previously licensed or proposed space station."

⁸⁸ 47 CFR § 25.208(w).

Commission proposed adopting specific regional limits as follows:⁸⁹

(1) In the region of the contiguous United States, located east of 100° West Longitude and including Alaska and Hawaii: -118 dBW/m²/MHz; and

(2) In the region of the contiguous United States, located west of 100° West Longitude: -121 dBW/m²/MHz.

28. Because the PFD limits contained in section 25.208 are generally angle-dependent and largely intended to facilitate sharing between space and terrestrial services, rather than amend this section to include these new regional PFD requirements, the *17 GHz FSS Notice* instead proposed to include them in section 25.140(a)(3), which contains rules to facilitate FSS intra-service operations in a two-degree orbital spacing environment.⁹⁰ Further, to improve the organizational coherence of our part 25 rules, the *17GHz FSS Notice* also proposed 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).⁹¹ As a consequence of this move, the *17 GHz FSS Notice* also proposed conforming updates to other paragraphs in section 25.140(b)(3)⁹² and to rule sections that currently refer to 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).⁹³

29. Commenters generally support the Commission's proposals to apply regional PFD limits to transmitting FSS space stations.⁹⁴ As discussed above, AT&T states that in conjunction with the proposed orbital spacing regimen, the proposed PFD limits would be too high in the northeast and west regions.⁹⁵ As discussed herein, we are modifying the orbital spacing requirements, and these modifications should alleviate AT&T's concerns with respect to aggregate interference and the proposed regional PFD limits. Accordingly, we adopt the proposed modifications to section 25.140(a)(3) to include these regional PFD limits for transmitting FSS space stations to adequately facilitate both inter-service and intra-service sharing. In addition, no commenters object to the Commission's proposal to move the analogous regional PFD limits applicable to 17/24 GHz BSS systems in section 25.208(w) to section 25.140(b)(3) and we make this change to our rules along with the associated conforming modifications.⁹⁶

30. Some commenters question whether the PFD limits in the 17.7-17.8 GHz band are sufficient to protect incumbent fixed service operations, noting among other things that the (1) this PFD mask has not been studied by the Commission since 1983; (2) the internationally adopted PFD limits proposed herein assume that fixed service and FSS have equal status in the band, but the GSO FSS service in the 17 GHz band would be secondary to incumbent fixed operations (3) further detailed study is required to understand the full extent of the issue, but at minimum the Commission should take a similar protective measure to account for aggregate interference as it did in the C-band proceeding and reduce the PFD limit by 4 dB; and that (4) both the existing and proposed new section 25.140(b)(3) would permit a space station applicant to exceed the regional PFD to protect satellite operations, so long as the applicant coordinated with affected satellite operators, but without regard to the impact on terrestrial operations.⁹⁷

⁸⁹ *17 GHz FSS Notice* at 13251-52, para. 33.

⁹⁰ *Id.* at 13252, para. 34.

⁹¹ *Id.*

⁹² The Commission proposed renumbering of 47 CFR § 25.140(b)(3) generally as well as conforming updates to paragraphs (b)(4) and (b)(5), and a new paragraph (b)(6). *See id.* at Appendix A.

⁹³ *17 GHz FSS Notice* at 13252, para. 34.

⁹⁴ Hughes Comments at 4; Satellite Companies Comments at 7; Viasat Reply at 5-6.

⁹⁵ AT&T Comments at 9; AT&T Reply at 4-5.

⁹⁶ As discussed above, these conforming modifications are to rule sections that currently reference 47 CFR § 25.208(w), including sections 25.114(d)(15)(i)-(ii), 25.140(b)(5), and 25.262(b)(1)-(2) and (c)-(d).

⁹⁷ AT&T Comments at 12-13; CTIA Comments at 4-5; AT&T Reply at 10-12; CTIA Reply 2-4.

As discussed above, with the modified orbital spacing requirements, the PFD limits we adopt herein should be sufficient to protect all incumbent services and alleviate aggregate interference concerns. We note that there is no evidence in the record that the current PFD mask applicable to these services need to be revised, nor has any evidence been introduced that terrestrial services have experienced any interference issues in either the 17.7-17.8 GHz band or adjacent 17.8-18.3 GHz band, despite the fact that satellite and terrestrial services have co-existed in this spectrum for years, using these PFD limits.⁹⁸ We note that although FSS allocation will be primary in the 17.3-17.8 GHz band and subject to the adopted PFD limits to protect fixed services from harmful interference, earth stations operating in the FSS (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 also clarify that although we allow an FSS space station to exceed the PFD limits pursuant to section 25.140(b)(3) vis-à-vis other space stations, our adopted PFD limits will continue to apply vis-à-vis fixed services in the 17.7-17.8 GHz band or adjacent 17.8-18.3 GHz band.⁹⁹

31. *Polarization and Full Frequency Re-Use Requirements.* The *17 GHz FSS Notice* proposed to amend section 25.210(f)¹⁰⁰ of our rules to include 17.3-17.8 GHz in the list of specified frequencies in which FSS operators are required 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.¹⁰¹ Commenters support this proposal with no objections.¹⁰² Accordingly, we adopt this proposal.

32. *Cross-Polarization Isolation Requirements.* The *17 GHz FSS Notice* proposed not to extend the cross-polarization requirements contained in section 25.210(i) to FSS space station antennas transmitting in the 17.3-17.8 GHz band.¹⁰³ The Commission sought comment on whether these requirements might be obsolete in the current digital transmission environment and could be eliminated for 17/24 GHz BSS space station transmissions as well.¹⁰⁴ The Satellite Companies and Hughes agree that cross-polarization requirements are not necessary for downlinking FSS space stations, and further agree that these requirements could be eliminated for 17/24 GHz BSS transmissions as well, as they have become obsolete in today's digital transmission environment.¹⁰⁵ We received no other comments on this issue. Accordingly, we will not extend these requirements to FSS space stations downlinking in the 17.3-17.8 GHz band, and we further eliminate the obsolete cross-polarization isolation requirement for 17/24 GHz space stations in section 25.210(i).¹⁰⁶

⁹⁸ See also Satellite Companies Comments at 7; Viasat Reply at 5-6.

⁹⁹ See e.g., 47 CFR § 25.208(c). The fixed service stations would be protected from harmful interference from GSO FSS downlink operations, given the existing 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.

¹⁰⁰ 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 operations.

¹⁰¹ *17 GHz FSS Notice* at 13252, para. 35.

¹⁰² AT&T Comments at 12; Hughes Comments at 4; Inmarsat Comments at 3; Satellite Companies Comments at 4; Viasat Comments at 4.

¹⁰³ *17 GHz FSS Notice* at 13252-53, para. 36.

¹⁰⁴ *Id.* 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. See also *17/24 GHz R&O and FNPRM*, 22 FCC Rcd at 8888-89, para. 113.

¹⁰⁵ The Satellite Companies Comments at 11; Hughes Comments at 4.

¹⁰⁶ 47 CFR § 25.210(i).

2. Measures to Mitigate Space Path Interference

33. In the 17.3-17.8 GHz reverse-band sharing environment, receiving DBS space stations are vulnerable to space path interference¹⁰⁷ from nearby co-frequency 17/24 GHz BSS space station transmissions.¹⁰⁸ To mitigate space path interference into DBS receivers, the *17 GHz FSS Notice* proposed to apply to FSS space stations an approach similar to the one now applicable to 17/24 GHz BSS space stations.¹⁰⁹ As discussed in detail below, we adopt these proposals.¹¹⁰ As discussed below, however, we are not increasing the minimum orbital separation distance between FSS and DBS space stations to 0.5 degrees. We also are not relaxing the angular measurement range over which FSS applicants are required to submit off-axis antenna gain data and associated PFD calculations. Rather, as discussed below, we extend the requirements contained in section 25.264(a) to FSS applicants. In addition, we amend section 25.264(a)(4) to require that measurements for both FSS and 17/24 GHz BSS transmitting antennas be made only at a single frequency in the middle of the band in which the applicant proposes to operate.

34. *Off-Axis Power Flux Density Coordination Trigger.* To avoid harmful levels of space path interference into DBS space station antennas from FSS transmissions, the *17 GHz FSS Notice* proposed modifications to section 25.264(a)-(i) of our rules to extend the current PFD coordination trigger of -117 dBW/m²/100 kHz to downlinking FSS space stations in the 17.3-17.8 GHz band.¹¹¹ Recognizing that current space station design often employs multiple spot beams and may result in a cumulative interference level at the DBS receiver, the Commission also proposed to amend sections 25.264(b)(1)-(2) and (e) to require that the PFD calculations at the DBS receiver from both 17/24 GHz BSS and FSS consider the *aggregate* power flux density from *all* 17.3-17.8 GHz transmitting beams on the adjacent space station.¹¹²

35. All commenters supported our proposal to extend the current PFD coordination trigger to downlinking FSS space stations and felt that it was reasonable to require that the associated PFD calculations consider the aggregate power flux density value.¹¹³ We adopt these proposals and amend sections 25.264(b)(1)-(2) accordingly.

36. *Requirements for Antenna Off-Axis Gain, Angular Measurement Ranges, and Minimum Longitudinal Separation.* The *17 GHz FSS Notice* proposed to amend section 25.264(g) of our rules to apply 0.5 degrees as the minimum orbital longitude separation¹¹⁴ that transmitting FSS space stations

¹⁰⁷ 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.

¹⁰⁸ 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.

¹⁰⁹ *17 GHz FSS Notice* at 13253-57, paras. 37-48.

¹¹⁰ 47 CFR § 25.264(a)-(i).

¹¹¹ *17 GHz FSS Notice* at 13253, para. 38.

¹¹² *Id.* at 13254, para. 39.

¹¹³ AT&T Comments at 10, Hughes Comments at 4, Satellite Companies Comments at 12.

