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

In the Matter of	)	
	)	
Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters	)	IB Docket No. 16-408
	)	
	)	

REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING

Adopted: September 26, 2017 **Released: September 27, 2017**

Comment Date: [30 days after publication in the Federal Register]
Reply Comment Date: [45 days after publication in the Federal Register]

By the Commission: Chairman Pai and Commissioners Clyburn, O'Rielly, and Carr issuing separate statements.

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I. INTRODUCTION

1. The Commission continues to encourage the development of new broadband services to the American public, including satellite broadband internet access. In this Report and Order and Further Notice of Proposed Rulemaking, the Commission acts to remove regulatory obstacles for companies proposing to provide these services via large, ambitious, non-geostationary-satellite orbit (NGSO), fixed-satellite service (FSS) satellite systems.

II. BACKGROUND

2. The Commission has adopted frequency allocations and service rules for NGSO FSS operations within the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, 18.8-19.3 GHz, and 28.6-29.1 GHz bands.[1] These rules and policies were adopted over a decade ago, and reflect the designs of NGSO FSS systems proposed at that time. Recently, proponents of a new generation of NGSO FSS systems have sought Commission authority for constellations of hundreds and thousands of satellites.[2] In the *Notice*,[3] the Commission proposed to update certain frequency allocations in the Ka-band, power limits, and service rules to facilitate these emerging systems.[4]

[1] 47 CFR §§ 2.106, 25.145, 25.146; *see also, e.g.*, *The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-band*, Report and Order, 18 FCC Rcd 14708 (2003) (*Ka-band NGSO FSS Order*); *The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ku-band*, Report and Order, 17 FCC Rcd 7841 (2002) (*Ku-band NGSO FSS Service Rules Order*).

[2] *See OneWeb Petition Accepted for Filing; Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3 GHz, 27.5-28.35 GHz, 28.35-29.1 GHz, and 29.5-30.0 GHz Bands*, Public Notice, 31 FCC Rcd 7666 (IB 2016); *Boeing Application Accepted for Filing in Part; Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 37.5-40.0 GHz, 40.0-42.0 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz Bands*, Public Notice, 31 FCC Rcd 11957 (IB 2016); *Applications Accepted for Filing; Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 12.75-13.25 GHz, 13.85-14.0 GHz, 18.6-18.8 GHz, 19.3-20.2 GHz, and 29.1-29.5 GHz Bands*, Public Notice, DA 17-524 (IB 2017); *Satellite Space Applications Accepted for Filing*, Public Notice, Report No. SAT-01245 (IB 2017).

[3] *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Notice of Proposed Rulemaking, 31 FCC Rcd 13651 (2016) (*Notice*).

[4] In this Order, "Ka-band" refers generally to the 17.7-20.2 GHz and 27.5-30 GHz frequency bands. Note, the Commission recently adopted an inquiry to examine bands between 3.7-24 GHz for expanded flexible wireless broadband use. *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, GN Docket No. 17-183, FCC 17-104 (Aug. 3, 2017) (*Mid-Band NOI*).

III. REPORT AND ORDER

A. Ka-band Plan

3. The Commission's Ka-band Plan designates portions of the 17.7-20.2 GHz (space-to-Earth, or downlink) and 27.5-30 GHz (Earth-to-space, or uplink) bands for certain satellite and terrestrial uses.[5] In the *Notice*, the Commission proposed to allow additional FSS operations in these bands to promote more flexible use of the spectrum and in light of certain waivers granted on delegated authority.[6] We address below the Commission's proposals in each relevant band segment.

1. 17.8-18.3 GHz

4. *Background*. Internationally, the 17.8-18.3 GHz band is allocated to the FSS worldwide on a co-primary basis with other services.[7] In the United States, this band is also allocated to the FSS on a primary basis, but only for Federal systems. The non-Federal Table has primary allocations for the fixed service and meteorological-satellite service, and no allocation for FSS. Nonetheless, both geostationary-satellite orbit (GSO) FSS and NGSO FSS non-Federal systems have been authorized in this band pursuant to individual waivers.[8] In the *Notice*, the Commission proposed to add an FSS allocation in the 17.8-18.3 GHz band on a secondary basis, and limit use to individually licensed earth stations.[9]

5. *Comments*. Parties uniformly support an FSS allocation in the 17.8-18.3 GHz band.[10] Most commenters on the issue urge the Commission to adopt a co-primary FSS allocation, consistent with the international allocations.[11] Others support a secondary FSS allocation, without specifically arguing against a co-primary allocation.[12]

6. Whether individually licensed earth stations are authorized on a primary or secondary basis, however, nearly all commenters agree that the Commission should permit blanket licensing of receive earth stations on a secondary basis to allow for greater use without limiting the primary fixed service.[13] Commenters argue they can successfully operate on an unprotected basis because fixed-service stations will likely use only portions of this band on a local basis, leaving other areas available for FSS

[5] 47 CFR §§ 2.106, 25.202(a)(1); *Notice*, 31 FCC Rcd at 13688-89, Appx. B. The Commission has previously used an overlay of "designations" to set out the relative rights of different uses of the Ka-band. These designations restrict the licensing and use of the Ka-band beyond that indicated in the U.S. Table of Frequency Allocations and its footnotes.

[6] *Notice*, 31 FCC Rcd at 13655, para. 8.

[7] 47 CFR § 2.106.

[8] *Notice*, 31 FCC Rcd at 13654, para. 6.

[9] *Id.* at 13655-56, para. 9.

[10] *See, e.g.*, Satellite Industry Association (SIA) Comments at 4-5; Intelsat License LLC (Intelsat) Comments at 2; LeoSat MA, Inc. (LeoSat) Comments at 4-5. SIA is a satellite trade association representing the majority of the other commenters in this proceeding. *See* About SIA, http://www.sia.org/about (last visited Sept. 26, 2017). Parties also commented on our proposals regarding power limits and sharing between GSO and NGSO systems in this band. We summarize and address these comments below.

[11] Inmarsat Inc. (Inmarsat) Comments at 3; Intelsat Comments at 2; LeoSat Comments at 4-5; WorldVu Satellites Limited, d/b/a OneWeb Comments at 30; OneWeb Reply at 31; SES S.A. and O3b Limited (SES/O3b) Comments at 10-12; SES/O3b Reply at 3-4; Space Exploration Technologies Corp. (SpaceX) Reply at 11-12.

[12] Boeing Comments at 2; Lockheed Martin Corporation (Lockheed) Comments at 2; Space Norway AS (Space Norway) Comments at 2; Telesat Canada (Telesat) Comments at 16; *see also* ViaSat, Inc. (ViaSat) Comments at 7 (supporting an FSS allocation "even if" secondary).

[13] *See* Boeing Comments at 3-4; Boeing Reply at 5-6; Inmarsat Comments at 3; LeoSat Comments at 4-5; OneWeb Comments at 30; OneWeb Reply at 31; SES/O3b Comments at 10-12; SES/O3b Reply at 4-5; Space Norway Comments at 2; SpaceX Comments at 4; SpaceX Reply at 11-12; ViaSat Comments at 7-8.

reception.[14] Regarding NGSO FSS user terminals, SpaceX contends that interference from the fixed service is unlikely because the potentially interfering fixed-service transmitters typically radiate in a near-horizontal direction using narrow-beam antennas, while receiving NGSO FSS user terminals only have significant gain in high elevation directions and low gain towards the horizon.[15] If interference were to occur, SpaceX notes that NGSO FSS operators could continue to provide service in another frequency band not shared with the fixed service, or could take mitigation measures such as shielding the earth station from the interfering fixed-service transmitter. No commenter opposed such blanket earth station licensing, and no fixed service operators filed comments in response to the *Notice*.

7. *Decision*. We adopt our proposal to add a secondary FSS allocation in the 17.8-18.3 GHz band. As further explained below, we believe that the power flux-density (PFD) limits we are adopting on space station transmissions in this band will be sufficient to protect the fixed service from harmful interference.[16] In addition, while terrestrial use of this band is significant, there are areas, particularly rural areas, where terrestrial deployment is less dense and by using mitigating techniques like siting considerations, off-axis rejection, and shielding, we expect FSS earth stations will be able to operate successfully without receiving harmful interference.[17] Even if a mobile-service allocation is introduced in the future, there would still be areas where FSS earth stations would be able to deploy, as terrestrial deployment would not likely cover 100 percent of U.S. territory. If interference does occur, earth stations can switch to other bands not shared with terrestrial users or use alternative mitigation techniques. We decline to adopt a primary FSS allocation at this time because we wish to preserve this band as an unrestrained, potential growth band for the terrestrial fixed service in the future and because the Commission is currently studying potential future terrestrial operations in this band.[18] Accordingly, we adopt a secondary FSS allocation in the 17.8-18.3 GHz band, subject to PFD limits as discussed below.[19]

8. In addition, we agree with commenters that, given the mitigation techniques available to FSS operators, there is no need to limit deployment to individually licensed earth stations. Doing so would unnecessarily increase licensing costs on both applicants and Commission staff. In the event of interference to FSS earth stations, whether individually or blanket licensed, FSS operators may switch to alternative frequencies that are not shared with the fixed service. Accordingly, to promote greater use of the spectrum without constraining the primary fixed service, we will allow blanket licensing of earth stations on a secondary basis in this band. In any future authorizations covering blanket-licensed earth stations receiving in the band 17.8-18.3 GHz, the Commission retains the ability to include a condition that requires the operator to notify its customers regarding the potential for receiving interference.

[14] LeoSat Comments at 5; SES/O3b Reply at 5.

[15] Letter from William M. Wiltshire, Counsel to SpaceX, to Marlene H. Dortch, Secretary, FCC (Aug. 3, 2017) (*August 3 SpaceX Ex Parte)*; *see also* Letter from Petra A. Vorwig, Senior Legal & Regulatory Counsel for SES S.A., et al., to Marlene H. Dortch, Secretary, FCC (Aug. 4, 2017).

[16] *See* Section III.C.1.

[17] According to the Commission's Universal Licensing System (ULS) there are approximately 25,270 terrestrial fixed-service frequency paths authorized in the 17.7-18.3 GHz band as of August 11, 2017.

[18] *Mid-Band NOI*, FCC 17-104.

[19] Sharing between GSO FSS and NGSO FSS systems will be governed by equivalent power-flux density limits, as explained below. We also note that space-to-Earth operations in the 17.8-18.6 GHz and 18.8-19.3 GHz bands must complete coordination with U.S. Federal systems, in accordance with footnote US334 to the U.S. Table of Frequency Allocations, 47 CFR § 2.106. In any event, non-Federal FSS systems operating on a secondary basis must protect and not claim protection from Federal FSS systems operating on a primary basis.

2. 18.3-18.6 GHz and 19.7-20.2 GHz

9. Both GSO FSS and NGSO FSS systems may operate in the 18.3-18.6 GHz and 19.7-20.2 GHz bands internationally.[20] The Commission has designated these bands for GSO FSS networks only, however, while designating the paired uplink bands 28.35-28.6 GHz and 29.5-30 GHz for GSO FSS networks on a primary basis and for NGSO FSS systems on a secondary basis.[21] Consistent with the treatment adopted internationally and in the paired uplink bands, the *Notice* proposed to allow NGSO FSS systems to operate on an unprotected, non-interference basis with respect to GSO FSS networks in the 18.3-18.6 GHz and 19.7-20.2 GHz bands, subject to international equivalent power flux-density (EPFD) limits as explained below.[22]

10. This proposal was unanimously supported.[23] We adopt this proposal to permit greater use of these bands consistent with international allocations, and subject to EPFD limits to protect GSO FSS networks as discussed below.

3. 18.8-19.3 GHz and 28.6-29.1 GHz

11. *Background*. The Commission has designated the 18.8-19.3 GHz downlink band for NGSO FSS operations only.[24] GSO FSS networks may operate in the paired 28.6-29.1 GHz uplink band on a secondary basis, however.[25] Internationally, GSO FSS and NGSO FSS operations have equal, primary status in these bands.[26] To promote greater spectrum use, the Commission proposed to add a secondary GSO FSS designation in the 18.8-19.3 GHz band, matching the paired uplink band, and invited comment on whether to afford GSO operations co-equal status with NGSO FSS systems in both the 18.8-19.3 GHz and 28.6-29.1 GHz bands.[27]

12. *Comments*. All commenters on the issue support allowing GSO FSS operations in the 18.8-19.3 GHz band.[28] GSO operators generally urge co-equal treatment of GSO and NGSO systems in the 18.8-19.3 GHz and 28.6-29.1 GHz bands,[29] while NGSO proponents argue it is important to preserve these bands as the sole frequencies in which NGSO systems have priority over GSO networks.[30]

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[20] 47 CFR § 2.106.