¹¹⁴ The angular separation, in conjunction with limits on certain orbital parameters of space stations in both the DBS and FSS services, bounds the range over which FSS applicants or licensees must provide off-axis angular gain and PFD data.

must maintain relative to DBS space stations, and to amend section 25.264(a) to reflect the corresponding off-axis measurement angles,¹¹⁵ i.e., ± 10 degrees in the X-Z plane and ± 20 degrees in planes rotated about the Z axis.¹¹⁶ The Commission proposed to retain the current requirements for orbital inclination and eccentricity and proposed to amend section 25.264(h) to extend these values to FSS space stations.¹¹⁷ Further, the Commission tentatively concluded that this same change in the required minimum orbital separation value and corresponding antenna measurement angles could be extended to 17/24 GHz BSS space stations transmitting in the 17.3-17.8 GHz band and proposed to similarly amend sections 25.264(a) and (g) with respect to 17/24 GHz BSS space stations.¹¹⁸

37. The majority of commenters oppose our proposal to increase the minimum orbital separation distance between FSS and DBS space stations to 0.5 degrees. The Satellite Companies urge us to adopt the 0.2 degree minimum orbital separation requirement now applicable between 17/24 GHz BSS and DBS space stations, arguing that a reduction in the angular range over which measurements would be required does not justify blocking significant portions of the orbital arc near DBS locations, thereby impeding efficient use of orbital resources.¹¹⁹ They argue further that while waivers of these measurement angles may have proven problematic in the past, there is no evidence that these difficulties persist today. The Satellite Companies further state that allowing simulated measurement data would serve to alleviate obstacles associated with providing data responsive to section 25.264.¹²⁰ Hughes argues that the 0.5 degree separation is overly restrictive, placing too great a burden on an already crowded orbital arc. Rather, Hughes proposes that to ensure the most efficient use of the orbital arc we should adopt a minimum orbital separation of 0.2 degrees between downlinking FSS space stations and the nearest DBS satellite.¹²¹ In contrast, AT&T supports our proposal to increase the minimum separation distance to 0.5 degrees. It notes that although our current rules permit separations as small as 0.2 degrees between 17/24 GHz BSS and DBS spacecraft, that no operator has sought to provide service from such proximity. AT&T further argues that the marginal increase in orbital separation distance will both reduce that angular measurement range over which data is required but will also improve overall on-orbit mission safety, including space path interference risks.¹²²

38. We will not adopt the proposal to require a minimum orbital separation of 0.5 degrees between downlinking FSS space stations and DBS satellites. The primary reason for the proposal of this value was to relieve FSS applicants from the angular range measurement requirements, which had proven problematic in the past for some applicants. In addition, the Commission believed it might enhance the acceptability of simulated data, thereby further relieving applicants from measured data requirements. The 0.2 degree value is the minimum longitudinal separation requirement currently applicable in our rules for 17/24 GHz BSS operators (who also downlink in the 17.3-17.7 GHz band) relative to DBS satellites.¹²³

¹¹⁵ 47 CFR § 25.264(a)-(b). These sections 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

¹¹⁶ *17 GHz FSS Notice* at 13255-56, para. 43. Smaller orbital separations would still be possible if a coordination agreement is achieved between the FSS and DBS operators.

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ Satellite Companies Comments at 12.

¹²⁰ *Id.* at 13.

¹²¹ Hughes Comments at 4.

¹²² AT&T Comments at 8.

¹²³ *Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services 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, 8943-44, para. 38 (2011).

In adopting that requirement, the Commission determined that taking into account an east/west stationkeeping tolerance of 0.05 degrees, a minimum 0.2 degree spacing between the assigned locations of 17/24 GHz BSS and DBS space stations was required to maintain a longitudinal separation of 0.1 degrees between 17/24 GHz BSS and DBS space stations at all times.¹²⁴ No space stations in the DBS and BSS services have been placed so near each other, and FSS operators, for whose benefit the Commission proposed the 0.5 degree separation requirement in this proceeding, clearly prefer the flexibility associated with the narrower orbital spacing requirement of 0.2 degrees.¹²⁵ Thus, we consider it to be sufficient to protect DBS receivers from space path interference when combined with the appropriate PFD coordination trigger, orbital constraints, and angular range measurement requirements for off-axis antenna gain. For this reason, we are not relaxing the angular measurement range over which FSS applicants are required to submit off-axis antenna gain data and associated PFD calculations. Rather, we extend the requirements contained in section 25.264(a) for 17/24 GHz BSS operators to FSS applicants. Specifically, measurements must be made over a range of $\pm 30^\circ$ from the X axis in the X-Z plane, and over a range of $\pm 60^\circ$ in planes rotated about the Z axis.¹²⁶ All commenters addressing the angular measurement range issue supported our proposal to extend our current requirements¹²⁷ for orbital inclination and eccentricity to FSS space stations.¹²⁸ We amend section 25.264(h) accordingly.

39. *Measurement Frequencies.* Our current rules require 17/24 GHz BSS applicants to make off-axis angular measurements 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.¹²⁹ In the *17 GHz FSS Notice*, the Commission sought comment on whether this requirement should be revised.¹³⁰

40. Both the Satellite Companies and Hughes assert that, to simplify the information to be provided by both GSO FSS and 17/24 GHz BSS operators, we should update sections 25.264(a)(4)-(5) to require submission of gain data based only on a single mid-band frequency, because gain values do not vary materially across the 17.3-17.8 GHz band.¹³¹ No other commenters addressed this question. We agree that the antenna gain typically varies little across the 17.3-17.8 GHz band and that multiple measurement frequencies often result in large amounts of repetitive information. Accordingly, we amend

¹²⁴ *Id.*

¹²⁵ Hughes Comments at 4, Reply at 7-8; Satellite Companies Comments at 4, Reply at 12-14.

¹²⁶ 47 CFR § 25.264(a). This rule section 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. It also includes additional specifications regarding the measurement increments, polarization, and frequencies to which we proposed no changes in the *17 GHz FSS Notice*.

¹²⁷ 47 CFR § 25.264(h). These requirements currently apply to 17/24 GHz BSS applicants and include a maximum orbital inclination of 0.075° and an orbital eccentricity no greater than 4.7×10^{-4} .

¹²⁸ AT&T Reply at 10; Hughes Comments at 4-5; Satellite Companies Comments at 14; Viasat Reply at 4-5; Inmarsat Comments at 3.

¹²⁹ 47 CFR § 25.264(a)(4). 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.

¹³⁰ *17 GHz FSS Notice* at 13256, para. 44.

¹³¹ Hughes Comments at 5; Satellite Companies Comments at 14.

¹⁸ The two-part submission process for antenna off-axis gain data and associated PFD calculations demonstrates conformance with the off-axis PFD coordination trigger. Under this approach at an early stage in the process, operators submit predicted antenna off-axis gain

section 25.264(a)(4) to require that measurements for both FSS and 17/24 GHz BSS transmitting antennas be made only at a single frequency in the middle of the band in which the applicant proposes to operate. Recognizing however, that instances may arise when additional measurement data may be warranted (e.g., when the aggregate PFD is near the coordination trigger value), we will also include a requirement that applicants must be prepared to provide additional measurement information at 5 MHz above, and 5 MHz below the band edge, upon request.

41. *Measured vs. Simulated Off-Axis Antenna Gain Data.* The *17 GHz FSS Notice* sought comment on whether the Commission should modify the two-part submission process to also accept simulated data in lieu of measured data to allow operators to demonstrate compliance with the requirements of Section 25.264. Specifically, the Commission asked what requirements for simulated data would ensure accuracy of the required calculations. The *17 GHz FSS Notice* sought comment on specific software programs that should be required, input assumptions, conditions or other parameters that we should specify, or information that we should require applicants to include with their showing. The *17 GHz FSS Notice* also asked how the use of simulated data might affect the current two-part information submission process. The Commission recognized that accepting simulated gain and PFD data could obviate a need to reduce the angular ranges over which such measurements are made, while also recognizing that adoption of an increased orbital separation between space-to-Earth transmitting FSS or BSS and DBS space stations could alleviate concerns associated with relying upon simulated off-axis gain data.¹³²

42. Commenters offered differing opinions. Hughes encourages us to permit the use of simulated data, arguing that simulated antenna pattern data is routinely used in on-board satellite antenna design and testing. It explains that predicted patterns are compared with measured patterns in compact antenna test ranges with agreement well beyond 30 dB sidelobes, and that simulated patterns are often preferred over measured data when the test range accuracy is in question as is often the case with high frequency and large antennas.¹³³ The Satellite Companies similarly advocate for the use of simulated data, asserting that permitting its use will address prior difficulties in supplying the information mandated by this rule while still providing the Commission and interested parties with the information needed to assess compliance with relevant requirements.¹³⁴

43. In contrast, AT&T encourages us to continue to require operators to submit actual, measured data and associated PFD calculations in satisfaction of section 25.264, and to extend these requirements to any new GSO FSS service in the 17 GHz band. It argues that measured data is invaluable in guarding against inaccuracies resulting from errors in software simulations, and that relying only on simulations may risk infidelities in the analysis or modelling to account for scattering effects or other interactions between the antenna and spacecraft structures. AT&T asserts that validation of first-stage results through submission of actual measured data will increase operator confidence in the predicted on-orbit performance. AT&T further argues that there is no evidence to support the GSO FSS operators' assertions that simulated data can provide "the information needed to assess compliance with relevant requirements."¹³⁵

44. We modify our rules to require 17/24 GHz BSS and GSO FSS operators to submit measured off-axis antenna gain data as part of the information submission process, with certain exceptions allowing for simulated data. Specifically, we will permit the use of simulated data *only* in those instances where the 17/24 GHz BSS operator or GSO FSS operator's space station will be located at an orbital separation of at least one degree from a prior-filed or licensed U.S. DBS operator's space

¹³² *17 GHz FSS Notice* at 13256-57, paras. 46-47.

¹³³ Hughes Reply at 8.

¹³⁴ Satellite Companies Comments at 14.

¹³⁵ AT&T Reply at 9-10.

station.¹³⁶ Apart from providing increased flexibility for all operators, a primary consideration in permitting GSO FSS use of the band is to ensure that incumbent systems are adequately protected from harmful interference. While permitting simulated data submission will certainly provide greater flexibility to 17/24 GHz BSS and GSO FSS applicants, the potential victim, (i.e., the DBS operator) is not fully confident in its reliability. We believe however, that at orbital separations greater than one degree from a DBS space station, the potential for space path interference is negligible because of the attenuation of potentially interfering off-axis emissions. Thus, over the remaining portions of the orbital arc, we will permit applicants the option to rely upon simulated off-axis antenna gain rather than measured data to satisfy the requirements of section 25.264.

45. In addition, we sought comment on the use of simulated data while simultaneously proposing to require a minimum orbital separation of 0.5 degrees between DBS and transmitting GSO FSS space stations – a scenario in which the potential for space path interference would be greatly diminished. These rule changes were considered as a means to relieve applicants of some of the measurement requirements which in the past had proved difficult for 17/24 GHz operators. GSO FSS commenters, however, assert that there is no evidence that these difficulties exist today, and cite as an example the recently SES-17 application which included off-axis gain measurements made over the full required range.¹³⁷ Accordingly, we believe that under this approach GSO FSS and 17/24 GHz BSS operators will be able to make the full range of necessary measurements when required by our rules but will have the added option to rely upon simulated data in some instances. Moreover, by first allowing use of simulated data in finite portions of the orbital arc, we may better assess and develop confidence in its reliability in a relatively low-risk scenario.¹³⁸ We believe this approach represents the best compromise between our competing goals of providing operator flexibility and protecting incumbent services from harmful interference, and we amend section 25.264(c) accordingly.

46. *Two-Part Data Submission Process.* In the *17 GHz FSS Notice*, the Commission proposed to amend sections 25.264(a)-(e) of our rules to extend the two-part data submission process requirements¹³⁹ to FSS applicants proposing space-to-Earth transmissions in the 17.3-17.8 GHz band.¹⁴⁰ The Commission also sought comment on whether we should retain, update, or modify any part of the process for 17/24 GHz BSS applicants.¹⁴¹ Finally, to correct an existing uncertainty regarding the timing of the PFD information submission, the Commission proposed to replace the phrase “within 60 days after completion of critical design review” in section 25.264(a)(6) and (b)(4) with a requirement to submit information “within two years after license grant” in these rule sections.¹⁴²

47. Commenters generally support the proposal to extend the two-part data submission

¹³⁶ This would also include foreign-licensed DBS operators who may be granted US market access at some future point.

¹³⁷ Satellite Companies Comments at 13.

¹³⁸ While the Commission previously rejected a proposal to amend section 25.264(c) to allow simulated data in all cases based on concerns that it was “not clear whether the simulated data would replicate the accuracy of the measurements,” we adopt a balanced approach here that allows us to assess the reliability of simulated data without threatening harmful interference. See AT&T Reply Comments at 3 (citing *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713,14817, ¶ 330 (2015)).

¹³⁹ The two-part submission process for antenna off-axis gain data and associated PFD calculations demonstrates conformance with the off-axis PFD coordination trigger. 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. No later than two months prior to launch this predicted data is confirmed by submission of measured data and associated PFD calculations.

¹⁴⁰ *17 GHz FSS Notice* at 13256, para. 45.

¹⁴¹ *Id.* at 13256-57, paras. 45-47.

¹⁴² *Id.* at 13257, para. 48.

process to FSS systems in the 17.3-17.8 GHz band and agree that redefining the deadline for first-phase (predicted) information to be provided “within two years after license grant” instead of linking it to the critical design review is appropriate.¹⁴³ AT&T also supports extending the two-part data submission process to GSO FSS applicants but recommends that the deadline for the second (measured) data submission be moved forward from the current two months prior to launch, to six months prior to launch. It argues that this extension would afford DBS operators sufficient time to review the information and seek remediation when necessary without disrupting critical launch schedules.¹⁴⁴

48. We modify sections 25.264(a)-(e) to extend the two-part data submission process to GSO FSS applicants in the 17.3-17.8 GHz band. As part of this modification, we replace the phrase “within 60 days after completion of critical design review in sections 25.264(a)(6) and (b)(4) with a phrase requiring submission of predicted data “within two years after license grant.” We are not adopting AT&T’s recommendation that we move the deadline for submission for the second phase information from two to six months prior to launch because, based on our experience, we are not convinced that a full six months is required to evaluate the data presented at this stage. Moreover, operators who are concerned about delays to their launch schedules may always submit the measured data in advance of the two-month deadline. The two-month deadline was adopted by amending sections 25.264(c)-(d) in the *Part 25 Second R&O*, moving it closer to the launch date to allow licensees to measure an antenna’s off-axis gain after it has been integrated with the satellite bus.¹⁴⁵ There is no supporting evidence in the record that this previously adopted timeline is no longer appropriate. Accordingly, we decline to modify the existing timeline and find that keeping the two-month prior to launch deadline for the second phase information submission would continue to serve the public interest.

3. Measures to Mitigate Ground Path Interference and Earth Station Operations

49. To protect 17.3-17.8 GHz band receiving FSS earth stations from ground path interference¹⁴⁶ arising from the Earth-to-space transmissions from nearby co-frequency DBS feeder link earth stations, the Commission proposed in the *17 GHz FSS Notice* to apply generally to receiving FSS earth stations the same coordination approach the Commission uses to facilitate operations between DBS and 17/24 GHz BSS earth stations.¹⁴⁷ Specifically, the Commission proposed to amend section 25.203 of our rules to apply the coordination approach contained in paragraph (m) 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 would not be entitled to protection from fixed service stations. The Commission sought comment on modifications to the parameters used with the ITU Radio Regulations Appendix 7 coordination methodology¹⁴⁸ to account for differences between the receiving antennas employed in the two services.

50. Commenters supported our proposal to apply generally the same coordination approach contained in section 25.203(m) of our rules, and used to facilitate operations between DBS and 17/24

¹⁴³ Satellite Companies Comments at 15; Hughes Comments at 5.

¹⁴⁴ AT&T Comments at 10.

¹⁴⁵ *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, 14816, para. 330 (2015).

¹⁴⁶ 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.

¹⁴⁷ *17 GHz FSS Notice* at 13257-58, para. 49.

¹⁴⁸ ITU Radio Regulations, Appendix 7 at § 3; Table 9b of Annex 7.

GHz BSS earth stations, to coordination with receiving FSS earth stations.¹⁴⁹ Accordingly, we modify this rule section to extend this approach to FSS earth station coordination, as discussed further below.

51. *Upgrades and Modifications to Grandfathered DBS Facilities.* The Commission proposed in the *17 GHz FSS Notice* proposed to retain the grandfathered status for existing DBS feeder link earth stations relative to FSS receiving earth stations, and to apply relative to the FSS the same criteria for permitting DBS operators to modify or add antennas to their existing networks that apply with respect to 17/24 GHz BSS.¹⁵⁰ Commenters who addressed this issue all agreed with the proposed approach,¹⁵¹ although Hughes stresses that grandfathered status should apply only to existing and specific modifications to DBS earth stations. Hughes' comments are consistent with the Commission's proposal. Based on the record we adopt the Commission's proposal and retain the grandfathered status for existing DBS feeder link earth stations relative to FSS receiving earth stations, and apply relative to the FSS the same criteria for permitting DBS operators to modify or add antennas to their existing networks.

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 17/24 GHz BSS earth stations in the 17.3-17.7 GHz band.¹⁵² 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 Radio Regulations.¹⁵³ Recognizing that the specific parameter values to be used in determining this coordination zone were based upon some characteristics specific to BSS receiving earth stations, the Commission proposed in the *17 GHz FSS Notice* to modify section 25.203(m)(1) to include new values for use in determining the coordination zone for DBS feeder link earth stations relative to FSS earth stations. The Commission sought comment on this decision and, in particular, on what these values should be.¹⁵⁴

53. Commenters generally agree that the existing coordination methodology specified in section 25.203(m)(1) of our rules to facilitate coordination between DBS feeder uplink stations and 17/24 GHz BSS earth stations should be extended to FSS earth stations.¹⁵⁵ FSS satellite operators also agree that some parameters in the table in this section need to be modified for use in calculating the coordination zone for use with FSS earth stations, as the current parameters are specific to 17/24 GHz BSS receiving earth stations.¹⁵⁶ To update section 25.203(m)(1), satellite operators also provide proposed FSS-specific parameters, which they state were calculated using ITU reference documents, although they

¹⁴⁹ Satellite Companies Comments at 15; Hughes Comments at 5; AT&T Comments at 9; Hughes Reply at 3.

¹⁵⁰ *17 GHz FSS Notice* at 13258, para. 51. Under that approach, new or modified DBS operations cannot exceed established PFD criteria and any new earth station antenna must be located within a specified distance around an existing authorized DBS feeder link earth station antenna. Otherwise, the new or modified earth station is subject to the coordination procedures in section 25.203(m) of our rules. See 47 CFR § 25.203(m).

¹⁵¹ Satellite Companies Comments at 15; Hughes Comments at 5; AT&T Comments at 9.

¹⁵² 47 CFR § 25.203(m)(1).

¹⁵³ *Id.* 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.

¹⁵⁴ 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.

¹⁵⁵ Satellite Companies Comments at 15; AT&T Comments at 9; Hughes Comments at 5.

¹⁵⁶ Satellite Companies Comments at 15-16; Hughes Comments at 5.

are not specific as to which documents or methodology were used to derive these parameters.¹⁵⁷ These updated parameters are shown underlined as follows:

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			<u>0.003</u>	
n	2			<u>2</u>	
p (%)	0.015			<u>0.0015</u>	
N_L (dB)	1			<u>1</u>	
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	<u>2.5</u>	<u>0.8</u>
W (dB)	4			<u>0</u>	
Receiving earth station parameters:	17/24 GHz BSS			FSS	
G_m (dBi)	36			<u>N/A</u>	
G_r	0			<u>0</u>	
ϵ_{min}	20°			<u>5°</u>	
T_e (K)	150			<u>300</u>	
Reference bandwidth: B (Hz)	10 ⁶				
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	<u>-144</u>	<u>-150.1</u>

54. In contrast, AT&T advocates that “to reduce the burden on incumbents” section 25.203(m) should be modified using the same parameters applicable to coordination with 17/24 GHz

¹⁵⁷ Satellite Companies Comments at 15-16 and Appendix A.

earth stations.¹⁵⁸

55. We adopt the proposal to extend the ITU Radio Regulations Appendix 7 coordination methodology currently in our rules to FSS earth stations, but with amended parameters. We do not agree with AT&T's assertion that performing this calculation with different parameters will be significantly burdensome to DBS operators. As noted in the *17 GHz FSS Notice*, the current parameters used in the coordination zone calculation were derived specifically with BSS receiving earth stations in mind and are not appropriate for coordination with FSS earth stations because of differences between FSS and BSS receiving earth stations, including in the abilities of the respective earth station antennas to reject unwanted or interfering signals. In fact, some parameters applicable to BSS receiving earth stations in the existing table have no function¹⁵⁹ in calculations involving FSS receiving earth stations. AT&T's objection may rest with the need to make a different calculation depending upon the type of earth station with which coordination may be required, rather than with the actual proposed FSS-specific parameters themselves. We determine, however, that in order to yield an effective coordination outcome, to facilitate the most efficient and effective use of the spectrum, the receiving earth station interference parameters used in the underlying calculations must also be specific to FSS. Accordingly, we adopt the modified parameters specified above, filed in the record as FSS-specific parameters.

56. Section 25.203(m)(2) identifies specific information that DBS applicants proposing new feeder link earth station must provide to a third-party coordinator prior to licensing to resolve any potential interference issues with affected receiving earth stations.¹⁶⁰ The Commission proposed in the *17 GHz FSS Notice* to apply this rule to coordination with FSS earth stations with no additional changes to the requested information.¹⁶¹ Commenters addressing this issue all support this approach,¹⁶² and we extend these information requirements to coordination with FSS receiving earth stations without changes.