[21] 47 CFR §§ 2.106, n.NG164, 25.202(a)(1), n.2; *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*, Report and Order, 15 FCC Rcd 13430, 13443, para. 28 (2000).

[22] *See* Section III.D.1; *Notice*, 31 FCC Rcd at 13656, para. 10.

[23] *See, e.g.*, SIA Comments at 5; Lockheed Comments at 2; SES/O3b Comments at 13. In addition, Space Norway asks that we limit NGSO FSS systems in the 18.6-18.8 GHz band to those in orbits with an apogee greater than 20,000 km, consistent with international footnote 5.522B. Space Norway Comments at 7. This request is outside the scope of the present rulemaking.

[24] 47 CFR § 2.106, n.NG165.

[25] 47 CFR § 25.202(a)(1), n.3.

[26] *See* International Telecommunications Union (ITU) Radio Regulations, No. 5.523A.

[27] *Notice*, 31 FCC Rcd at 13656-57, paras. 11-12.

[28] *See, e.g.*, SIA Comments at 6; Space Norway Comments at 4; EchoStar Comments at 3-7; SpaceX Comments at 5.

[29] EchoStar Comments at 3-7; Inmarsat Comments at 4-5; ViaSat Comments at 8-9.

[30] *See* Boeing Comments at 5; SES/O3b Comments at 13; Space Norway Comments at 3; SpaceX Comments at 5.

EchoStar suggests the Commission adopt a "default mechanism" in the event that GSO networks are secondary in this band, and are unable to successfully coordinate with NGSO systems.[31]

13. Intelsat also asserts that any new, secondary GSO FSS designation in the 18.8-19.3 GHz band should not "undermine" its GSO FSS operations conducted outside the United States, and asks the Commission to clarify that its allocation of primary status to NGSO FSS and secondary status to GSO FSS in the 18.8-19.3 GHz band applies only to services offered in the United States, while outside the United States both U.S.-licensed NGSO and GSO systems would operate as co-primary with ITU date priority determining protection status.[32]

14. *Decision*. We believe that preserving the 18.8-19.3 GHz and 28.6-29.1 GHz bands for more intensive use by burgeoning NGSO FSS systems will serve the public interest, particularly in light of our decision below to adopt a default presumption that NGSO systems must protect GSO FSS and GSO broadcasting-satellite service (BSS) networks in other bands. While ITU coordination requirements will continue to apply between filings of different administrations, which in turn may limit NGSO FSS operations in the United States, limiting the primary designation in these bands to NGSO FSS systems will give operators of these systems greater flexibility in the coordination discussions and ultimate deployment. Nonetheless, we agree with the consensus that GSO FSS networks should be given some access to this band, because doing so will increase spectrum use and can be done compatibly with NGSO FSS operations. We therefore will allow GSO FSS operations in the 18.8-19.3 GHz band on an unprotected, non-interference basis with respect to NGSO FSS systems.[33]

15. With respect to Intelsat's assertion that any limitation of GSO FSS operations in the band to secondary status be applied only to service offered within the United States, we observe that the Commission has historically applied its Ka-band satellite designations to U.S.-licensed operations around the world.[34] While Intelsat asks that we now adopt a regime of priority in the 18.8-19.3 GHz band for operations outside the United States based on ITU filing date, we decline to do so here. The Commission has never previously adopted a priority regime in these bands that relied on the order of an operator's ITU filing. Notably, the ITU's Article 9 coordination procedures do not apply between filings from the same administration. Thus, today, the date of receipt of an ITU coordination request has no bearing on the priority relationship between two U.S.-filed satellite systems, either at the ITU or with the Commission. We upset no interests of existing GSO FSS operators by adopting a new, secondary designation for their use in the 18.8-19.3 GHz band because under the current Commission rules U.S.-authorized GSO FSS operations in this band have no status vis-à-vis U.S.-authorized NGSO FSS operations anywhere in the world.[35] Further, because of the importance of this NGSO FSS primary band, we agree with SpaceX that this designation should continue to govern the relationship between NGSO and GSO systems licensed by the Commission and operating under a U.S. ITU filing, even for operations outside the United States.[36]

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[31] Letter from Jennifer A. Manner, Senior Vice President, Regulatory Affairs, EchoStar Corporation, to Marlene H. Dortch, Secretary, FCC at 2 (Sept. 1, 2017) (*September 1 EchoStar Letter*).

[32] Intelsat Comments at 4-5; *see also* Inmarsat Reply at 3 (echoing Intelsat's comments).

[33] *See infra* Appx. A, n.NG165. This is already the treatment in the corresponding 28.6-29.1 GHz band.

[34] *Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, Third Report and Order, 12 FCC Rcd 22310, 22337, para. 67 (1997) ("[W]e believe it is in the public interest to require U.S. non-Government licensees to operate in accordance with our 28 GHz band plan throughout the world.").

[35] This treatment is limited to the scope of the grant—i.e., for market access recipients, operations within the United States.

[36] *See* SpaceX Reply at 12-13. U.S. licensees must, of course, operate consistent with ITU coordination requirements when such requirements apply.

16. Finally, we reject EchoStar's suggestion that we must adopt a "default mechanism" in the event that NGSO FSS operators and GSO FSS operators do not reach an agreement on how protection of the NGSO system in the 18.8-19.3 GHz and 28.6-29.1 GHz bands will be achieved.[37] The status of GSO FSS operations in these bands is secondary. They are entitled to no protection from any interference caused by NGSO FSS systems. If there is a dispute as to whether the level of interference caused by GSO FSS transmissions rises to "harmful interference," and therefore violates their secondary status, this question may be taken to the Commission. Since we do not intend to modify the status of GSO FSS operations in these bands, we perceive no benefit to inquiring on this point in the Further Notice.

4. 19.3-19.4 GHz, 19.6-19.7 GHz, and 29.3-29.5 GHz

17. *Background*. The Commission has designated the 19.3-19.7 GHz downlink and 29.1-29.5 GHz uplink bands for NGSO MSS feeder links, anticipating their use by multiple systems.[38] No other satellite use is currently designated in the 19.3-19.7 GHz band, but GSO FSS systems may operate on a co-equal basis in the 29.25-29.5 GHz segment. Noting that the only NGSO MSS licensee to use these designations, Iridium Constellation LLC, operates within the 19.4-19.6 GHz and 29.1-29.3 GHz bands, the Commission proposed to open the remaining 19.3-19.4 GHz and 19.6-19.7 GHz segments to additional GSO FSS and NGSO FSS operations, and to allow NGSO FSS systems in the 29.3-29.5 GHz segment.[39]

18. *Comments*. Many parties support our proposal to allow greater FSS use of these bands.[40] Some argue that NGSO FSS systems should operate on an equal or superior basis to GSO FSS networks in these bands.[41] Commenters also propose blanket licensing of FSS earth stations on a secondary basis, in addition to individual licensing on a primary basis.[42] Inmarsat questions the usefulness of adopting designations in these band segments that are inconsistent with worldwide international allocations.[43] Under the ITU Radio Regulations, GSO FSS networks and NGSO MSS feeder links are co-equal in the 19.3-19.7 GHz band, while other NGSO FSS operations must protect GSO FSS networks.[44] In the 29.1-29.5 GHz band, NGSO FSS operations other than MSS feeder links are prohibited.[45]

19. *Decision*. Given the relatively small and fragmented nature of these band segments, we believe that consistent treatment with international allocations will allow for additional FSS operations without unduly complicating the regulatory environment for satellite operators. Accordingly, we adopt our proposal to allow both GSO FSS and NGSO FSS operations in the 19.3-19.4 GHz and 19.6-19.7 GHz

[37] Letter from Brennan Price, Senior Principal Engineer, Regulatory Affairs, EchoStar Corporation, to Marlene H. Dortch, Secretary, FCC at 2-3 (Sept. 19, 2017) (*September 19 EchoStar Letter*).

[38] 47 CFR §§ 2.106, n.NG166, 25.202(a)(1), nn.4, 5; *see also, e.g.*, 47 CFR § 25.250 (coordination requirements between NGSO MSS feeder links in the 19.3-19.7 GHz and 29.1-29.5 GHz bands).

[39] *Notice*, 31 FCC Rcd at 13657, para. 13.

[40] *See, e.g.*, Intelsat Comments at 2-3; Lockheed Comments at 2; LeoSat Comments at 7; SES/O3b Comments at 14. Commenters also suggest we examine the 19.4-19.6 GHz and 29.1-29.3 GHz bands currently used by NGSO MSS feeder links. *See, e.g.*, ViaSat Comments at 10. We agree with Iridium, however, that this issue falls outside the scope of the present rulemaking. Iridium Reply at 3-4.

[41] Boeing Comments at 6-7; OneWeb Reply at 34.

[42] LeoSat Comments at 7; SES/O3b Comments at 14; Inmarsat Comments at 7; Space Norway Comments at 5. Space Norway argues that blanket licensing of earth stations should be available for both GSO FSS and NGSO FSS systems "in all bands allocated to that service." Space Norway Comments at 6-7. We have addressed this argument in the relevant bands included in the *Notice*, but otherwise find that it falls outside the scope of this rulemaking.

[43] Inmarsat Comments at 6.

[44] ITU Radio Regulations, Nos. 5.523D, 22.2.

[45] *Id.*, No. 5.535A.

bands, subject to PFD limits to protect terrestrial stations as discussed below.[46] This band will continue to be shared on a co-primary basis with the fixed service on the basis of first-in-time coordination.[47] To ensure that both types of operation will be enabled, and consistent with international treatment, we will require NGSO FSS systems to operate on a secondary basis with respect to GSO FSS networks in these bands.[48]

20. We agree with Inmarsat, however, that permitting NGSO FSS operations in the 29.3-29.5 GHz uplink band at variance with global allocations would add regulatory complication with little apparent benefit because of the relatively small amount of spectrum and typically global nature of NGSO systems. We therefore decline this proposal.

21. Finally, we are persuaded by commenters that FSS earth stations can receive in the 19.3-19.4 GHz and 19.6-19.7 GHz bands under blanket licenses and on a secondary basis to the fixed service, without imposing constraints on terrestrial stations. The same mitigation techniques noted by commenters regarding the 17.8-18.3 GHz band, including the ability to switch to alternative frequencies if interference were to occur, apply in this band. Even more so, any FSS operators wishing to ensure protection of its earth stations may go through the individual licensing and coordination procedure to do so. Accordingly, we believe that additional, secondary blanket licensing of earth stations is feasible in this band and revise our rules to permit it.

B. Codification of Frequency Uses

22. *Table of Allocations*. For clarity, the *Notice* proposed to codify the Ka-band Plan's satellite designations into footnotes to the U.S. Table of Frequency Allocations, and to remove duplicative notes in section 25.202(a)(1), except with respect to those notes concerning terrestrial operations in the 27.5-28.35 GHz and 37.5-40 GHz bands.[49] Similarly, the Commission proposed to incorporate into footnotes to the Table the remaining frequency-use restrictions in section 25.202(a)(1) that were not recently amended in the Commission's Spectrum Frontiers proceeding. Commenters uniformly support this proposal, which we adopt for clarity.[50] As proposed, we also codify the Ka-band Plan in the 27.5-29.5 GHz band by removing the primary fixed and mobile service entries from the 28.35-29.1 GHz and 29.25-29.5 GHz bands within the non-Federal Table of Frequency Allocations. We also add new footnote NG62 to the Allocation Table in order to permit incumbent fixed service licensees to continue to operate as authorized.[51]

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[46] Consistent with No. 5.523D of the ITU Radio Regulations, GSO FSS networks will be co-equal with NGSO MSS feeder links in this band. In addition, because both NGSO MSS feeder links and NGSO FSS systems have been proposed in these bands in the current processing rounds, sharing among them will be done under the same sharing mechanism of $\Delta T/T$ of 6 percent applicable between NGSO FSS systems, discussed below.

[47] 47 CFR § 25.251.

[48] While affording different statuses to NGSO FSS operations and NGSO MSS feeder link operations could create discrepancies for NGSO systems serving users in both the MSS and FSS in these bands, we note that this treatment will apply internationally regardless of our decision here. *See* Boeing Comments at 6. Where an NGSO operator has both FSS and MSS systems, the practical effect may be that the NGSO system may have to protect GSO FSS networks for both types of NGSO service.

[49] *Notice*, 31 FCC Rcd at 13657, para. 14. In the *Notice*, the Commission proposed to move every footnote in section 25.202(a)(1) except footnotes 1 and 7, which the Commission decided to include in section 25.202(a)(1) in the recent Spectrum Frontiers Report and Order. *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8023-43, paras. 19-72 (2016) (*Spectrum Frontiers Proceeding*).

[50] *See, e.g.*, SIA Comments at 6; SES/O3b Comments at 16; Space Norway Comments at 5.

[51] The Commission's Universal Licensing Services indicates that: 1) there are no licensees in the 28.35-28.5 GHz band; 2) a single licensee is authorized to operate a permanent fixed point-to-point link in the 28.5-29.5 GHz band; and 3) 17 licensees are authorized to operate temporary fixed stations in the 29.25-29.5 GHz band.

23. In the *Notice*, the Commission also proposed to specify that, in the 27.5-28.35 GHz band, NGSO FSS systems must operate on an unprotected, non-interference basis with respect to GSO FSS networks. No commenter opposed this proposal, which we adopt consistent with our default treatment of GSO and NGSO operations.

24. *10.7-11.7 GHz and 12.75-13.25 GHz*. In moving footnotes from section 25.202(a)(1) into the Table of Allocations, the Commission proposed to specify the limitation on the operation of NGSO FSS earth stations in the 10.7-11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) bands as to individually licensed earth stations only, rather than to gateway earth stations only as currently prescribed.[52] Commenters support this proposal, and none oppose it.[53] Given the renewed interest in these bands by pending and authorized NGSO FSS operators, we believe that specifying individually licensed primary earth stations, consistent with our treatment of other bands shared on an equal basis with the fixed service, is clearer and strikes a better balance between the two services than a strict limitation to gateways. We therefore adopt our proposal.

25. Parties further argue that blanket licensing of earth stations should be permitted on a secondary basis to the fixed service in these bands.[54] We agree that blanket licensing in the 10.7-11.7 GHz downlink band is appropriate, but decline to allow blanket licensing in the 12.75-13.25 GHz uplink band, where earth stations would be transmitting and could potentially cause interference to terrestrial stations. Regarding the 10.7-11.7 GHz band, the same mitigation techniques noted above in the 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz bands are available to earth station operators.[55] In the event of harmful interference, operators could switch to alternative spectrum not shared with the fixed service, such as the adjacent 11.7-12.2 GHz band. In addition, any operations that require certainty of protection may be individually coordinated and licensed. Accordingly, to allow for opportunistic use without posing a risk of interference to terrestrial services, we will permit blanket licensing of receive earth stations in the 10.7-11.7 GHz band on an unprotected basis.

26. *FSS Frequency List.* Finally, rather than attempt to reproduce in section 25.202(a)(1) all of the frequency bands available for FSS, which are already stated completely in the Table of Frequency Allocations in section 2.106, the *Notice* proposed to use this paragraph only to note the restrictions on FSS not codified in the Table.[56] Commenters argue the frequency list should be retained as a useful and authoritative summary of the Table of Allocations.[57]

27. Since we are relocating most of the frequency-use restrictions in this paragraph to the Table of Frequency Allocations,[58] we believe that a bare list of FSS frequencies, without notations of status (primary or secondary), other primary uses, restrictions to certain types of FSS systems or

[52] *Notice*, 31 FCC Rcd at 13657, para. 14.

[53] SIA Comments at 6; SES/O3b Comments at 16.

[54] OneWeb Comments at 31-32; Space Norway Comments at 5; *see also* SpaceX Comments at 6-7.

[55] *August 3 SpaceX Ex Parte* at n.3, (regarding blanket licensing in the 10.7-11.7 GHz band).

[56] *Notice*, 31 FCC Rcd at 13657, para. 14.

[57] *See* SIA Comments at 6-7; Boeing Comments at 7; SES/O3b Comments at 16; Letter from Suzanne Malloy, Vice President, Regulatory Affairs, SES, to Marlene H. Dortch, Secretary, FCC (Sept. 19, 2017); SpaceX Comments at 6.

[58] We reject SpaceX's suggestion to note the Ka-band designations in both section 25.202(a)(1) and the Table of Frequency Allocations. SpaceX Comments at 6. We do not wish to recreate the Table in section 25.202(a)(1), an invitation for discrepancies, and see no reason to single out the Ka-band designations over the many other limitations noted in the Table. Nonetheless, SpaceX is correct that section 25.202(a) contains frequency lists for other services. *Id.* Many of these are simple tautologies. *Compare* 47 CFR § 25.103 (defining "1.5/1.6 GHz Mobile-Satellite Service" as mobile-satellite service provided in any portion of the 1525-1559 MHz and 1626.5-1660.5 MHz bands) *with* 47 CFR § 25.202(a)(4)(iii)(A) (stating the 1525-1559 MHz and 1626.5-1660.5 MHz bands are "available for use by the 1.5/1.6 GHz Mobile-Satellite Service").

designations among FSS systems, coordination obligations, etc., would not be useful even if maintained accurately. And section 25.202(a)(1) has not been accurate since at least 1996, and is incomplete today.[59] Allocated FSS frequency bands above 50.2 GHz are presently omitted from section 25.202(a)(1). These omissions falsely imply, pursuant to section 25.202(b), that the missing frequencies are subject to case-by-case licensing rather than licensing under default service rules in section 25.217. Because of its potential to generate confusion and no apparent benefit, we delete the FSS frequency list in section 25.202(a)(1).[60]

C. Protection of Terrestrial Services

1. Ka-band PFD Limits

28. *Background*. The ITU has adopted PFD limits on space station transmissions to protect terrestrial services in the 17.7-19.7 GHz band and earth exploration-satellite (passive) and space research (passive) services in the 18.6-18.8 GHz band.[61] The Commission has codified these limits within the 17.7-17.8 GHz and 18.3-19.7 GHz bands. Because the *Notice* proposed a new FSS allocation in the 17.8-18.3 GHz band, and additional GSO FSS and NGSO FSS designations within the 18.3-19.7 GHz band, the Commission also proposed to fully implement the ITU PFD limits in these bands to protect co-primary services.[62] The *Notice* observed, however, that the existing PFD limits may not be appropriate for very large NGSO systems. Accordingly, the Commission proposed an aggregate PFD value of -115 (dBW/m^2)/MHz for NGSO systems, and invited comment on the development of EPFD limits to protect terrestrial users given the time-varying nature of interference by NGSO systems.

29. *Comments*. All commenters on the issue agree with our proposal to apply international PFD limits to GSO networks within the 17.7-19.7 GHz band.[63] Most also support adoption of the ITU PFD limits for NGSO systems.[64] SpaceX contends that the current ITU limits do not adequately account for very large constellations.[65] Parties raise concerns, however, that our proposed aggregate PFD value of -115 (dBW/m^2)/MHz is overly restrictive or technically unsound.[66] LeoSat argues that it may also not

[59] *Compare* 47 CFR 25.202(a)(1), n.1 (1996-2012) (stating the 27.5-29.5 GHz band "is shared coequally with terrestrial radiocommunication services") *with Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, First Report and Order and Fourth Notice of Proposed Rulemaking, 11 FCC Rcd 19005, 19024, para. 42 (1996), published at 61 FR 44177 (Aug. 28, 1996) (limiting terrestrial services in the 27.5-30 GHz band to the 27.5-28.35 GHz and 29.1-29.25 GHz segments).

[60] This decision does not affect frequency lists in other rule parts, with which the Commission may have a different experience.

[61] ITU Radio Regulations, Article 21, Table 21-4 & n.8.

[62] *Notice*, 31 FCC Rcd at 13658, paras. 15-16.

[63] *See, e.g.*, SIA Comments at 7; LeoSat Comments at 8; SES/O3b Comments at 18; Space Norway Comments at 6; Telesat Comments at 5.

[64] LeoSat Comments at 8-9; OneWeb Comments at 20; SES/O3b Comments at 18; Space Norway Comments at 6.

[65] SpaceX Comments at 8-10. SpaceX argues that PFD limits should be assessed dynamically, and that a large NGSO system should be deemed compliant with PFD limits so long as the aggregate PFD produced by the entire constellation at any point on Earth does not exceed the PFD level for the relevant angles of arrival. *Id.* at 12. SES/O3b oppose SpaceX's adjustments, and suggest instead that the PFD limit only consider satellites visible to the potentially affected terrestrial station. SES/O3b Reply at 16 n.69, 17.

[66] *See* Boeing Comments at 8-9, SES/O3b Comments at 19 (arguing that an aggregate PFD limit of -115 (dBW/m^2)/MHz is unnecessarily restrictive); SpaceX Comments at 10, OneWeb Comments at 21-22 (contending aggregate PFD is technically flawed); *but see* Telesat Comments at 5 (supporting aggregate PFD).

sufficiently protect terrestrial stations.[67] No commenter proposes EPFD limits that the Commission should impose on NGSO FSS systems in order to protect terrestrial networks.[68]

30. *Decision*. We adopt the ITU PFD limits for both GSO and NGSO space stations in the 17.7-19.7 GHz band. These limits were derived after years of study. As systems typically not limited to U.S. coverage, NGSO constellations must meet these ITU PFD limits outside U.S. territory. Adopting internationally consistent power limits simplifies compliance for both GSO and NGSO operators. However, the ITU PFD limits in the 19.3-19.4 GHz and 19.6-19.7 GHz bands are not well suited for NGSO FSS constellations, as they do not account for the size of the constellation by an "X" factor. Therefore, we will apply in these bands the PFD limits in the 17.7-19.3 GHz band which do account for the number of satellites in the constellation. Otherwise, we received no input from fixed service operators, and no technical consensus has developed even among satellite operators regarding an appropriate alternative to apply in the United States. Therefore, we do not have a sufficient record to deviate from the internationally derived limits.[69] Accordingly, we decline to adopt an alternative, aggregate PFD value. In addition, no EPFD limits have been proposed that we could adopt to protect terrestrial services in place of PFD limits. Rather than deviate from the existing ITU PFD limits, we will rely on our waiver policy to address, on a case-by-case basis, whether the ITU PFD limits we are codifying into our rules to protect the fixed service should be modified for a given large NGSO constellation.

2. Sharing with Other Platforms

31. The *Notice* also inquired how we should take into account sharing between NGSO FSS systems and non-satellite technologies and platforms.[70] Lockheed offers considerations for sharing between NGSO FSS systems and stations on aerial platforms that operate in the fixed service, and notes that further study is needed.[71] We agree that this issue warrants future consideration. However, we are not in a position now to prescribe sharing rules for this scenario and do not find a basis in the record for initiating such a proceeding in this docket, including the question of fixed service operations in bands not designated for this service today.[72]

D. Protection of GSO Networks

1. Ka-band EPFD Limits

32. *Background*. The ITU has adopted power limits for NGSO FSS systems to promote the shared use of spectrum with GSO FSS and GSO BSS satellite networks.[73] These limits, expressed as

[67] LeoSat Comments at 8-9 (stating that aggregate PFD may be inadequate to protect fixed service operations).

[68] Boeing and Telesat support the development of EPFD limits to protect terrestrial stations, however. Boeing Comments at 8-9; Telesat Comments at 5. *But see, e.g.*, LeoSat Reply at 8 (arguing the development of EPFD limits would be time consuming and potentially delay NGSO constellation deployments).

[69] Nor is there a basis in the record to adopt EPFD limits above 30 GHz, which are currently being studied internationally. *September 19 EchoStar Letter* at 3-4. The United States is participating actively in these studies, and we support these international efforts.

[70] *Notice*, 31 FCC Rcd at 13658, para. 17.

[71] Lockheed Comments at 8-10; *see also* Letter from Edward A. Yorkgitis, Jr. and Joshua Guyan, Counsel to Elefante Group, Inc., to Marlene H. Dortch, Secretary, FCC (Sept. 19, 2017) (*September 19 Elefante Letter*).