57. Because receive-only earth stations are not required to apply for licenses nor to be registered with the Commission, the *17 GHz FSS Notice* sought comment on how to facilitate coordination with DBS operators and to ensure protection from DBS feeder link earth station ground path interference. The Commission proposed that interference protection be afforded to individual FSS receiving earth stations from DBS feeder link transmissions only if they have been licensed with the Commission, and to amend section 25.203(m)(3) of our rules to reflect this requirement.¹⁶³ We further proposed, however, to allow blanket-licensed FSS earth stations on an unprotected basis in the 17.3-17.8

¹⁵⁸ AT&T Comments at 9.

¹⁵⁹ *E.g.*, G_m is defined in the notes to Table 9b of Annex to Appendix 7 of the ITU Radio Regulations as the on-axis gain of the receiving earth station antenna. It is not used in coordination zone calculations between GSO/FSS satellite earth stations operating in reverse-band situations.

¹⁶⁰ 47 CFR § 25.203(m)(2).

¹⁶¹ *17 GHz FSS Notice* at 13259, para. 53. The requested information includes: 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.

¹⁶² Satellite Companies Comments at 16; Hughes Comments at 5; AT&T Comments at 9.

¹⁶³ *17 GHz FSS Notice* at 13259-60, para. 54.

GHz band and proposed to amend section 25.115(e) to reflect this.¹⁶⁴

58. Commenters expressed differing opinions regarding the types of FSS earth stations that should be permitted to operate in the band, and the extent of protection that they should be afforded. Viasat urges the Commission to protect blanket-licensed earth stations in the band consistent with section 25.209(c), arguing that there is no reason to treat individually or blanket-licensed earth stations differently.¹⁶⁵ Viasat argues that protecting such earth stations would pose no threat to incumbent services, would “facilitate the ability of operators to utilize the 17.3-17.8 GHz band to support user terminals,” and would encourage intensive use of the band.¹⁶⁶ The Satellite Companies support our proposal to afford interference protection only to licensed FSS receiving earth stations, asserting that this approach will ensure that DBS feeder link operators have access to the information regarding the FSS earth station sites that require protection.¹⁶⁷

59. We adopt the proposals to extend interference protection only to individually-licensed FSS receiving earth stations in the 17.3-17.8 GHz band. We disagree with Viasat’s assertion that we should extend interference protection to blanket-licensed earth stations. By definition, a blanket earth station license can encompass multiple stations that may be operated anywhere within a geographic area,¹⁶⁸ and as such are not amenable to the reverse-band coordination process outlined in section 25.203(m) of our rules.¹⁶⁹ While we agree with Viasat that blanket-licensed receive-only earth stations may pose no interference threat to incumbent operators, the lack of precise location coordinates precludes the ability to protect them from ground path interference from DBS feeder link earth stations through the coordination process. Although we are limiting interference protection to individually licensed earth stations, consistent with our approach in other frequency bands¹⁷⁰ we will not further restrict such licenses by function (*e.g.*, gateways or feeder links).

60. *Blanket-Licensed Earth Stations and ESIMs.* As mentioned above, the Commission also proposed to amend section 25.115(e) of the rules to facilitate blanket-licensed FSS earth stations other than ESIMs to operate on an unprotected basis in the 17.3-17.8 GHz band.¹⁷¹ In addition, the Commission sought comment on whether operation of ESIMs in the 17.3-17.8 GHz band could increase FSS operators’ flexibility to use the band more efficiently and what modifications to our rules might be required to permit operation of ESIMs while protecting incumbent services.¹⁷²

61. Commenters expressed differing opinions on these issues. AT&T believes that FSS downlink operations should be limited to individually-licensed, gateway-type earth stations, whose precise locations are known and whose typically large-diameter antennas facilitate coordination.¹⁷³ AT&T does not support allowing blanket-licensed earth stations prior to the completion of ITU WRC-23

¹⁶⁴ *Id.* at 13260, para. 55.

¹⁶⁵ Viasat Comments at 7-9; Viasat Reply at 6-8. Section 25.209(c)(1) of the Commission’s rules addresses interference protection for receive-only GSO/FSS earth stations and states that such earth stations are not afforded interference protection from other authorized space station operations, if those operations would not cause harmful interference to a GSO/FSS earth station operating with the levels specified in paragraphs (a) and (b) of that section. 47 CFR § 25.209(c)(1).

¹⁶⁶ Viasat Comments at 7-9.

¹⁶⁷ Satellite Companies Comments at 16.

¹⁶⁸ 47 CFR § 25.103.

¹⁶⁹ 47 CFR § 25.203(m).

¹⁷⁰ *See, e.g.*, 47 CFR § 25.136(d)-(e).

¹⁷¹ *17 GHz FSS Notice* at 13260, para. 55.

¹⁷² *Id.*

¹⁷³ AT&T Comments at 11-12

studies.¹⁷⁴ AT&T argues that permitting a service that could receive interference on a regular basis could result in substandard service, contrary to the public interest.¹⁷⁵ CTIA focuses its objections on the 17.7-17.8 GHz band, where it opposes allowing FSS receiving earth stations generally, and more specifically opposes blanket-licensed earth stations, arguing that it would unnecessarily hamper future increased terrestrial use. Specifically, CTIA asserts that it is difficult to get accurate information on the location of blanket-licensed earth stations, which could make reallocation of spectrum difficult in the future.¹⁷⁶ CTIA also argues that, should the Commission wish to make the 17 GHz band available for increased terrestrial use in the future, giving priority to the fixed service via footnote would not address any future mobile service operations.¹⁷⁷

62. In contrast, the Satellite Companies support our proposal to allow blanket-licensed earth stations to operate on an unprotected basis in the band,¹⁷⁸ and refer to other commenter's objections as "baseless" because any interference would affect only FSS providers.¹⁷⁹ The Satellite Companies refute CTIA's argument that the Commission should restrict use of the 17.7-17.8 GHz band segment today in case there is a future desire to introduce terrestrial mobile service in the band, claiming it directly conflicts with the Commission's commitments to meeting demand for additional satellite spectrum and promoting efficient use of the 17 GHz band.¹⁸⁰ Hughes supports permitting GSO FSS downlink operations to earth stations, including blanket-licensed earth stations and ESIMs, provided they do not cause interference to incumbent services.¹⁸¹ Viasat claims that CTIA's objections are based upon ill-defined concerns that future mobile operations would be impeded, noting that no part of the 17.3-17.8 GHz band is allocated to the mobile service in the United States, nor has the Commission proposed such an allocation.¹⁸²

63. Commenters also express very differing opinions on operations of ESIMs in the 17.3-17.8 GHz band. AT&T and CTIA oppose permitting ESIMs in the band, consistent with their rationale for opposing blanket licensed earth stations more generally.¹⁸³ CTIA further argues that ESIM operation presents a coexistence challenge different from fixed FSS earth stations, and that such operations would be incompatible with any future mobile operations in the 17.7-17.8 GHz band.¹⁸⁴ It claims that comprehensive studies are needed to evaluate if spectrum could be shared without risking harmful interference to incumbent services, and it urges the Commission to prohibit ESIM operations in the band, both to protect critical incumbent uses and to preserve flexibility in the band for any future increased terrestrial use.¹⁸⁵

64. Hughes, The Satellite Companies, and Viasat all urge the Commission to permit ESIMs

¹⁷⁴ *Id.*; see also Letter from Brenna Sparks, DIRECTV, LLC to Marlene H. Dortch, Secretary, FCC, IB Docket No. 20-330 (filed July 1, 2022).

¹⁷⁵ AT&T Reply at 7.

¹⁷⁶ CTIA Comments at 5-6.

¹⁷⁷ CTIA Reply at 4-5.

¹⁷⁸ Satellite Companies Comments at 16.

¹⁷⁹ *Id.* at 14.

¹⁸⁰ *Id.* at 15.

¹⁸¹ Hughes Comments at 5-6, Hughes Erratum.

¹⁸² Viasat Reply at 3.

¹⁸³ AT&T Comments at 12; AT&T Reply at 7-8; CTIA Comments at 5; CTIA Reply at 7.

¹⁸⁴ CTIA Comments at 5.

¹⁸⁵ CTIA Reply at 7.

operations in the 17.3-17.8 GHz band.¹⁸⁶ The Satellite Companies claim that there is no reason to limit FSS operators' flexibility, given that ESIMs pose no interference risk to incumbent services and place no constraints upon such services if they are not entitled to protection.¹⁸⁷ Viasat similarly argues that permitting ESIM operations would pose no interference threat to incumbent services and would allow the band to be used more productively in the public interest.¹⁸⁸ Hughes claims that ESIM receiving earth stations can be accommodated in the 17.3-17.8 GHz band without interference protections and argues that there is no need to limit FSS network flexibility in determining how to operate in the 17 GHz band, particularly as DBS site locations are well known and receiving ESIM stations pose no interference threat themselves to other users.¹⁸⁹ Viasat rejects CTIA's assertion that ESIMs present a different coexistence challenge from other FSS receiving earth stations, or that they would further complicate an already complex sharing situation, as AT&T has argued. Viasat further argues that sharing studies are not needed as a prerequisite to allowing receiving ESIM operations.¹⁹⁰ As with blanket-licensed earth stations generally, Viasat urges the Commission to extend full interference protection to ESIM earth stations.¹⁹¹

65. We will adopt the proposals to facilitate authorization of blanket-licensed earth stations and ESIMs to operate in the 17.3-17.8 GHz band on an unprotected basis. As stated above, such (receiving) stations pose no interference threat to other services, nor will they place any undue coordination burden on incumbent operators if operating on an unprotected basis. AT&T states that a "service that could potentially be interfered into on a regular basis, resulting in a substandard service, would be contrary to the public interest."¹⁹² Given the well-established locations of DBS feeder uplink and the ability to design satellite networks to avoid interfering signals and switch operations to other available frequencies, we believe that FSS earth station operators can avoid subjecting their operations to regular unwanted interference. Thus, we see no justification to prohibit blanket-licensed earth stations or ESIMs and limit FSS operators' flexibility in designing their networks, or a need to delay our decision as AT&T and CTIA suggest. We find that it would serve the public interest to allow blanket-licensed earth stations and ESIMs in the band, subject to conditions discussed herein, including that operations are on an unprotected basis, to increase FSS operators' flexibility to use the band more efficiently for provisioning of advanced satellite services for the benefit of American consumers.

66. We reject CTIA's concerns about future terrestrial use as speculative. There is no allocation of any part of the 17.3-17.8 GHz band to the mobile service in the United States, nor is there currently any plan, a proceeding or proposal before us to make such an allocation. Based on the record, allowing blanket-licensed earth stations or ESIMs in the band would be consistent with sound spectrum policy principles increasing efficient and effective use of the spectrum without causing harmful interference to incumbent users today. With respect to any potential for harmful interference from FSS (space-to-Earth) operations to fixed service operations, we find that the risk is minimal, and the technical standards adopted herein to prevent harmful interference to other services, including the fixed service, are sufficient to protect those services irrespective of whether or not we permit blanket-licensed earth stations or ESIMs in the band. Accordingly, we modify our rules to facilitate authorization of blanket-licensed receiving earth stations as well as FSS ESIMs in the 17.3-17.8 GHz band on an unprotected basis. There is nothing in the record to demonstrate that receiving ESIM earth stations could pose interference threat to incumbent users in the band. Accordingly, we do not believe that completion of ITU sharing and feasibility studies for receiving ESIMs are needed before we allow receiving ESIMs in the band on an

¹⁸⁶ Hughes Comments at 5-6; Satellite Companies Comments at 16-17; Viasat Comments at 5-7.

¹⁸⁷ Satellite Companies Comments at 16-17; Satellite Companies Reply at 14.

¹⁸⁸ Viasat Comments at 5-7.

¹⁸⁹ Hughes Reply at 3-4.

¹⁹⁰ Viasat Reply at 6-8.

¹⁹¹ *Id.* at 7-8.

¹⁹² AT&T Reply at 7.

unprotected basis, as AT&T appears to suggest. Moreover, because ESIMs will not be afforded interference protection, they should not increase the coordination burden on incumbent users in the band either. As with other types of blanket-licensed earth stations however, ESIMs operations will only be allowed on an unprotected basis with respect to DBS feeder link operations as well as terrestrial operations in the 17.7-17.8 GHz band. Accordingly, we amend section 25.202 and footnote NG527A to streamline authorization of receiving ESIM earth stations on an unprotected basis in the 17.3-17.8 GHz band.

4. Other Proposed Rule Changes

67. The Commission proposed various conforming modifications to our rules that are required as a result of the changes proposed above.¹⁹³ Specifically, the Commission proposed 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, the Commission proposed 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). Similarly, the *17 GHz FSS Notice* proposed to modify section 25.115(e) to identify the information required for receiving earth station applicants in this band. Finally, the Commission proposed to 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. No commenters opposed these proposed conforming modifications, and we adopt them.

68. *Radio Astronomy*. The Commission sought comment on whether there was a need for any additional measures that the Commission should consider with respect to radio astronomy in the adjacent 17.2-17.3 GHz band.¹⁹⁴ No commenter proposed any new rule or changes to our existing rules. The Satellite Companies stated that no new rules were necessary, noting that there were no concerns regarding adverse effects to radio astronomy from the 17/24 GHz downlink transmissions already using the band which are functionally equivalent to FSS downlinks.¹⁹⁵ Accordingly, we find that no rule change is necessary with respect to Radio Astronomy.¹⁹⁶

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

69. In the *17 GHz FSS Notice*, the Commission proposed adding a definition for the extended Ka-band in section 25.103. Specifically, the *17 GHz FSS Notice* proposed to define the extended Ka-band 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).¹⁹⁷ The Commission also proposed two approaches to facilitate routine licensing of extended Ka-band earth stations communicating with GSO FSS space stations to streamline and harmonize extended Ka-band earth station licensing with licensing in other FSS bands.¹⁹⁸ The first proposal was to extend the routine license off-axis EIRP density

¹⁹³ *17 GHz FSS Notice* at 13261, para. 59.

¹⁹⁴ *Id.* at 13261, para. 60.

¹⁹⁵ Satellite Companies Comments at 11.

¹⁹⁶ We note that current part 25 rules include requirements 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. 47 CFR § 25.203(f).

¹⁹⁷ *17 GHz FSS Notice*, at 13261, para. 62.

¹⁹⁸ *Id.* at 13261-62, paras. 63-64. Conforming modifications to paragraphs 47 CFR § 25.218 (a) and (f) which refer to paragraph (i) were also proposed.

limits for conventional Ka-band¹⁹⁹ earth stations contained in section 25.218(i)²⁰⁰ to extended Ka-band earth stations. The second proposal was to extend an alternative approach to routine licensing now contained in section 25.212(e)²⁰¹ to extended Ka-band earth stations.²⁰² To implement this alternative approach the *17 GHz FSS Notice* proposed modifying section 25.212(e) and (h)²⁰³ to permit such applicants to similarly demonstrate compliance with the off-axis gain requirements in sections 25.209(a)-(b)²⁰⁴ combined with an input power density limit of 3.5 dBW/MHz. In the *17 GHz FSS Notice*, the Commission also proposed 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).²⁰⁵

70. Most commenters supported these proposals, arguing that they would facilitate streamlined licensing of extended Ka-band FSS earth stations.²⁰⁶ We add a definition of extended Ka-band and adopt the rule changes proposed in the *17 GHz FSS Notice* to facilitate streamlined earth station licensing in the extended Ka-band similar to licensing in other FSS bands. CTIA argues, however, that the proposed rules lack clarity, and because the Commission has not adequately considered the downstream consequences or explained any impact on affected stakeholders, we should provide further explanation and opportunity for comment before adopting them.²⁰⁷ CTIA questions in particular what filing requirements in lieu of section 25.220 would apply, or whether these earth stations might be newly eligible for autogrant under section 25.115(a)(3).²⁰⁸

71. We note that the uplink power levels in question are defined at the geostationary orbit and are intended to obviate the need for coordination between co-frequency GSO FSS space station operations in a two-degree spacing environment. Lacking any extended Ka-band uplink off-axis power limits in our current rules with which to demonstrate conformance – and which our rules currently define for GSO earth station applicants in most other FSS bands²⁰⁹ – extended Ka-band earth station applicants have no choice but to make the more burdensome off-axis EIRP density showings relative to the geostationary arc, as defined in section 25.115(g)(1).²¹⁰

72. Under our current rules, extended Ka-band transmitting earth station applications in bands shared with terrestrial services (i.e., 27.5-28.35 GHz) must be filed on FCC Form 312, Main Form, and Schedule B. Filing requirements include any relevant information required by paragraphs (a)(5)-(10)

¹⁹⁹ 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. 47 CFR § 25.103.

²⁰⁰ 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). Conforming modifications to paragraphs (a) and (j) which refer to paragraph (i) were also proposed.

²⁰¹ 47 CFR § 25.212(e).

²⁰² *17 GHz FSS Notice* at 13262, para. 64.

²⁰³ 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.

²⁰⁴ 47 CFR §§ 25.209(a)-(b).

²⁰⁵ 47 CFR §§ 25.115(g), (k), and 25.220(a).

²⁰⁶ See Satellite Companies Comments at 17-18; Viasat Comments at 4.

²⁰⁷ CTIA Reply at 8-9.

²⁰⁸ *Id.*

²⁰⁹ 47 CFR §§ 25.211, 25.212, and 25.218.

²¹⁰ 47 CFR § 25.115(g)(1).

or (g) or (j) of section 25.115.²¹¹ Although we are not changing this, we adopt the Commission's proposals in the *17 GHz Notice* to allow conforming extended Ka-band applicants to file in accordance with the requirements of section 25.115(g)(1), instead of (g)(2). CTIA erroneously suggests that extended Ka-band earth station applicants should comply with the requirements of section 25.220.²¹² This rule currently applies to the conventional Ka-band, but not the extended Ka-band. We also adopt the proposals in the *17 GHz FSS Notice*, to apply the process in section 25.220 if extended Ka-band applicants do not conform to the uplink off-axis power limits adopted herein.²¹³ With regard to an autogrant procedure in section 25.115(a)(3), to be eligible, earth stations must meet the criteria specified in section 25.115(a)(2), which among other things list specific qualifying frequency bands.²¹⁴ The extended Ka-band frequency ranges are not included in this list, nor has the Commission proposed any modification to add them. Accordingly, extended Ka-band applicants are not eligible for that procedure.

73. We believe that CTIA's concerns may stem from an erroneous assumption that the uplink power limits adopted herein and the associated routine processing would somehow permit FSS earth station applicants in the extended Ka-bands to bypass other existing Commission rules. In particular, in the 27.5-28.35 GHz extended Ka-band segment, transmitting FSS earth stations will be sharing the band with Upper Microwave Flexible Use Service (UMFUS) stations, and the requirements of section 25.136(a) for FSS earth stations seeking to operate in this band include a requirement to coordinate, when warranted, in accordance with the procedures of sections 25.136(a) and 101.103(d).²¹⁵ We make clear that as defined in our rules, routine licensing requires qualifying applications to be consistent *with all Commission rules*, and will continue to include all requirements contained in section 25.136(a)²¹⁶ for earth station applicants in the 27.5-28.35 GHz band. Accordingly, we can envision no adverse effect on terrestrial Ka-band stakeholders with these rule changes. These rule changes will streamline and harmonize extended Ka-band earth station licensing with licensing in other FSS bands. Accordingly, we

²¹¹ *17 GHz FSS Notice* at Appendix A. See also 47 CFR § 25.115(e), which requires, among other information, that applicants submit: A detailed description of the service to be provided, including frequency bands and satellites to be used. The applicant must identify either the specific satellite(s) with which it plans to operate, or the eastern and western boundaries of the arc it plans to coordinate; The diameter or equivalent diameter of the antenna; Proposed power and power density levels; Identification of any random access technique, if applicable; Identification of a specific rule or rules for which a waiver is requested. In addition, applicants for earth stations licensed in accordance with 47 CFR § 25.136 must demonstrate that the transmitting earth stations will meet the relevant criteria specified in that section, including any showings required under § 25.136(a)(4), (c), (d)(4), and/or (e)(4). Finally, as proposed in our rules, extended Ka-band GSO/FSS earth station applicants must also provide the relevant information in paragraphs (g)(1) or (g)(2).

²¹² CTIA Reply at 8-9. 47 CFR § 25.220.

²¹³ 47 CFR § 25.220. Among other things, this rule section requires that non-conforming earth station operators coordinate with adjacent space station operators out to six degrees and places additional constraints on future operations with respect to these adjacent operators. It does not address coordination with terrestrial operations.

²¹⁴ 47 CFR § 25.115(a)(2)-(3).