[72] We note this issue is being studied in the 2019 World Radiocommunication Conference study cycle. We will continue to follow any international studies covering sharing between NGSO FSS systems and stations on aerial platforms and if appropriate address whether we need to propose any such rules to allow for the co-existence of both operations. However, we do not believe that retaining a "placeholder" allocation to the fixed service is the appropriate approach until such a rulemaking is initiated.

[73] ITU Radio Regulations, Article 22, Section II.

EPFD levels, apply in portions of the 3.7-30 GHz range.[74] Any NGSO FSS system operating in compliance with these limits is considered as having fulfilled its obligation under Article 22 of the ITU Radio Regulations not to cause unacceptable interference to any GSO network.[75] Domestically, the Commission has implemented the ITU Article 22 EPFD limits for NGSO FSS operation within the 10.7-14.5 GHz band.[76]

33. The *Notice* proposed to adopt the ITU EPFD limits in the 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.35 GHz, and 29.5-30 GHz bands, in order to provide greater certainty regarding the compatibility of NGSO FSS and GSO FSS operations.[77] The Commission also proposed to extend relevant EPFD limits to additional frequency bands, the 19.3-19.4 GHz, 19.6-19.7 GHz, and 29.3-29.5 GHz bands, in which the *Notice* proposed to allow NGSO FSS operations on an unprotected, non-interference basis with respect to GSO FSS networks.

34. *Comments*. Nearly all parties commenting on the issue, including GSO operators, support the domestic adoption of ITU EPFD limits.[78] Commenters also support extending ITU EPFD limits to the 19.3-19.4 GHz, 19.6-19.7 GHz, and 29.3-29.5 GHz bands.[79] ViaSat, however, contends that the current Ka-band EPFD limits are insufficient to protect some modern GSO satellites.[80] ViaSat urges the Commission to develop new EPFD limits, including aggregate EPFD limits in uplink frequencies. ViaSat and other GSO operators also note that there is no mechanism at the ITU to address aggregate interference, and urge the Commission to adopt such a mechanism.[81] Finally, Boeing argues that notwithstanding EPFD limits, NGSO FSS systems authorized to operate in the United States should be required to comply with the criteria in Recommendation ITU-R S.1323-2.[82]

35. *Decision*. We adopt the ITU EPFD limits in the 17.8-30 GHz frequency range, which will harmonize our rules with international regulations and provide greater certainty for NGSO FSS operators. While we recognize that these limits were not developed with the most advanced modern GSO networks in mind, ViaSat has not proposed any new EPFD limits, and it would not be advisable to remain without Ka-band EPFD limits in our rules pending such deliberations. Similarly, we decline to adopt

[74] EPFD limits apply on a per-system basis in the uplink and downlink directions, and on an aggregate basis (among all operating NGSO FSS systems) in the downlink only.

[75] ITU Radio Regulations, No. 22.5I.

[76] 47 CFR §§ 25.146, 25.208(g)-(m).

[77] *Notice*, 31 FCC Rcd at 13659, para. 19. The *Notice* also proposed to incorporate EPFD limits on inter-satellite emissions from NGSO FSS space stations into GSO space stations. *Id.* & n.53.

[78] EchoStar Reply at 8; Kepler Communications Inc. (Kepler) Comments at 2; LeoSat Comments at 10; LeoSat Reply at 8; Lockheed Comments at 2; OneWeb Comments at 24; Space Norway Comments at 8; SES/O3b Comments at 19; SES/O3b Reply at 18-19; SpaceX Comments at 11-12; Telesat Comments at 6; Telesat Reply at 13-14; *see also* Inmarsat Comments at 8, Inmarsat Reply at 5 (not objecting to adoption of ITU EPFD limits). As an alternative, OneWeb suggests that NGSO FSS operators be able to choose which EPFD limits in the Ka-band they will comply with. OneWeb Comments at 24.

[79] LeoSat Comments at 10; SES/O3b Comments at 19; *see also* Inmarsat Comments at 9, Space Norway Comments at 8 (proposing the Commission extend to the 19.3-19.4 GHz, 19.6-19.7 GHz bands the EPFD limits that apply in the 19.7-20.2 GHz band, rather than the less restrictive limits that apply in the 17.8-18.6 GHz band). *But see* OneWeb Comments at 42 (arguing the Commission "should investigate mechanisms to allow NGSO FSS and GSO FSS on a more equal status [in these bands], without resorting to EPFD limits").

[80] ViaSat Comments at 18; ViaSat Reply at 6-16; Letter from John P. Janka et al., Counsel to ViaSat, Inc., to Marlene H. Dortch, Secretary, FCC (Sept. 19, 2017) (*September 19 ViaSat Letter*).

[81] ViaSat Comments at 13-16; EchoStar Reply at 8; September 1 EchoStar Letter at 2-3; Inmarsat Comments at 8-9; Inmarsat Reply at 5-6.

[82] Boeing Reply at 3-4.

Boeing's suggestion to incorporate an ITU Recommendation, which is not an international requirement, because this would be inconsistent with our desire to harmonize the treatment of NGSO FSS systems with global regulations. We will require NGSO FSS licensees to comply with existing aggregate EPFD limits as well, and may intervene if operators cannot agree among themselves how to ensure the aggregate limits are met.

36. In further keeping with international treatment, we decline to adopt our proposal to extend EPFD limits to the 19.3-19.4 GHz and 19.6-19.7 GHz bands.[83] We ultimately believe that any benefit from extending EPFD limits to these relatively small, discrete band segments does not justify the complications of deviating from Article 22 of the ITU Radio Regulations.[84]

2. Default GSO-NGSO Sharing

37. *Background*. As observed in the *Notice*, the first sentence of section 25.156(d)(5) effectively precludes both NGSO-like and GSO-like systems from operating in the same frequency bands until the Commission has adopted formal sharing criteria in that band. The Commission proposed to delete this provision to allow GSO and NGSO applicants to demonstrate that they can operate compatibly with any existing users.[85] The Commission also requested comment as to whether it should adopt, as a default sharing rule, a provision similar to one in the ITU Radio Regulations that, except as otherwise provided, NGSO systems must not cause unacceptable interference to, and must not claim protection from, GSO FSS networks and GSO BSS networks.[86]

38. *Comments*. Commenters unanimously support deleting both sentences of section 25.156(d)(5).[87] Most commenters on the issue also support replacing that rule provision with an equivalent of the ITU provision.[88] Two commenters, however, argue there should be no default presumption that NGSO systems must protect GSO FSS and GSO BSS systems.[89]

39. *Decision*. We agree with most commenters that section 25.156(d)(5) is unnecessarily restrictive, and that an equivalent to the ITU provision, which applies internationally, will serve as a better default. Generally, both GSO networks and NGSO FSS systems can operate using the same frequencies if NGSO systems are required to protect GSO networks. If NGSO systems are not required to protect GSO networks, GSO networks may be precluded entirely, because as a general matter they have less flexibility to avoid causing harmful interference to NGSO systems or protecting themselves while operating in the same band. Accordingly, to allow both types of uses by default, we will require NGSO systems to protect GSO FSS and GSO BSS networks, similar to the ITU provision. However, the extent of the protection of GSO networks can be more or less restrictive depending on the specific EPFD limits NGSO FSS systems may have to meet within a given frequency band. We expect that EPFD limits will continue to be useful in facilitating sharing and will likely be developed in additional bands in the future.

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[83] Above, we determined not to permit NGSO FSS operations in the 29.3-29.5 GHz band, consistent with international allocations, thus rending our proposal to extend EPFD limits to this band moot.

[84] For example, we conclude below that NGSO FSS applicants may certify compliance with EPFD limits, rather than provide detailed technical demonstrations, because the ITU Radiocommunication Bureau will perform its own technical analysis of similar showings. This is not true in the 19.3-19.4 GHz and 19.6-19.7 GHz segments. Thus, applicants might otherwise be required to provide, and Commission staff to review, EPFD demonstrations solely in these bands.

[85] *Notice*, 31 FCC Rcd at 13659-60, para. 21.

[86] *See* ITU Radio Regulations, No. 22.2.

[87] *See, e.g.*, SIA Comments at 8-9; EchoStar Reply at 6-7; SpaceX Comments at 11, n.24; OneWeb Comments at 25.

[88] Kepler Comments at 2; EchoStar Reply at 6-7; Inmarsat Comments at 9-10; OneWeb Comments at 24; SES/O3b Reply at 15; Space Norway Comments at 9; Telesat Comments at 6.

[89] Boeing Comments at 11-12; SpaceX Reply at 14-15.

Once adopted, NGSO operators will be provided greater certainty with respect to their obligations to protect GSO networks.

E. Rule Consolidation and Streamlining

40. *Background*. In adding Ka-band EPFD limits, the Commission proposed to consolidate the NGSO FSS licensing provisions for operation in the Ka-band, currently found in section 25.145, into the licensing rules for NGSO FSS operation in the 10.7-14.5 GHz band, set forth in section 25.146, and sought comment on ways to simplify the consolidated section 25.146.[90]

41. *Discussion*. Several parties ask that we consider relaxing the EPFD demonstration requirements as applied to the Ka-band, and take account of the recently finalized ITU validation software.[91] We agree that the current demonstration requirements applicable to the 10.7-14.5 GHz band may no longer be necessary. Since we are adopting the EPFD limits contained in Article 22 of the ITU Radio Regulations, and applicants must use the ITU-approved validation software to assess compliance with these limits, the Commission's staff review would duplicate that performed by the ITU Radiocommunication Bureau. Yet, the Commission has found that, due to staffing constraints and technical complexity, its review of EPFD demonstrations typically takes a few months. We do not believe that such review is warranted to reduce the likelihood that an incorrect submission is made to the ITU. Given the newly available ITU validation software and the separate analysis conducted by the ITU, we will simply require NGSO FSS applicants to certify that they will meet the international EPFD limits.[92] After licensing, we will require NGSO FSS operators to successfully undergo ITU review of their EPFD demonstrations and to provide the Commission with the input data files used for public disclosure.[93]

42. Additionally, because we are relying on ITU EPFD limits, we do not believe it is necessary to restate them in our rules. Rather, we will incorporate by reference the relevant portions of Article 22. Similarly, we are adopting ITU PFD limits on NGSO FSS space stations, which the ITU also analyzes. For the same reasons as our decisions regarding EPFD limits, we will incorporate ITU PFD limits by reference and allow applicants to certify as to their compliance. In the limited case of NGSO FSS operations in the 19.3-19.4 GHz and 19.6-19.7 GHz bands, where we are requiring licensees to comply with ITU PFD limits that apply in the adjacent 17.7-19.3 GHz band, we still believe that a certification will be sufficient even though the ITU will not perform a technical evaluation of compliance with our limits. The Commission already allows certifications of compliance with PFD and other space

[90] *Notice*, 31 FCC Rcd 13659 para. 20. In proposing this rule consolidation, the Commission proposed to delete section 25.145(e), similar provisions in sections 25.142(d) and 25.143(d), and the cross-references to section 25.142(d) in section 25.217, all of which proscribe certain exclusionary arrangements to serve foreign markets. The Commission noted that these provisions have been superseded by section 648 of the Open-market Reorganization for the Betterment of International Telecommunications (ORBIT) Act, which contains a parallel prohibition. 47 U.S.C. § 765g.

[91] *See* Boeing Reply at 11-13; OneWeb Comments at 22, n.53; Space Norway Comments at 8; Telesat Reply at 15; SpaceX Comments at 22, n.53. *But see* SES/ O3b Comments at 20-21 (arguing that compliance with operational EPFD limits should be demonstrated at the time of the submission of the application).

[92] We note that the Commission has adopted certification requirements for other satellite power limits, even in the absence of any technical review. 47 CFR § 25.140(a)(3). Because of the detailed review performed by the ITU, we have even greater confidence that EPFD levels certified to will be respected.

[93] *See* Letter from Brian D. Weimer, Counsel to OneWeb, to Marlene H. Dortch, Secretary, FCC (Sept. 10, 2017), Letter from Susan H. Crandall, Associate General Counsel, Intelsat Corporation, to Marlene H. Dortch, Secretary, FCC (Sept. 15, 2017) (raising questions about EPFD input files submitted by NGSO FSS applicants); *September 19 EchoStar Letter* at 2 (supporting EPFD certifications with submission of input files and a statement of the basis for the analysis, e.g., software used by the ITU); *September 19 ViaSat Letter* at 4 (arguing the Commission and other operators should have access to EPFD demonstration information).

station power limits,[94] and given the similarity of operations in the 17.7-19.3 GHz band, for which technical information is evaluated at the ITU, with operations in the 19.3-19.4 GHz and 19.6-19.7 GHz bands, we believe that a certification from the operator will provide sufficient assurance that the system will be capable of operating within our PFD limits in these bands.

43. In addition, we adopt our unopposed proposal to delete section 25.145(e), similar provisions in sections 25.142(d) and 25.143(d), and the cross-references to section 25.142(d) in section 25.217, all of which have been superseded by the ORBIT Act, in order to remove redundancies from our rules.

44. Finally, we consolidate the ephemeris data requirement on NGSO FSS systems into 25.146,[95] and delete paragraph (h) of this section, which states that NGSO FSS licensees will be awarded a blanket license for space stations and is redundant with section 25.114.[96]

F. Spectrum Sharing among NGSO FSS Systems

1. Default Sharing

45. *Background*. Both internationally and domestically, NGSO FSS operators are expected to coordinate their shared use of spectrum.[97] If a coordination agreement cannot be reached internationally, the system with the earlier filing date at the ITU is entitled to protection from the later-filed system, while this later-filed system is not entitled to protection. Domestically, the Commission has adopted a different approach. Systems within a given processing round can coordinate with equal rights. In the absence of an agreement, a default mechanism to enable spectrum sharing among NGSO FSS systems within the 10.7-14.5 GHz, 18.8-19.3 GHz, and 28.6-29.1 GHz bands has been established.[98] Under this mechanism, an NGSO FSS system may operate throughout its authorized band except during "in-line" events. An "in-line" event occurs when satellites of different NGSO FSS systems are physically aligned with an operating earth station of one of those systems, such that the topocentric angle between the satellites is less than 10 degrees as measured from the earth station.[99] To avoid interference among the systems experiencing an in-line event, the Commission requires that, absent another sharing agreement by the operators, the affected satellite operators divide the commonly assigned spectrum equally according to the chosen "home" spectrum for the duration of the in-line event.[100]

46. As an alternative to the 10-degree avoidance angle, in the past the Commission has considered adopting a threshold based on when the change in system noise temperature caused by

[94] 47 CFR § 25.140(a)(3).

[95] Ephemeris data give the orbital parameters of satellites at different times.

[96] As the deletion of section 25.146(h) will simply remove a redundant provision without affecting the rights or obligations of any licensee or applicant, we find, for good cause, that the notice and public procedure rulemaking requirements specified in the Administrative Procedure Act (APA) is unnecessary. *See* 5 U.S.C § 553(b)(B) (providing that notice and comment requirement of the Administrative Procedure Act does not apply when agency "for good cause finds . . . that notice and public procedure [for rulemaking action] are impracticable, unnecessary, or contrary to the public interest").

[97] *See* ITU Radio Regulations, Article 9; 47 CFR § 25.261(d).

[98] 47 CFR § 25.261; *Ka-band NGSO FSS Order*, 18 FCC Rcd at 14714, para. 18; *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7850, para. 27.

[99] 47 CFR § 25.261(b); *Ka-band NGSO FSS Order*, 18 FCC Rcd at 14719, para. 35, 14719-20, para. 37; *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7855, para. 47, 7856, para. 49.

[100] 47 CFR § 25.261(c), (d); *Ka-band NGSO FSS Order*, 18 FCC Rcd at 14722, para. 45; *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7857, paras. 53-54.

interference, or ΔT/T, equals 6 percent.[101] The Commission, however, declined to adopt this alternative, which is used as an international coordination trigger between GSO FSS networks, because it considered such an alternative to be a long-term interference criterion that is inappropriate to address short-term in-line interference events between NGSO systems.[102] The *Notice* asked whether the current 10-degree separation angle for NGSO FSS systems is still appropriate in light of modern system designs, or if an alternative sharing mechanism should be adopted.[103]

47. *Comments*. Parties suggest three types of sharing criteria for NGSO FSS systems: avoidance angles, ITU filing date, or a ΔT/T of 6 percent. LeoSat, SES/O3b, SpaceX, and Boeing support the use of in-line avoidance and suggested threshold angles between 2 and 10 degrees.[104] Telesat argues that no single separation angle will be appropriate for all systems.[105] It provides a technical analysis showing that the same level of interference protection for different proposed NGSO FSS systems would require avoidance angles varying by as much as 20 degrees.[106] Telesat instead proposes that we determine priority of spectrum use according to ITU filing date, consistent with international coordination requirements.[107] OneWeb agrees that a single avoidance angle is inappropriate for all systems, but argues that defining a threshold when the ΔT/T value equals 6 percent would account for the characteristics of each system.[108] SpaceX suggests adopting a 25 percent ΔT/T with 10 degree maximum separation angle for uplink transmissions, and further recommends creating a "neutral central clearinghouse" that would receive data about the operation of all operators sharing any given frequency band in order to promote agreements that would maximize the use of spectrum.[109] Finally, ViaSat and Space Norway contend that

[101] *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7853-54, paras. 41-42; *Ka-band NGSO FSS Order*, 18 FCC Rcd at 14718, para. 31.

[102] *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7856, para. 50; *see also Ka-band NGSO FSS Order*, 18 FCC Rcd at 14718, para. 32 (stating "the physical differences of NGSO systems render that measurement – which is successfully used in a geostationary satellite orbit environment – unfit" for the purpose of sharing among NGSO FSS systems).

[103] *Notice*, 31 FCC Rcd at 13660-61, paras. 23, 26.

[104] Boeing Reply at 16, SpaceX Comments at 19-21, Letter from William M. Wiltshire, Counsel to SpaceX, to Marlene H. Dortch, Secretary, FCC at 1 (Aug. 17, 2017) (*August 17 SpaceX Ex Parte*) (supporting a 10-degree separation angle); SES/O3b Reply at 22-23 (between 2 and 5 degrees); LeoSat Comments at 12, LeoSat Reply at 2 (between 2 and 3 degrees); *see also* ViaSat Reply at 27-29 (arguing the 10-degree trigger angle should not be changed). *But see* Kepler Comments at 4 (arguing a 10-degree separation angle "will cause excessive work for operators in the NGSO to coordinate."). Some commenters also suggest that the trigger angle should be based on a review of the relevant NGSO FSS system designs. *See* Boeing Comments at 12-13; SpaceX Reply at 7-8; Space Norway Comments at 12.

[105] Telesat Comments at 9-10; Telesat Reply at 6-10; *see also* Letter from Henry Goldberg, Attorney for Telesat Canada, to Marlene H. Dortch, Secretary, FCC (Aug. 30, 2017).

[106] Telesat Reply, Exh. 2, Table 2-1.

[107] Telesat Comments at 14-15; Telesat Reply at 11-12; *see also* LeoSat Comments at 12-13, LeoSat Reply at 3-4 (arguing that priority during in-line events should be determined by ITU filing date); OneWeb Reply at 19-23 (suggesting the Commission consider relying on ITU filing date to govern in-line interference events).

[108] OneWeb Comments at 14-15; *see also* LeoSat Reply at 2-4 (supporting a trigger of 2- to 3-degree angular separation with an additional criterion of ΔT/T of 6 percent, and reliance on ITU filing date to determine priority when the trigger is met).

[109] *See August 3 SpaceX Ex Parte* at 2-4; Letter from William M. Wiltshire, Counsel to SpaceX, to Marlene H. Dortch, Secretary, FCC (Sept. 15, 2017).

the burden of sharing under in-line avoidance rules may fall more severely on smaller NGSO FSS constellations or systems in highly elliptical orbits, respectively.[110]

48. *Decision*. We believe that coordination among NGSO FSS operators in the first instance offers the best opportunity for efficient spectrum sharing. Before resorting to a default mechanism, we will require authorized NGSO FSS operators to discuss their technical operations in good faith with an aim to accommodating both systems.[111] If a question arises as to whether one operator is coordinating in good faith, the matter may be brought to the Commission and we may intervene to enforce the condition and aid the parties to find a solution.

49. Should coordination remain ongoing at the time both systems are operating, or if good faith coordination otherwise proves unsuccessful, we will require band-splitting when the ΔT/T of an interfered link exceeds 6 percent. While the Commission once found this long-term interference criterion to be unsuited for NGSO FSS sharing, based on the current record we conclude that this approach is the best method for characterizing the situations in which there is potential for interference between NGSO FSS systems. Although we recognize that this will be a complex calculation, as noted in the record,[112] using this threshold will provide both equal access to spectrum and a flexible mechanism that is specific to the particular interference situation and systems involved. Further, the single avoidance angle method previously adopted has now been shown to not address all of the varieties of new proposed systems.[113] This is equally true if a fixed avoidance angle is coupled with a further interference criterion, such as a ΔT/T of 25 percent. Further, to provide regulatory certainty while operators pursue the development of their constellations, we will not consider this issue in a Further Notice without first gaining experience in its implementation. After monitoring the development of NGSO FSS systems, we may revisit our specific threshold for spectrum-splitting in light of the matured technical designs of those systems that have continued to progress.

50. In contrast to a ΔT/T of 6 percent threshold, Telesat's proposal to award priority to a single NGSO FSS operator according to the date of receipt of its ITU coordination request would give no certainty to other operators that they may use any portion of the spectrum absent that operator's consent.[114] In other words, absent coordination, Telesat asks the Commission to pick a single "winner"—Telesat, in many frequency bands—that would be given certainty of operations in wide swaths of spectrum without offering any certainty to a multitude of other proposals in the same bands. This regime could unduly chill investment in competing systems. If the first priority system is not ultimately deployed, it could delay the provision of NGSO FSS broadband by lower-priority systems fearful of a hypothetical sharing environment. And it gives the highest priority system weaker incentives to accommodate competing NGSO FSS systems. In contrast, our default sharing solution sets all applicants in a processing round on an equal basis. This equality will form the basis of the necessary coordination

[110] *See* ViaSat Comments at 19-21; ViaSat Reply at 20-27; Space Norway Comments at 9-12. Beyond the scope of the proposals in the *Notice*, the European Space Agency provided the Commission with information regarding the orbital debris issues associated with large NGSO constellations. Letter from Johann-Dietrich Wörner, Director, European Space Agency, to Marlene H. Dortch, Secretary, FCC (filed Sept. 15, 2017).

[111] Such good faith coordination also offers the best means to mitigate potentially unequal burdens for smaller NGSO FSS systems or those in highly elliptical orbits. And while we encourage similar industry cooperation in the form of a "clearinghouse" or other organization, the current record is insufficient to mandate the creation of such an entity.

[112] Telesat Reply at 9.

[113] For example, the record in earlier proceedings indicated that "a 10-degree angle of separation allows all systems to operate in the entire available Ku-Band spectrum for at least 82 percent of the time." *Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7855, para. 47. Estimates in this proceeding suggest that a 10-degree angle would result in in-line-free operation for only 53.3 percent of the time for at least one system. *See* ViaSat Reply at 21.

[114] *See* Boeing Reply at 14.

discussions. We expect more accommodation, more sharing, and ultimately, more competition, will result from treating NGSO FSS applicants equally than by a first-come, first-served regime in a potentially challenging sharing environment. In addition, Telesat's proposal would cause confusion because the ITU dates of receipt for any two U.S.-licensees would not have any international significance, since coordination between these two U.S. systems is a domestic matter and not subject to ITU rules. Accordingly, to set all NGSO FSS applicants and market access petitioners in the processing rounds on an equal footing and because no one angle is appropriate for all systems, we adopt a ΔT/T of 6 percent threshold to define the default sharing required among NGSO FSS systems.