²¹⁵ See 47 CFR §§ 25.136(a) and 101.103(d). This latter section requires that coordination notifications include relevant technical details of the proposal. At minimum, this should include, as applicable, the following: Applicant's name and address; Transmitting station name; Transmitting station coordinates; Frequencies and polarizations to be added, changed or deleted; Transmitting equipment type, its stability, actual output power, emission designator, and type of modulation(s) (loading); An indication if modulations lower than the values listed in the table to §101.141(a)(3) of the Commission's rules will be used; Transmitting antenna type(s), model, gain and, if required, a radiation pattern provided or certified by the manufacturer; Transmitting antenna center line height(s) above ground level and ground elevation above mean sea level; Receiving station name; Receiving station coordinates; Receiving antenna type(s), model, gain, and, if required, a radiation pattern provided or certified by the manufacturer; Receiving antenna center line height(s) above ground level and ground elevation above mean sea level; Path azimuth and distance; Estimated transmitter transmission line loss expressed in dB; Estimated receiver transmission line loss expressed in dB.

²¹⁶ 47 CFR § 25.136(a).

find that it would serve the public interest to adopt the conforming and streamlining changes proposed in the *17 GHz FSS Notice*.²¹⁷

IV. NOTICE OF PROPOSED RULEMAKING ON NGSO FSS USE OF THE 17 GHz BAND

74. Some commenters advocate allocating the 17.3-17.8 GHz band to both GSO and NGSO FSS (space-to-Earth) operations.²¹⁸ Commenters point out that the demand for NGSO FSS (space-to-Earth) spectrum is growing,²¹⁹ and that there is currently an imbalance between NGSO FSS (Earth-to-space) and NGSO FSS (space-to-Earth) spectrum in the Ka-band, which allocating the band to NGSO FSS would help to redress.²²⁰ Further, these commenters note that an NGSO FSS (space-to-Earth) allocation would align with the preparatory studies for the ITU 2023 World Radiocommunications Conference (WRC-23).²²¹

75. In the *17 GHz FSS Notice*, the Commission observed that the interference-mitigation regime it established for BSS and DBS feeder links in the 17.3-17.7 GHz band presupposed only GSO satellites.²²² Further, the Commission noted that 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.²²³ Since the release of the *17 GHz FSS Notice*, some sharing and compatibility studies and preparatory work have been started by interested parties on FSS use of 17 GHz band and these studies are aiming to be completed in time for the next World Radio Conference in 2023 for any needed changes to the ITU Radio Regulations. These studies are expected to address certain sharing issues and the potential of the 17 GHz band for use by NGSO FSS satellites, including ESIMs.²²⁴

76. We seek comment on commenters request to allocate the 17.3-17.7 GHz band to NGSO FSS (space-to-Earth), as well as on permitting unprotected NGSO FSS (space-to-Earth) operations in the 17.7-17.8 GHz band, similar to our action with regard to GSO FSS operations in these bands in the *Report and Order*. Kuiper, Mangata, SES and Telesat, SpaceX and OneWeb support an allocation to NGSO FSS in the band.²²⁵ Specifically, Kuiper observes that demand for internet services is growing, particularly with more people working from home, and that at the same time, there is a 300-megahertz imbalance in spectrum available to NGSO providers, with 2,500 megahertz in 27.5-30.0 GHz of Earth-to-space spectrum and only 2,200 megahertz in 17.8-18.6 and 18.8-20.2 GHz in the Ka-band.²²⁶ Kuiper points out that in several recent rulemakings, the Commission has made spectrum available for both GSO

²¹⁷ Reiterated at para. 69 *supra*.

²¹⁸ See e.g., Kuiper Comments at 1-2; Mangata Reply at 2-3; SES and Telesat Reply at 3; SpaceX Ex-Parte Letter, IB Docket No. 20-330, filed on April 25, 2022 (SpaceX April 25, 2022 Ex-Parte); OneWeb Reply at 2-3, 6.

²¹⁹ Kuiper Comments at 3; Mangata Reply at 3; SES and Telesat Reply at 2; OneWebReply at 4.

²²⁰ Kuiper Comments at 3.

²²¹ Kuiper Reply at 3; Mangata Reply at 3; OneWeb Reply at 6.

²²² *17 GHz FSS Notice* at para. 18 (citing *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*)).

²²³ *Id* (citing ITU *Radio Regulations*, Article 22).

²²⁴ See Resolutions 173 and 174 (WRC-19) (WRC-23 Agenda Items 1.16 and 1.19) at <https://www.itu.int/en/ITU-R/study-groups/rcpm/Pages/wrc-23-studies.aspx>.

²²⁵ Kuiper Comments at 1-2; Mangata Reply at 2-3; SES and Telesat Reply at 3; OneWeb Reply at 2-3, 6.

²²⁶ Kuiper Comments at 3.

and NGSO operations.²²⁷ Kuiper also states that nothing in the United States’ positions for WRC-23 distinguishes between GSO and NGSO FSS satellite services, nor recommends any band for GSO only.²²⁸ SpaceX agrees with Kuiper, and states that timely access to the 17 GHz band is critical to enable satellite operators to meet the growing demand of American consumers for next-generation broadband connectivity wherever they are. SpaceX also states that because NGSO FSS operators such as SpaceX must share the spectrum allocated to their service, limited access to Ka-band spectrum presents a potential bottleneck that could reduce these operators’ ability to provide high-capacity, low latency broadband services to underserved and unserved Americans—especially for critical downlink spectrum, where NGSO systems have access to 300 MHz less spectrum than on the uplink.²²⁹ Space X also states that the “lack of equivalent power flux-density (“EPFD”) limits in the band should not serve as a barrier to successful coexistence between NGSO and GSO operators in the 17 GHz band.”²³⁰ OneWeb adds that we have recognized the value of NGSO constellations in providing broadband services to the public,²³¹ and that allowing NGSO FSS use would provide the same benefits of more spectrum, and particularly contiguous spectrum, to NGSO constellations as to GSO satellites and constellations.²³²

77. Opposing the idea, AT&T points out that neither the Commission nor international bodies have studied the technical feasibility of NGSO operations in the 17.3-17.7 GHz band.²³³ AT&T reminds that the current interference prevention regime in the band and the technical rules proposed in the *17 GHz FSS Notice* are based on GSO systems sharing the band, and do not consider the technical characteristics nor interference potential of NGSO systems. Similarly, Hughes asserts that NGSO operations, if allowed at all, should be on a secondary basis,²³⁴ and SES and Telesat state only that we should provide an opportunity for NGSO proponents to demonstrate that they can share the band successfully with GSO FSS (space-to-Earth) services.²³⁵ The FWCC agrees with AT&T that “the Commission should reject proposals to include non-geostationary satellite orbit (NGSO) FSS downlinks in this proceeding until technical studies can be produced demonstrating that NGSO FSS operations can share the 17.7-17.8 GHz band without causing harmful interference to incumbent services.”²³⁶

78. We seek comment on NGSO FSS spectrum needs and permitting NGSO FSS (space-to-Earth) operations in the band, and ask commenters to support their views with technical data and studies to help us determine whether and how an allocation to NGSO FSS in the space-to-Earth direction in the band would serve the public interest while protecting incumbent users. If we were to allocate this spectrum for NGSO FSS, what are the appropriate technical rules vis-à-vis DBS/BSS, GSO FSS, or terrestrial services? What rules need to be adopted or modified to enable effective sharing while protecting the incumbent users? Are the EPFD limits in the adjacent bands sufficient to protect DBS/BSS stations and GSO FSS stations? Are there methods of protection other than EPFD limits that would be applicable? Would the addition of an NGSO allocation further degrade the reference situation for the DBS stations operating in accordance with the ITU Radio Regulations Appendix 30 plan?²³⁷ Are there

²²⁷ *Id.* at 4-5.

²²⁸ *Id.* at 5-6.

²²⁹ SpaceX April 25, 2022 *Ex Parte* at 1.

²³⁰ *Id.* at 2.

²³¹ OneWeb Reply at 4.

²³² *Id.*

²³³ AT&T Reply at 13. *See also* Viasat Reply at 3-4.

²³⁴ Hughes Reply at 10.

²³⁵ SES and Telesat Reply at 3.

²³⁶ *Id.*

²³⁷ ITU Radio Regulations, Appx. 30. *See also* <https://www.itu.int/en/ITU-R/space/plans/Pages/AP30-30A.aspx>.

any domestic and international coordination issues and/or other technical challenges that we need to address? All parties, whether advocating for an NGSO FSS (space-to-Earth) allocation in the band or against it, should support their views and requests with technical studies and data with quantitative and qualitative analyses.

79. *Digital Equity and Inclusion.* The Commission, as part of its continuing effort to advance digital equity for all,²³⁸ including people of color, persons with disabilities, persons who live in rural or Tribal areas, and others who are or have been historically underserved, marginalized, or adversely affected by persistent poverty or inequality, invites comment on any equity-related considerations²³⁹ and benefits (if any) that may be associated with the proposals and issues discussed herein. Specifically, we seek comment on how our proposals may promote or inhibit advances in diversity, equity, inclusion, and accessibility, as well the scope of the Commission’s relevant legal authority.

V. PROCEDURAL MATTERS

80. *Ex Parte Presentations.* The proceeding the Notice of Proposed Rulemaking initiates shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.²⁴⁰ 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 with rule 1.1206(b). In proceedings governed by rule 1.49(f) 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.

81. *Filing Requirements—Comments and Replies.* 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).

²³⁸ Section 1 of the Communications Act of 1934 as amended provides that the FCC “regulat[es] interstate and foreign commerce in communication by wire and radio so as to make [such service] available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex.” 47 U.S.C. § 151.

²³⁹ The term “equity” is used here consistent with Executive Order 13985 as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. See Exec. Order No. 13985, 86 Fed. Reg. 7009, Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (January 20, 2021).

²⁴⁰ 47 CFR §§ 1.1200 *et seq.*

- *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. 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>
- *Persons 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 or call the Consumer and Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

82. *Final Regulatory Flexibility Act Analysis*. Pursuant to the Regulatory Flexibility Act of 1980, as amended, 5 U.S.C. § 601 *et seq.* (RFA), the Commission's Final Regulatory Flexibility Analysis in this Report and Order is attached as Appendix B. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this Report and Order including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).

83. *Initial Regulatory Flexibility Act Analysis*. As required by the Regulatory Flexibility Act²⁴¹ the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities of the proposals addressed in the Notice of Proposed Rulemaking. The IRFA is set forth in Appendix C. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to the Notice of Proposed Rulemaking, and they should have a separate and distinct heading designating them as responses to the IRFA. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of the Notice of Proposed Rulemaking, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with the Regulatory Flexibility Act.²⁴²

84. *Paperwork Reduction Act*. This document contains new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies will be invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might further reduce the

²⁴¹ See 5 U.S.C. § 603.

²⁴² See 5 U.S.C. § 603(a).

information collection burden for small business concerns with fewer than 25 employees.