2. Scope of Default Sharing Mechanism

51. *Background*. As codified in section 25.261, the avoidance of in-line interference requirement applies to NGSO FSS operations in the 18.8-19.3 GHz and 28.6-29.1 GHz bands only. In conjunction with other potential revisions to this rule, the Commission proposed to expand the NGSO FSS sharing requirement to all frequency bands proposed for NGSO FSS licensing under section 25.146. The Commission also sought comment as to whether the default sharing rule should apply to additional bands, in place of the strict band segmentation among NGSO FSS systems required by section 25.157(e).[115]

52. *Frequency Bands*. Most commenters on the issue support applying a spectrum sharing mechanism to NGSO FSS systems in additional frequency bands, including pending applications in the 37-52 GHz range.[116] Only ViaSat suggests that we consider band segmentation.[117] Above, we chose a spectrum splitting sharing mechanism that is triggered when a ΔT/T threshold of 6 percent is exceeded. This approach is suited to varying NGSO FSS system designs. We also believe this threshold is appropriate for NGSO FSS systems in any of the currently envisioned frequency bands because it takes into account each specific system design in any band. Accordingly, we will apply this criterion by default to NGSO FSS systems in any frequency band. We do not see merit in considering band segmentation. In a worst case scenario, when the ΔT/T threshold of 6 percent threshold is exceeded 100 percent of the time, the result is the equivalent to band segmentation. Thus, our method of spectrum sharing allows for the possibility of co-frequency operation absent a coordination agreement, but is in no case less favorable to licensees than strict band segmentation would be.[118]

53. *Geographic Area*. SpaceX and SES/O3b ask that we clarify the geographic scope of our NGSO FSS sharing method as it relates to non-U.S.-licensed satellite systems granted U.S. market access.[119] While SpaceX argues that it should govern such operations worldwide, a grant of market access typically considers radiofrequency operations only within the United States. Sharing between systems of different administrations internationally is subject to coordination under Article 9 of the ITU Radio Regulations.[120] We believe this international regime is the appropriate forum to consider NGSO FSS radiofrequency operations that fall outside the scope of a grant of U.S. market access. Because ITU coordination procedures do not apply between two U.S. systems, our spectrum splitting sharing

[115] *See Notice*, 31 FCC Rcd at 13660-61, para. 23. The Commission also proposed to clarify this section and its relation to the band segmentation rule in section 25.157(e). *Id.*

[116] *See, e.g.*, Boeing Comments at 12; OneWeb Comments at 10-11.

[117] ViaSat Reply at 27.

[118] However, because the band segmentation requirement applies to NGSO-like systems other than NGSO FSS systems, we do not agree with Boeing that it should be removed entirely. Boeing Comments at 13-14; Boeing Reply at 18. Instead, as proposed, we clarify in section 25.157(e) that it does not apply to NGSO FSS systems licensed under section 25.261. We also clarify that section 25.261 applies only to NGSO FSS systems using directional earth station antennas, which are generally necessary for co-frequency operation.

[119] SpaceX Reply at 9-11; SES/O3b Comments at 26; SES/O3b Reply at 25.

[120] ITU Radio Regulations, No. 9.12.

mechanism triggered when a ΔT/T threshold of 6 percent is exceeded will govern such operations both within and outside the United States.

3. Earth Station Power Limits

54. *Background*. While recognizing their potential to facilitate spectrum sharing, the Commission has previously declined to adopt off-axis power limits on NGSO FSS earth stations due to concerns of threatening the viability of NGSO FSS proposals.[121] In the *Notice*, the Commission revisited this issue in conjunction with its review of the avoidance of in-line interference mechanism, and further asked whether earth station antenna gain standards or satellite downlink power limits could promote more efficient spectrum use among NGSO FSS systems.[122]

55. *Discussion*. Parties are divided on whether we should adopt additional power limits to facilitate spectrum sharing, or whether such limits are unnecessary or premature.[123] Above, we established a mechanism to promote sharing among the various NGSO FSS system designs, without mandating any particular system architecture. This sharing mechanism is sufficient to define the sharing requirements among NGSO FSS systems. While prescribing limits on off-axis earth station emissions could promote sharing further, it may also preclude the use of smaller, less expensive earth stations for consumer applications. In addition to the potential need to establish off-axis limits, SpaceX has raised the possibility of introducing limits on on-axis earth station emissions. Such on-axis limits would reduce the differences between earth station emissions to satellites at orbits with significant different heights. We recognize the potential utility of SpaceX's proposal; however, given the variety of NGSO FSS system proposals and their potential to offer broadband services directly to consumers, we believe it is premature to adopt any additional technical limitations to promote sharing among NGSO FSS systems.[124]

4. Ephemeris Data

56. *Background*. Knowledge of the physical locations of NGSO FSS satellites is an essential element of spectrum sharing under the Commission's rules.[125] For NGSO FSS systems operating in the 10.7-14.5 GHz band, section 25.271(e) requires licensees to publish such orbital information, or ephemeris data, on a website bulletin board using the North American Aerospace Defense Command two-line orbital element format and updated at least once every three days. We proposed to extend this requirement to all NGSO FSS systems in the frequency bands proposed for NGSO FSS operation in the *Notice*—the 17.8-18.6 GHz, 18.8-19.4 GHz, 19.6-20.2 GHz, 27.5-29.1 GHz, and 29.3-30 GHz bands.[126]

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[121] *See Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7859-60, para. 61; *Ku-band NGSO FSS Service Rules NPRM*, 16 FCC Rcd at 9695, para. 49.

[122] *Notice*, 31 FCC Rcd at 13662-63, paras. 28-30.

[123] *See* Boeing Comments at 15-17, Boeing Reply at 20-22, OneWeb Comments at 27-28, SpaceX Reply at 13-14, Telesat Comments at 17, Telesat Reply at 15-17 (opposing earth station power limits); LeoSat Comments at 14-15, Lockheed Comments at 4-5, SES/O3b Comments at 27-28, SES/O3b Reply at 27-30, *August 17 SpaceX Ex Parte* at 4-6, Space Norway Comments at 13, *September 19 Elefante Letter* at 6 (supporting some earth station power limits). In addition, LeoSat argues that we should develop a mechanism to expedite the processing of earth stations applications. LeoSat Comments at 9-10. While we may consider this issue in a future rulemaking, we did not seek comment on any such mechanisms in the *Notice*, and find that LeoSat's request falls outside the scope of this rulemaking.

[124] *See generally* SpaceX Comments at 27, *August 3 SpaceX Ex Parte* at 4-6, Kepler Comments at 4 (suggesting preferential treatment of NGSO FSS systems that incorporate certain design elements).

[125] *Notice*, 31 FCC Rcd at 13661, para. 24. Such information enables spectrum sharing among NGSO FSS systems and allows GSO FSS operators to more easily identify the source of any harmful interference by an NGSO FSS system. *Id.* & n.64.

[126] We also proposed to apply this requirement explicitly to non-U.S.-licensed NGSO FSS operators that are granted market access in the United States. *Id.*

We also invited comment on whether this website is the most effective means to provide up-to-date ephemeris data.[127]

57. *Comments*. Commenters agree that sharing of ephemeris data is essential for the compatible operation of NGSO FSS constellations, and that the requirement should be expanded to additional frequency bands.[128] Several argue, however, that the Commission should permit alternative means to distribute ephemeris data among satellite operators, rather than requiring every NGSO FSS operator to maintain a website.[129]

58. *Decision*. We agree that the current website requirement may be unduly rigid, and that other means to share ephemeris data could be equally or more efficient and useful. Accordingly, we will simply require NGSO FSS operators to ensure that ephemeris data regarding their constellation is available to all authorized, co-frequency satellite operators in a manner that is mutually acceptable to the parties.[130] The requirement will apply in all bands in which we require sharing among NGSO FSS systems under the default method adopted herein.[131]

5. Applications after a Processing Round

59. *Background*. The *Notice* also asked how our chosen method for spectrum sharing among NGSO FSS systems should relate to our processing round procedure for assigning NGSO-like licenses, and whether only those systems authorized in a processing round should be entitled to share spectrum on an equal basis.[132]

60. *Comments*. Most commenters on this issue contend that later applicants should be required to operate on an unprotected, non-interference basis with respect to earlier authorized operators in a processing round.[133] Others argue that the Commission should not foreclose future access, especially in the nascent uses of the 37-52 GHz range.[134]

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[127] *Notice*, 31 FCC Rcd at 13661, para. 25.

[128] *See generally* Boeing Comments at 15; Boeing Reply at 19-20; Kepler Comments at 2; LeoSat Comments at 13-14; Lockheed Comments at 3-4; OneWeb Comments at 15; SES/O3b Comments at 26; SES/O3b Reply at 23-25; Space Norway Comments at 12; SpaceX Comments at 18-19; Telesat Comments at 16-17; *see also* Planet Labs Inc. and Spire Global, Inc. (Planet/Spire) Comments at 4 (arguing that all NGSO operators should provide ephemeris data for orbital debris mitigation purposes). In addition, all commenters on the issue supported our proposal to explicitly apply this requirement to non-U.S.-licensed NGSO FSS market access grantees, which we adopt for clarity. Lockheed Comments at 3; Space Norway Comments at 12; SpaceX Comments at 18-19.

[129] Boeing Comments at 15; Boeing Reply at 19-20; Kepler Comments at 2; OneWeb Comments at 15; *see also* Planet/Spire Comments at 4; SpaceX Comments at 19; Telesat Comments at 16-17.

[130] Such data could be made available by a third party, such as the Space Data Association or the U.S. Strategic Command's Joint Space Operations Center. *See* SpaceX Comments at 19; Telesat Comments at 16-17. We note that this requirement addresses compatible radiofrequency operations, not orbital debris concerns. We may consider the sharing of ephemeris data in an orbital debris context in a later rulemaking. *See* Planet/Spire Comments at 4; SES/O3b Reply at 24; Telesat Comments at 16. In addition, this requirement does not a preclude larger effort to address the issue internationally. *See* Kepler Comments at 2; LeoSat Comments at 13-14.

[131] In the Notice, we proposed to expand this requirement to all frequency bands in which we proposed to apply the avoidance of in-line interference sharing mechanism, which were specified as certain bands in the 10-30 GHz range. In this Order, we adopt a sharing method among NGSO FSS systems that applies to all such systems, regardless of the operating frequency band. As a consequence of this decision, the ephemeris data requirement will apply to all frequency bands in which NGSO FSS systems may operate.

[132] *Notice*, 31 FCC Rcd at 13662, para. 27.

[133] *See, e.g.*, SES/O3b Comments at 23; OneWeb Comments at 13; *see also August 17 SpaceX Ex Parte* at 6-7 (requesting the Commission clarify its treatment of modifications of systems approved in a processing round); Letter from Bruce A. Olcott, Counsel to The Boeing Company, to Marlene H. Dortch, Secretary, FCC (Sept. 19, 2017)
(continued….)

61. *Decision*. The purpose of the recent processing rounds was to establish a sharing environment among NGSO systems, to provide a measure of certainty in lieu of adopting an open-ended requirement to accommodate all future applicants. At the same time, it is uncertain how many of the pending system applications will proceed to full deployment. While we will initially limit sharing under the ΔT/T of 6 percent threshold to qualified applicants in a processing round, treatment of later applicants to approved systems must necessarily be case-by-case based on the situation at the time, and considering both the need to protect existing expectations and investments and provide for additional entry as well as any comments filed by incumbent operators and reasoning presented by the new applicant.

G. Milestones

1. NGSO Milestones

62. *Background*. To prevent harmful "warehousing" of spectrum and orbital resources, the Commission requires NGSO licensees and market access recipients to deploy their full constellations within six years of grant.[135] Failure to satisfy this milestone requirement renders the entire authorization void, and subjects the grantee to forfeiture of up to $5 million under the surety bond posted for the authorization.[136]

63. The *Notice* proposed to relax the six-year milestone requirement for NGSO systems to afford operators greater flexibility with system design and implementation, in light of proposals to launch and operate thousands of satellites.[137] The Commission proposed two implementation milestones instead. First, licensees would be required to launch and operate 75 percent of the authorized constellation within six years of grant. Second, the full constellation would have to be completed within nine years after grant. Failure to meet either milestone would result in an automatic reduction of the number of authorized satellites to the number deployed on that milestone date, but would not cause a termination of the entire license. In addition, failure to satisfy the first milestone requirement would trigger a forfeiture of the bond, while satisfaction of this milestone would release the licensee from its bond obligation.

64. As an alternative to this proposal, the Commission inquired whether applicants should be able to declare a minimum number of satellites necessary to provide substantial service, as a basis for the initial milestone.[138] The Commission also asked whether, after satisfaction of any milestones, NGSO licensees should be required to maintain a certain percentage of their authorized constellation in orbit for the duration of the license term. Finally, the Commission sought comment on whether any changes to the NGSO milestone requirement should be limited to large NGSO constellations.

65. *Comments*. Parties responded to the *Notice* with a range of milestone proposals. OneWeb, which has been granted U.S. market access for a constellation 720 satellites, urges the Commission to retain the 100 percent completion milestone to deter speculation.[139] Others propose a

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(*September 19 Boeing Letter*) (arguing for a presumption that three NGSO licensees make sufficient use of a frequency band).

[134] *See, e.g.*, Kepler Comments at 3; LeoSat Reply at 9-10.

[135] 47 CFR §§ 25.137(d)(1), 25.164(b); *see also* 47 CFR § 25.144(b) (milestone requirements for the Satellite Digital Audio Radio Service). Warehousing occurs when an entity holds exclusive authorization or priority for spectrum use or an orbital position, but is unable or unwilling to deploy its authorized satellite system in a timely manner. Such warehousing can hinder the availability of services to the public by deterring entry by another party committed and able to proceed. *See Notice*, 31 FCC Rcd at 13663, para. 31, n.77.

[136] 47 CFR §§ 25.137(d)(4), 25.161(a)(1), 25.165(a)(1), (c).

[137] *Notice*, 31 FCC Rcd at 13663-64, paras. 32-33.

[138] *Id.* at 13664, para. 33.

[139] OneWeb Comments at 2-7; OneWeb Reply at 15-19; *see also* Letter from Jennifer A. Manner, Senior Vice President, Regulatory Affairs, EchoStar Corporation, to Marlene H. Dortch, Secretary, FCC at 3 (Aug. 31, 2017)
(continued….)

more lenient initial milestone of between 10 and 75 percent deployment at six years, with two commenters supporting a 50 percent requirement.[140] Regarding a second milestone, parties contend that authorized systems should be fully deployed after 9 years,[141] or 12 years,[142] or that no such fixed completion milestone should be set.[143] Instead of percentage-based milestones, some commenters argue that applicants should be able to specify their own milestone objectives based on their particular service needs.[144] Finally, after satisfaction of all milestones, SES/O3b argue that NGSO operators should be required to maintain 75 percent of their authorized constellation in orbit at all times.[145]

66. *Decision*. After considering the record, we largely adopt our proposal in the *Notice*, but will require 50 percent deployment of the authorized constellation at the first milestone. Our chosen milestone approach seeks to accomplish two goals. First, it should be simple, clear, and easy to administer. Second, it should discourage applicants from seeking authorizations for oversized, unrealistic constellations, even if those applicants eventually provide substantial service to the public.[146] Proposals that allow applicants to set their own milestone objectives, that set more complex milestones, or that re-engage the Commission in construction determinations would not achieve our dual milestone goals.[147]

67. Instead, given the desire for additional flexibility evident in the record, we conclude that requiring launch and operation of 50 percent of the authorized satellite system within six years of grant strikes an appropriate balance between providing flexibility for the licensee and a measure of certainty for other operators.[148] If a licensee fails to meet this milestone, its authorization will be reduced to the

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(urging the Commission retain existing milestone requirement for NGSO constellations). Similarly, ViaSat urges us to consider the impact of any milestone adjustments on other NGSO operators. ViaSat Comments at 21-23.

[140] Kepler Comments at 5 (supporting a 75 percent initial deployment milestone); LeoSat Comments at 15 (supporting a 50 percent initial deployment milestone); Lockheed Comments at 5-7 (supporting a 75 percent or 50 percent initial deployment milestone); SES/O3b Comments at 32 (supporting a 33 percent initial deployment milestone); Space Norway Comments at 14 (supporting a 10 percent or 20 percent initial deployment milestone); Telesat Reply at 18 (supporting a 33 percent initial deployment "safe harbor"); *see also* Planet/Spire Comments at 6 (supporting "flexible Percentage Milestones"). SES/O3b also suggest more complex milestones. Under their proposal, 33 percent of the authorized constellation must be deployed after six years, with at least one satellite in each orbital plane. Failure to meet this milestone would limit the authorization to three times the number of satellites deployed on the milestone date. SES/O3b Comments at 32. LeoSat argues that the remainder of the authorized constellation should be under construction at the time of the first milestone. LeoSat Comments at 15.

[141] Kepler Comments at 5; Leosat Comments at 15; Lockheed Comments at 5-6; Space Norway Comments at 14.

[142] Boeing Comments at 19-20; *see also September 19 Boeing Letter*.

[143] SES/O3b Comments at 33; SpaceX Comments at 15-16; Telesat Reply at 18. SES/O3b also recommend that the bond requirement be maintained until satisfaction of the nine-year milestone. SES/O3b Comments at 33.

[144] Boeing Comments at 18; Boeing Reply at 23; Lockheed Comments at 6-7; SpaceX Comments at 15-16; Telesat Comments at 18; Telesat Reply at 17-18.

[145] SES/O3b Comments at 33. Beyond changes to our milestone rules, Kepler asks that we revise the bond requirement for NGSO systems. Kepler Comments at 4-5. We did not seek comment on bond revisions in the *Notice*, and conclude that Kepler's request falls outside the scope of this rulemaking.

[146] Such unused authorizations for spectrum-orbit resources can create unnecessary coordination burdens and uncertainty for other operators. These may deter an operator that is able to proceed with its authorized satellite system.

[147] *See Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, 14738 para. 59 (2015) (establishing a simplified milestone requirement and removing interim construction demonstrations).

[148] For example, if a licensee is authorized to operate a constellation of 100 satellites and after six years has deployed only 40 as of the milestone date, its bond will be forfeited and its authorization will be automatically
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number of satellites in use on the milestone date, and the bond will be forfeit.[149] Operators that successfully complete the first milestone will have an additional three years to deploy the remainder of their constellation, free of bond obligations.[150] After the milestone period, we will require licensees to maintain 50 percent of their authorized constellation in orbit at all times, or have their constellation size similarly reduced to conform to their diminished operations.[151] Reducing the first milestone requirement from 75% deployment, as proposed in the *Notice*, to 50% deployment will not necessarily affect the coverage of the authorized system. A constellation may be able to achieve its full coverage despite having only 50% of its satellites deployed.[152] Further, licensees will be required to complete their authorized constellations within 9 years. Finally, because operators of smaller satellite systems may also benefit from deployment flexibility, we will apply these milestones and requirements equally to all NGSO systems, regardless of size.

2. Replacements

68. The Commission also proposed to clarify in section 25.164 that both GSO and NGSO replacement space stations, which must be scheduled for launch before the retirement of the space stations being replaced, are not subject to the separate milestone requirements in that section.[153] All commenters on this issue supported the Commission's proposal, which we adopt to clarify this treatment.[154]

H. International Coverage

69. *Sections 25.145 and 24.146*. Sections 25.145(c)(1) and 25.146(i)(2) require certain NGSO FSS systems to be capable of providing service anywhere between 70° North Latitude and 55° South Latitude for at least 18 hours of every day. The *Notice* proposed to delete these international coverage requirements, noting they prohibit the use of certain non-geostationary orbits and system

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reduced to 40 satellites. If the licensee wished to operate a greater number of satellites in the future, it would be required to file a license modification application.

[149] We decline to extend the bond period to nine years. *See* SES/O3b Comments at 33. Under our "escalating" bond requirement, liability increases from $1,000,000 to $5,000,000 progressively over the six-year bond period. 47 CFR § 25.165(a)(1). Extending this period to nine years, without appropriately increasing the maximum liability, would weaken the incentive of the bond and is unsupported by the record. In addition, because it could vitiate our percentage-based milestone requirement, we will not allow a modification of the authorized number of satellites to reduce a licensee's milestone obligation after grant. *See* Planet/Spire Comments at 7.

[150] Further, a licensee may request to modify its authorization at any time to deploy additional satellites. These applications will be considered on a case-by-case basis as "NGSO-like" applications filed after a processing round. Given this additional opportunity for modification and public comment when plans have matured, we decline to extend the milestone period beyond 9 years, or to forgo a fixed completion milestone altogether, as creating undue uncertainty for other operators.

[151] This will prevent some unused authorizations after the milestone period, and is consistent with our 50 percent deployment requirement for the first milestone.

[152] Because our NGSO milestone requirement is not necessarily related to the coverage of the system, it is unlike build-out requirements in certain wireless services that require coverage of a percentage of the population. *See, e.g.*, 47 CFR § 24.103 (requiring Personal Communications Service licensees to provide coverage of certain percentages of the population within geographic areas).

[153] *Notice*, 31 FCC Rcd at 13664, para. 34.

[154] SIA Comments at 9; Planet/Spire Comments at 8; SES/O3b Comments at 35; Space Norway Comments at 14; SpaceX Comments at 15 n.30; Telesat Comments at 18. Planet/Spire also request that we modify the definition of a replacement NGSO space station. Planet/Spire Comments at 8-9. We did not seek comment on revising this definition in the *Notice*, and conclude that Planet/Spire's request is beyond the scope of this rulemaking. We may, however, consider it in the future.

designs.[155] Every commenter on the issue agrees that removing this requirement would afford operators greater design flexibility.[156] We agree with this assessment and therefore delete the international coverage requirements in these sections.

70. *Section 25.217*. In addition, section 25.217(b)(1) contains an international coverage requirement mirroring the 18-hour, 70° North Latitude / 55° South Latitude rules described above, which applies to NGSO systems "before any frequency-band-specific service rules have been adopted for [a particular] frequency band."[157] For NGSO FSS systems operating in various frequency bands, such as those in the 37-52 GHz range (for which the Commission has not adopted frequency-band-specific rules), this means that the same type of coverage constraints that we are lifting for other NGSO FSS systems would continue to apply. This type of disparate treatment is unjustified because many of the same services, including broadband internet services, can be provided to consumers in a variety of frequency bands. Moreover, providing the same degree of flexibility for NGSO systems covered by section 25.217(b) is consistent with our goal of providing additional flexibility with respect to geographic coverage rules for all "operators of NGSO FSS systems," as proposed in the *Notice*.[158] This makes particular sense for systems that operate in multiple bands – some covered by section 25.217(b) and some not – which would otherwise be subject to two different coverage regimes depending on which band the system was accessing.[159] To afford the same flexibility to all NGSO FSS systems regardless of the band, we therefore remove this section 25.217(b) default international coverage requirement.[160]

I. Pending Applications

71. The motivating purpose for this rulemaking was to update our rules and policies to prepare for a new generation of NGSO FSS satellite systems.[161] Many of these applications are now pending before the Commission. Accordingly, as of their effective date, we will apply the rules and procedures we adopt in this Report and Order to pending space station applications and petitions for U.S.

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[155] *Notice*, 31 FCC Rcd at 13664, para. 35; *see also Ku-band NGSO FSS Service Rules Order*, 17 FCC Rcd at 7860, para. 64 ("[O]ur coverage requirements prohibit service coverage from being limited by system design.").

[156] *See* Boeing Comments at 20-21; Boeing Reply at 25-26; Kepler Comments at 5; Lockheed Comments at 7; OneWeb Comments at 8; SES/O3b Comments at 35; SES/O3b Reply at 36; Space Norway Comments at 14-15; SpaceX Comments at 23-24; *see also* ViaSat Comments at 23. ViaSat nonetheless argues that it would be inequitable to change the international coverage requirement for pending applicants, because those who designed their systems to comply with the requirement could be placed at a competitive disadvantage. ViaSat Comments at 23-24. We address the application of this rule change, rather than the merits of the rule itself, below.

[157] 47 CFR § 25.217(b)(1) (requiring compliance with the international coverage requirement in section 25.143(b)(2)(ii)).

[158] *Notice*, 31 FCC Rcd at 13652, para. 2.

[159] Indeed, nearly half of the pending NGSO FSS applications and petitions (8 of 17) request waiver of one or more of these provisions. *O3b Limited*, IBFS File Nos. SAT-MOD-20160624-00060, SAT-AMD-20161115-00116, SAT-AMD-20170301-00026; *The Boeing Company*, IBFS File No. SAT-LOA-20160622-00058; *The Boeing Company*, IBFS File No. SAT-LOA-20161115-00109; *Space Norway AS*, IBFS File No. SAT-PDR-20161115-00111; *Kepler Communications Inc.*, IBFS File No. SAT-PDR-20161115-00114; *Audacy Corporation*, SAT-LOA-20161115-00117; *Space Exploration Holdings, LLC*, IBFS File No. SAT-LOA-20161115-00118; *Space Exploration Holdings, LLC*, IBFS File No. SAT-LOA-20170301-00027.

[160] Beyond the international coverage requirements, SpaceX urges the Commission to remove separate requirements on NGSO FSS systems to provide continuous coverage of the 50 United States, Puerto Rico, and the U.S. Virgin Islands. SpaceX Comments at 24-25; 47 CFR §§ 25.145(c)(2), 25.146(i)(1). While this request is outside the scope of the present rulemaking, the issue is addressed below in a Further Notice of Proposed Rulemaking.