85. *Congressional Review Act.* The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, concurs that this rule is “non-major” under the Congressional Review Act, 5 U.S.C. § 804(2). The Commission will send a copy of this Second Report and Order to Congress and the Government Accountability Office pursuant to 5 U.S.C. § 801(a)(1)(A).

86. *Additional Information.* For additional information on this proceeding, please contact Sean O’More, International Bureau, Satellite Division, 202-418-2453, sean.omore@fcc.gov.

VI. CONCLUSION AND ORDERING CLAUSES

87. IT IS ORDERED, 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), and 303(r), that the Report and Order IS ADOPTED, the policies, rules, and requirements discussed herein ARE ADOPTED, and parts 2 and 25 of the Commission’s rules IS AMENDED as set forth in Appendix A.

88. IT IS FURTHER ORDERED, 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), and 303(r), that the rule amendments set forth in Appendix A of this Report and Order WILL BECOME EFFECTIVE 30 days from the date of publication in the Federal Register, except that the rule changes to sections 25.114, 25.115, 25.117, 25.140, 25.203, and 25.264, which may contain new or modified information collection requirements, will not become effective until the Office of Management and Budget completes review of any information collection requirements that the International Bureau determines is required under the Paperwork Reduction Act. The Commission directs the International Bureau to announce the effective dates for the rule changes to sections 25.114, 25.115, 25.117, 25.140, 25.203, and 25.264 by subsequent Public Notice.

89. IT IS FURTHER 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), and 303(r), the Notice of Proposed Rulemaking on NGSO FSS, Docket No. 22-273, IS ADOPTED.

90. IT IS FURTHER ORDERED that the Commission’s Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order and Notice of Proposed Rulemaking, including the Initial and Final Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration.

91. IT IS FURTHER ORDERED that the Commission SHALL SEND a copy of this Report and Order in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

Appendix A**Final Rules**

For the reasons discussed herein, the Federal Communications Commission amends 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; and

c. In the list of Non-Federal Government (NG) Footnotes, add footnote NG58, remove footnote NG163, and revise footnote NG527A.

The additions and revisions read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

Federal Communications Commission

FCC 22-XXX

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) NG527A 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	17.7-17.8 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) NG527A	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) NG527A	
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 18.3-18.6 FIXED-SATELLITE (space-to-Earth) US334 G117	US334 US519 18.3-18.6 FIXED-SATELLITE (space-to-Earth) NG527A	Satellite Communications (25)
18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE			US139	US139 US334	

* * * * *

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

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

(d) In the band 17.7-17.8 GHz, earth stations in the fixed-satellite service may be authorized for the reception of FSS emissions from geostationary satellites, subject to the condition that these earth stations shall not claim protection from transmissions of non-Federal stations in the fixed service that operate in that band.

* * * * *

NG527A Earth Stations in Motion (ESIMs), as regulated under 47 CFR part 25, are an application of the fixed-satellite service (FSS) and the following provisions shall apply:

(a) In the bands 10.7-11.7 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz, ESIMs may be authorized for the reception of FSS emissions from geostationary and non-geostationary satellites, subject to the conditions that these earth stations may not claim protection from transmissions of non-Federal stations in the fixed service and that non-geostationary-satellite systems not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(b) In the bands 11.7-12.2 GHz (space-to-Earth), 14.0-14.5 GHz (Earth-to-space), 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), ESIMs may be authorized to communicate with geostationary satellites on a primary basis.

(c) In the bands 11.7-12.2 GHz (space-to-Earth), 14.0-14.5 GHz (Earth-to-space), 18.3-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.4-28.6 GHz (Earth-to-space), and 29.5-30.0 GHz (Earth-to-space), ESIMs may be authorized to communicate with non-geostationary satellites, subject to the condition that non-geostationary-satellite systems may not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(d) In the band 17.8-18.3 GHz, ESIMs may be authorized for the reception of FSS emissions from geostationary and non-geostationary satellites on a secondary basis, subject to the condition that non-geostationary-satellite systems not cause unacceptable interference to, or claim protection from, geostationary-satellite networks.

(e) In the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space), ESIMs may be authorized to communicate with geostationary and non-geostationary satellites, subject to the condition that geostationary-satellite networks may not cause unacceptable interference to, or claim protection from, non-geostationary satellite systems in the fixed-satellite service.

(f) In the band 17.3-17.8 GHz, ESIMs may be authorized for the reception of FSS emissions from geostationary satellites on an unprotected basis.

* * * * *

PART 25 – SATELLITE COMMUNICATIONS

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

Authority: 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, in alphabetical order, a definition for “Extended Ka-Band” and revising the definition of “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), (15), and (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), 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), (b)(4), or (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 (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), 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.

* * * * *

8. Amend § 25.140 by revising paragraphs (a)(2), (a)(3)(iii), (b)(3) through (5), and the introductory text of paragraph (d), redesignating paragraph (b)(6) as (b)(7), and adding new paragraph (b)(6) 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)-(6) 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 FSS 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 dBW/m²/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 dBW/m²/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) through (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 dBW/m²/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 as described in paragraph (5) of this section, the following applicants must either certify that their proposed operations have been coordinated with the adjacent operator of a previously authorized or proposed co-frequency space station, or must 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.

(i) Applicants for a 17/24 GHz BSS space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously authorized or proposed co-frequency 17/24 GHz BSS space station;

(ii) Applicants for a FSS space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously authorized or proposed co-frequency 17/24 GHz BSS space station;

(iii) Applicants for a 17/24 GHz BSS space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously authorized or proposed co-frequency FSS space station transmitting in the 17.3-17.8 GHz band.

(5) Where an authorized or proposed 17/24 GHz BSS or FSS space station is located within four degrees of a previously authorized or proposed 17/24 GHz BSS space station, no new third proposed 17/24 GHz BSS or FSS space station may be located within eight degrees of the first authorized or proposed space station in the same direction as the second authorized or proposed space station, unless the applicant for the third space station certifies that its proposed operation has been coordinated with the operator of the first previously authorized or proposed 17/24 GHz BSS space station, or the applicant for the third proposed space station provides an interference analysis of the kind described in paragraph (a) of this section, or the applicant for the third proposed space station demonstrates that its proposed network will not cause more interference to the first previously authorized or proposed space station than if the applicant for the third proposed space station were located at an orbital separation of eight degrees from the first previously authorized or proposed 17/24 GHz BSS space station.

(6) In addition to the requirements of paragraphs (b)(3) (4) and (5) 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.

(7) In addition to the information required by § 25.114, an applicant for a GSO space station operating in the frequencies of the ITU Appendices 30 and 30A (incorporated by reference, see § 25.108) must provide a statement that the proposed operation will take into account the applicable requirements of these Appendices of the ITU Radio Regulations and a demonstration that it is compatible with other U.S. ITU filings under Appendices 30 and 30A or, for any affected filings, a letter signed by the affected

operator indicating that it consents to the new application.

* * * * *

(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 § 25.202 by revising paragraph (a)(10)(i) to read as follows:

§ 25.202 Frequencies, frequency tolerance, and emission limits.

(a) * * *

(10)

(i) The following frequencies are available for use by Earth Stations in Motion (ESIMs) communicating with GSO FSS space stations, subject to the provisions in § 2.106 of this chapter:

- 10.7-11.7 GHz (space-to-Earth)
- 11.7-12.2 GHz (space-to-Earth)
- 14.0-14.5 GHz (Earth-to-space)
- 17.3-17.7 GHz (space-to-Earth)
- 17.7-17.8 GHz (space-to-Earth)
- 17.8-18.3 GHz (space-to-Earth)
- 18.3-18.8 GHz (space-to-Earth)
- 18.8-19.3 GHz (space-to-Earth)
- 19.3-19.4 GHz (space-to-Earth)
- 19.6-19.7 GHz (space-to-Earth)
- 19.7-20.2 GHz (space-to-Earth)
- 28.35-28.6 GHz (Earth-to-space)
- 28.6-29.1 GHz (Earth-to-space)
- 29.25-30.0 GHz (Earth-to-space)

* * * * *

10. Amend § 25.203 by revising Table 1 to paragraph (m)(1) and paragraph (m)(3) to read as follows:

§ 25.203 Choice of sites and frequencies.

* * * * *

(m) * * *

(1) * * *

Table 1 to paragraph (m)(1).

Space service designation in	Fixed-Satellite
------------------------------	-----------------

which the transmitting earth station operates					
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			0.003	
n	2			2	
p (%)	0.015			0.0015	
N_L (dB)	1			1	
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	2.5	0.8
W (dB)	4			0	
Receiving earth station parameters:	17/24 GHz BSS			FSS	
G_m (dBi)	36			N/A	
G_r	0			0	
ϵ_{min}	20°			5°	
T_e (K)	150			300	
Reference bandwidth: B (Hz)	10 ⁶				
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	-144	-150.1

* * * * *

(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.

* * * * *

11. Amend § 25.208 by removing and reserving paragraph (w).

§ 25.208 Power flux-density limits.

* * * * *

(w) [Reserved]

12. Amend § 25.209 by revising the introductory text of paragraphs (a)(1), (3) and (4), and (6), and (b)(1) through (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:

* * * * *

13. Amend § 25.210 by revising paragraph (f), and removing and reserving paragraph (i) 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.

* * *

(g)-(i) [Reserved]

* * * * *

14. Amend § 25.212 by revising 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.

15. Amend § 25.218 by revising paragraph (a), adding a heading for paragraph (b), and revising paragraphs (i) and (j) to read as follows:

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

(a) *Applicability.* 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.

(b) *Routine Processing.*

* * *

* * * * *

(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) *Non-Qualifying Applications.* 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.

16. Amend § 25.220 by revising 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.

* * * * *

17. Revise § 25.262 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) and (b), 25.202(a)(9), and (e) through (g), 25.210(i) through (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.

18. Amend § 25.264 by revising the section heading and the introductory text to paragraph (a), paragraphs (a)(4), and (6), the introductory text to paragraph (b), the introductory text to paragraph (b)(2), paragraphs (b)(2)(ii), (b)(3) and (4), and (c), the introductory text to paragraph (d), paragraph (d)(1)(ii), the introductory text to paragraphs (d)(2), (e),(e)(1), and (e)(2), paragraph (e)(3), the introductory text to paragraph (f), paragraphs (f)(2) and (g), and the introductory text to paragraphs (h) and (i) 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:

* * *

(4) At a minimum of one measurement frequency at the center of the portion of the 17.3-17.8 GHz frequency band over which the space station is designed to transmit. Applicants or licensees must provide additional measurement data at 5 MHz above the lower edge of the band and/or at 5 MHz below the upper edge of the band, upon request by the Commission staff.

* * * * *

(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:

(1) * * *

(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/m²/100 kHz at those prior-filed U.S. DBS space station locations.

(3) If the calculated pfd exceeds the threshold level of -117 dBW/m²/100 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. As an alternative, licensees authorized to operate at locations one degree or greater from a prior-filed DBS space station may submit simulated transmitting antenna off-axis gain data in lieu of measured data, over the same angular ranges, frequencies and polarizations.

(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/m²/100 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/m²/100 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 0.2 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**Final Regulatory Flexibility Analysis**

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in *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*, Notice of Proposed Rulemaking.² The Commission sought written public comment on the proposals in the Notice, including comment on the IRFA. No comments were received on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the Order:

2. This Order creates a new allocation for the fixed-satellite service (FSS) (space-to-Earth) in the 17.3-17.8 GHz frequency band, adopts technical rules for the use of this band by GSO FSS satellites and for sharing the band between satellites of different satellite services and stations in the terrestrial fixed service, and defines the “extended Ka-band” and adopts rules to harmonize extended Ka-band licensing with licensing in other FSS bands.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA:

3. There were no comments filed that specifically addressed the rules and policies proposed in the IRFA.

C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration:

4. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.⁴ The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

D. Description and Estimate of the Number of Small Entities to Which Rules Will Apply:

5. 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 the rules adopted herein.⁵ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁶ In addition, the term “small business” has the same meaning as

¹ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. §§ 601-12, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996, Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *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*, Notice of Proposed Rulemaking (17 GHz FSS Notice, FCC 20-158), IB Docket No. 20-330, FCC 20-158, 2020 WL 6822431 (F.C.C.), Appx. B (2020).

³ See 5 U.S.C. § 604.

⁴ 5 U.S.C. § 604(a)(3).

⁵ *Id.*

⁶ 5 U.S.C. § 601(6).

the term “small business concern” under the Small Business Act.⁷ 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).⁸ Below, we describe and estimate the number of small entities that may be affected by adoption of the final rules.

6. **Satellite Telecommunications.** This industry 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.”⁹ Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$35 million or less in annual receipts as small.¹⁰ U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year.¹¹ Of this number, 242 firms had revenue of less than \$25 million.¹² Additionally, based on Commission data in the 2021 Universal Service Monitoring Report, as of December 31, 2020, there were 71 providers that reported they were engaged in the provision of satellite telecommunications services.¹³ Of these providers, the Commission estimates that approximately 48 providers have 1,500 or fewer employees.¹⁴ Consequently using the SBA’s small business size standard, a little more than half of these providers can be considered small entities.

7. **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.¹⁵ 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.¹⁶ Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.¹⁷ The SBA has developed a small business size standard for “All Other

⁷ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), 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.”

⁸ 15 U.S.C. § 632.

⁹ See U.S. Census Bureau, *2017 NAICS Definition, “517410 Satellite Telecommunications,”* <https://www.census.gov/naics/?input=517410&year=2017&details=517410>.

¹⁰ See 13 CFR § 121.201, NAICS Code 517410.

¹¹ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517410, <https://data.census.gov/cedsci/table?y=2017&n=517410&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

¹² *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. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

¹³ Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report at 26*, Table 1.12 (2021), <https://docs.fcc.gov/pubId.lic/attachments/DOC-379181A1.pdf>.

¹⁴ *Id.*

¹⁵ 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>.

¹⁶ *Id.*

¹⁷ *Id.*

Telecommunications”, which consists of all such firms with annual receipts of \$35 million or less.¹⁸ For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.¹⁹ 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, 999,999.²⁰ Thus, the Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

E. Description of Projected Reporting, Recordkeeping and Other Compliance Requirements for Small Entities:

8. The Order adopts several rule changes that would affect compliance requirements for space station and earth station operators. For example, the Order adopts rules for operations by space station FSS operators in the 17.3-17.8 GHz band, including revisions to some existing technical requirements that would now apply to these FSS operations. The Order also adopts changes that would affect earth station operator licensing. The Commission adopts changes to harmonize extended Ka-band earth station licensing with licensing in other FSS bands. In total, the actions in this Order 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.

F. Steps Taken to Minimize the Significant Economic Impact on Small Entities and Significant Alternatives Considered:

9. The RFA requires an agency to describe any significant alternatives that it has considered in developing its 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 rule 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.”²¹

10. In this Order, the Commission considered whether and how to apply various technical rules to enable GSO FSS operations to share the 17.3-17.8 GHz band with other services in an efficient and effective manner. This include consideration, for example, of power levels, orbital spacing, and other technical considerations, and what information the Commission may need to assess compliance with technical requirements, taking into consideration potential impact on the applicant or operator. As one example, the Commission declines to require submission of certain measured data six months before satellite launch, instead requiring the data submission only two months prior to launch. As another example, the Commission considered whether to streamline certain earth station application rules to enable more routine processing of applications for the extended Ka-band. Overall, the actions in this document will reduce burdens on the affected licensees, including small entities.

G. Report to Congress:

11. The Commission will send a copy of the *Report and Order*, including this FRFA, in a

¹⁸ See 13 CFR § 121.201, NAICS Code 517919.

¹⁹ 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>.

²⁰ *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.

²¹ 5 U.S.C. § 603(c)(1)-(4).

report to be sent to Congress pursuant to the Congressional Review Act.²² In addition, the Commission will send a copy of the *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.²³

²² 5 U.S.C. § 801(a)(1)(A).

²³ See 5 U.S.C. § 604(b).

APPENDIX C**Initial Regulatory Flexibility Analysis**

1. As required by the Regulatory Flexibility Act (RFA),¹ the Commission has prepared this Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Notice. 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 provided on the first page of the Notice and as instructed above in paragraph 29. The Commission will send a copy of the Notice, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.² In addition, the Notice and IRFA (or summaries thereof) will be published in the Federal Register.³

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

2. In recent years, the need for more spectrum for satellite operations has increased dramatically, as smaller, lighter satellites and more and less expensive launch options have revolutionized satellite communications.⁴ In order to accommodate this need, this Notice of Proposed Rulemaking (Notice) seeks public comment on whether non-geostationary orbit (NGSO) satellites can successfully share spectrum in the 17.3-17.7 and 17.7-17.8 GHz frequency bands. This Notice also requests public comment on what technical standards would prevent harmful interference between NGSO satellites, and between NGSO satellites and other users of the bands. This rulemaking will continue to facilitate the deployment of NGSO FSS systems capable of providing broadband and other services on a global basis, and will promote competition among NGSO FSS system proponents, including the market entry of new competitors.⁵

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.⁶

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rulemaking Will 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 the proposed rules and policies, if adopted.⁷ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁸ In addition, the term “small business” has

¹ 5 U.S.C. § 603. The RFA, 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).

² 5 U.S.C. § 603(a).

³ *Id.*

⁴ See *Mitigation of Orbital Debris in the New Space Age*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 4156, 4158, para. 3 (2020).

⁵ See generally Executive Order No. 14036, Promoting Competition in the American Economy, 86 FR 36987 (July 9, 2021) (“The heads of all agencies shall consider using their authorities to further the policies set forth in section 1 of this order, with particular attention to: (i) the influence of their respective regulations, particularly any licensing regulations, on concentration and competition in the industries under their jurisdiction; and...”). Executive Order at 86 FR 36991.

⁶ 47 U.S.C. §§ 154(i), 157(a), 303(c), 303(f), 303(g), and 303(r).

⁷ 5 U.S.C. § 603(b)(3).

⁸ 5 U.S.C. § 601(6).

the same meaning as the term “small business concern” under the Small Business Act.⁹ 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 SBA.¹⁰

5. ***Satellite Telecommunications.*** This industry 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.”¹¹ Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$35 million or less in annual receipts as small.¹² U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year.¹³ Of this number, 242 firms had revenue of less than \$25 million.¹⁴ Additionally, based on Commission data in the 2021 Universal Service Monitoring Report, as of December 31, 2020, there were 71 providers that reported they were engaged in the provision of satellite telecommunications services.¹⁵ Of these providers, the Commission estimates that approximately 48 providers have 1,500 or fewer employees.¹⁶ Consequently using the SBA’s small business size standard, a little more than half of these providers can be considered 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.¹⁷ 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.¹⁸ Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.¹⁹ The SBA has developed a small business size standard for “All Other

⁹ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), 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.”

¹⁰ 15 U.S.C. § 632.

¹¹ See U.S. Census Bureau, *2017 NAICS Definition, “517410 Satellite Telecommunications,”* <https://www.census.gov/naics/?input=517410&year=2017&details=517410>.

¹² See 13 CFR § 121.201, NAICS Code 517410.

¹³ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517410, <https://data.census.gov/cedsci/table?y=2017&n=517410&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

¹⁴ *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. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

¹⁵ Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report at 26*, Table 1.12 (2021), <https://docs.fcc.gov/pubId.lic/attachments/DOC-379181A1.pdf>.

¹⁶ *Id.*

¹⁷ 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>.

¹⁸ *Id.*

¹⁹ *Id.*

Telecommunications”, which consists of all such firms with annual receipts of \$35 million or less.²⁰ For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.²¹ 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, 999,999.²² Thus, the Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

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

7. The Notice invites comment on potential changes to the spectrum sharing requirements among NGSO FSS satellite systems. Because of the costs involved in developing and deploying an NGSO FSS satellite constellation, we anticipate that few NGSO FSS operators affected by this rulemaking would qualify under the definition of “small entity.”

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

8. 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.”²³

9. The Notice invites comment on technical and operational rules to enable NGSO FSS systems to operate in the 17.3-17.8 GHz band while protecting other authorized users of the bands from harmful interference.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rules:

10. None.

²⁰ See 13 CFR § 121.201, NAICS Code 517919.

²¹ 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>.

²² *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.

²³ 5 U.S.C. § 603(c)(1)–(c)(4).

APPENDIX D
List of Commenters

Comments

AT&T Services, Inc.
CTIA – The Wireless Association
Hughes Network Systems, LLC
Inmarst, Inc.
Kuiper Systems LLC
The Satellite Companies (consisting of SES Americom, Inc.; Hughes Network Systems, LLC; Telesat Canada; Intelsat License LLC; Eutelsat S.A.; The Boeing Company; Lockheed Martin Corp.; and Thales Avionics, Inc.)
Viasat, Inc.

Reply Comments

AT&T Services, Inc.
CTIA
Hughes
Mangata Networks LLC
Nokia
The Satellite Companies
SES/Telesat
Viasat
WorldVu Satellites Limited (OneWeb)

Ex Parte Filings

Amazon.com Services LLC
AT&T Services, Inc.
DIRECTV Enterprises, LLC
Fixed Wireless Communications Coalition (FWCC)
Hughes Network Systems, LLC
Kuiper Systems LLC
SES