[161] *See Notice*, 31 FCC Rcd at 13651-52, para. 1.

market access.[162] The Commission may apply new procedures to pending applications if doing so does not impair the rights an applicant possessed when it filed its application, increase an applicant's liability for past conduct, or impose new duties on applicants with respect to transactions already completed.[163] Applicants do not gain any vested right merely by filing an application, and the simple act of filing an application is not considered a "transaction already completed" for purposes of this analysis.[164] Accordingly, applying our new rules and procedures to pending space station applications will not impair the rights any applicant had at the time it filed its application. Nor will doing so increase an applicant's liability for past conduct.

72. We disagree with ViaSat's argument that we should dismiss pending applications in the current processing rounds, or indefinitely withhold action until additional EPFD deliberations are completed.[165] Doing so would largely negate the purpose of this rulemaking and delay the authorization of pending systems. Rather, we note that ViaSat has reviewed the pending proposals and believes it can operate with each of the technical designs proposed.[166]

IV. FURTHER NOTICE OF PROPOSED RULEMAKING

73. This Further Notice of Proposed Rulemaking supports the Commission's goals to ensure that our rules provide for flexibility for NGSO FSS systems while at the same time promoting efficient use of spectrum and providing additional broadband access. This inquiry focuses on one specific issue—the Commission's current domestic coverage requirement for NGSO FSS systems.

74. The Commission requires NGSO FSS systems to provide continuous coverage of the fifty states, Puerto Rico and the U.S. Virgin Islands.[167] Systems with more localized coverages are prohibited.

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[162] In addition, we will allow current licensees and market access recipients to submit a simple letter request to modify particular conditions in their grants consistent with the rule changes adopted in this Order. *See* SES/O3b Comments at 15.

[163] *See Landgraf v. USI Film Products*, 511 U.S. 244, 280 (1994); *DirecTV, Inc., v. FCC*, 110 F.3d 816, 825-26 (D.C. Cir., 1997); *Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14.0-14.5 GHz Frequency Bands*, Report and Order, 27 FCC Rcd 16510, 16553, para. 115 n.279 (2012).

[164] *Chadmoore Communications, Inc. v. FCC*, 113 F.3d 235, 240-41 (D.C. Cir. 1997) ("In this case the Commission's action did not increase [the applicant's] liability for past conduct or impose new duties with respect to completed transactions. Nor could it have impaired a right possessed by [the applicant] because none vested on the filing of its application."); *Hispanic Info. & Telecomms. Network v. FCC*, 865 F.2d 1289, 1294-95 (D.C.Cir.1989) ("The filing of an application creates no vested right to a hearing; if the substantive standards change so that the applicant is no longer qualified, the application may be dismissed."); *Schraier v. Hickel*, 419 F.2d 663, 667 (D.C.Cir.1969) (filing of application that has not been accepted does not create a legal interest that restricts discretion vested in agency); *see also United States v. Storer Broadcasting Co.*, 351 U.S. 192 (1952) (pending application for new station dismissed due to rule change limiting the number of licenses that could be held by one owner); *Bachow Communications, Inc. v. FCC*, 237 F.3d 683, 686-88 (D.C. Cir. 2001) (upholding freeze on new applications and dismissal of pending applications in light of adoption of new licensing scheme); *PLMRS Narrowband Corp. v. FCC*, 182 F. 3d 995, 1000-01 (D.C. Cir. 1999) (applicant did not, by virtue of filing application, obtain the right to have it considered under the rules then applicable).

[165] ViaSat Reply at 8, 31-32.

[166] ViaSat Petition to Deny, IBFS File No. SAT-LOA-20161115-00117 *et al* (filed June 26, 2017) ("ViaSat's analysis of the Applications . . . suggests that the NGSO operations proposed in each Application, when evaluated in isolation, should not pose a risk of harmful interference to ViaSat's existing and future Ka-band GSO operations as long as actual and authorized NGSO operations are limited to the parameters specified in the Applications.") (emphasis omitted).

[167] 47 CFR §§ 25.145(c)(2), 25.146(i)(1), 25.217(b)(1).

This requirement stems from a similar requirement placed on NGSO MSS systems which are, as a general matter, unable to share spectrum without causing harmful interference.[168]

75. The domestic coverage requirement for NGSO FSS systems could be unnecessary or counterproductive, however. For example, among the several pending applications that request waivers of this requirement,[169] one operator seeks to provide service in remote areas of Alaska as part of an "Arctic Satellite Broadband Mission."[170] Its satellite system would operate in a highly elliptical orbit chosen to maximize service to the Arctic region, but which prevents coverage of the lower United States. Another operator is currently providing low-latency satellite service to Americans at sea.[171] The equatorial orbit of its system, however, precludes U.S. coverage at high latitudes.[172] Such specialized systems may be authorized by foreign administrations and intended to serve only part of the United States. We do not believe it would serve the public interest to block access to these systems solely because of their specialized coverage areas, given that multiple NGSO FSS systems can share the same frequency bands. Rather, we expect that the most efficient way to encourage widespread service offerings by NGSO FSS systems, including in remote and underserved areas of the United States, would be to allow both general and specialized coverage systems.

76. We therefore propose to remove the domestic coverage requirement for NGSO FSS systems operating in all permitted spectrum bands, which we believe will afford operators greater flexibility in their system designs. We invite comment on this proposal. Given that this requirement applies to NGSO FSS systems by default, is it appropriate to deny access to every concerned frequency band if a system design does not allow for continuous U.S. coverage? What are the advantages of retaining, or removing, this coverage requirement? For parties that support retaining the domestic coverage requirement, are there particular considerations we should take into account when deciding whether or not to waive it in a particular case?

V. PROCEDURAL MATTERS

A. *Ex Parte* Procedures

77. The proceeding this Further Notice initiates shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.[173] 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

[168] 47 CFR § 25.143(b)(2)(iii).

[169] *O3b Limited*, IBFS File Nos. SAT-MOD-20160624-00060, SAT-AMD-20161115-00116, SAT-AMD-20170301-00026; *Space Norway AS*, IBFS File No. SAT-PDR-20161115-00111; *Kepler Communications Inc.*, IBFS File No. SAT-PDR-20161115-00114; *Audacy Corporation*, SAT-LOA-20161115-00117; *Space Exploration Holdings, LLC*, IBFS File No. SAT-LOA-20161115-00118; *Space Exploration Holdings, LLC*, SAT-LOA-20170301-00027.

[170] *Space Norway AS*, IBFS File No. SAT-PDR-20161115-00111.

[171] *O3b Limited*, Stamp Grant, IBFS File Nos. SAT-LOI-20141029-00118 and SAT-AMD-20150115-00004 (granted Jan. 22, 2015).

[172] The Satellite Policy Branch of the International Bureau has granted a waiver of the domestic coverage requirement for this system. *Id.*

[173] 47 C.F.R. §§ 1.1200 *et seq.*

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.

B. Comment Period and Procedures

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

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: http://apps.fcc.gov/ecfs/.

- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

  Filings can be sent by hand or messenger delivery, 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.

  - All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.

  - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.

  - U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

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

C. Regulatory Flexibility Act

79. 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 C.

80. In addition, as required by the RFA, we have prepared an Initial Regulatory Flexibility Analysis (IRFA) regarding the possible significant economic impact on small entities of the policies and

rules adopted in the Further Notice of Proposed Rulemaking, which is found in Appendix F.[174] We request written public comment on the IRFA. Comments must be filed in accordance with the same deadlines as comments filed in response to the FNRPM and must 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 this FNPRM, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).

D. Paperwork Reduction Act

81. This document contains 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, other Federal agencies, and the general public are invited to comment on the modified information collection requirements contained in this document. 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 information collection burden for small business concerns with fewer than 25 employees.

82. In this document, we have assessed the effects of reducing the application burdens of NGSO FSS satellite applicants, and find that doing so will serve the public interest and is unlikely to directly affect businesses with fewer than 25 employees.

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

E. Congressional Review Act

84. The Commission will send a copy of this Report and Order to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

VI. CONCLUSION AND ORDERING CLAUSES

85. IT IS ORDERED, pursuant to Sections 4(i), 7(a), 10, 303, 308(b), and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 157(a), 160, 303, 308(b), 316, that this Report and Order IS ADOPTED, the policies, rules, and requirements discussed herein ARE ADOPTED, Parts 2 and 25 of the Commission's rules ARE AMENDED as set forth in Appendix A, and this Further Notice of Proposed Rulemaking IS ADOPTED.

86. IT IS FURTHER ORDERED that this Report and Order SHALL BE effective 30 days after publication in the Federal Register, except that those amendments which contain new or modified information collection requirements that require approval by the Office of Management and Budget under the Paperwork Reduction Act WILL BECOME EFFECTIVE after the Commission publishes a notice in the Federal Register announcing such approval and the relevant effective date.

[174] *See* 5 U.S.C. § 603.

87. 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 Further Notice of Proposed Rulemaking, including the Initial and Final Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Final Rule

For the reasons discussed in the preamble, 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. In § 2.106, the Table of Frequency Allocations is amended as follows:

a. Pages 49, 52, and 55 are revised.

b. In the list of non-Federal Government (NG) Footnotes, footnotes NG57, NG62, and NG535A are added; and footnotes NG164, NG165, and NG166 are revised.

The revisions and additions read as follows:

§2.106 Table of Frequency Allocations.

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International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)	12.2-12.7 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492	12.2-12.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile BROADCASTING 5.484A 5.487	12.2-12.75	12.2-12.7 FIXED BROADCASTING-SATELLITE 5.487A 5.488 5.490	Satellite Communications (25) Fixed Microwave (101)
12.5-12.75 FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.494 5.495 5.496	5.487A 5.488 5.490 12.7-12.75 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	12.5-12.75 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.493		12.7-12.75 FIXED NG118 FIXED-SATELLITE (Earth-to-space) MOBILE	TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
12.75-13.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.441 MOBILE Space research (deep space) (space-to-Earth)			12.75-13.25 US251	12.75-13.25 FIXED NG118 FIXED-SATELLITE (Earth-to-space) 5.441 NG52 NG57 MOBILE US251 NG53	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A 5.499			13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A	13.25-13.4 AERONAUTICAL RADIONAVIGATION 5.497 Earth exploration-satellite (active) Space research (active)	Aviation (87)
13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.499 5.500 5.501 5.501B			13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.501B	13.4-13.75 Earth exploration-satellite (active) Radiolocation Space research Standard frequency and time signal-satellite (Earth-to-space)	Private Land Mobile (90)
13.75-14 FIXED-SATELLITE (Earth-to-space) 5.484A RADIOLOCATION Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research 5.499 5.500 5.501 5.502 5.503			13.75-14 RADIOLOCATION G59 Standard frequency and time signal-satellite (Earth-to-space) Space research US337 US356 US357	13.75-14 FIXED-SATELLITE (Earth-to-space) US337 Standard frequency and time signal-satellite (Earth-to-space) Space research Radiolocation US356 US357	Satellite Communications (25) Private Land Mobile (90)
14-14.25 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research			14-14.2 Space research US133	14-14.2 FIXED-SATELLITE (Earth-to-space) NG55 Mobile-satellite (Earth-to-space) Space research US133	Satellite Communications (25)

	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 US519	17.8-18.3 FIXED Fixed-satellite (space-to-Earth) US334 US519	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521			18.3-18.6 FIXED-SATELLITE (space-to-Earth) US334 G117 US139	18.3-18.6 FIXED-SATELLITE (space-to-Earth) US139 US334	Satellite Communications (25)
18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE					
18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 US334 G117 SPACE RESEARCH (passive) US139 US254	18.6-18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) US255 NG164 SPACE RESEARCH (passive) US139 US254 US334	
18.8-19.3 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE			18.8-20.2 FIXED-SATELLITE (space-to-Earth) US334 G117	18.8-19.3 FIXED-SATELLITE (space-to-Earth) NG165 US139 US334	
19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE				19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) NG166 US334	Satellite Communications (25) TV Broadcast Auxiliary (74F) Cable TV Relay (78) Fixed Microwave (101)
19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B Mobile-satellite (space-to-Earth) 5.524	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	19.7-20.1 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B Mobile-satellite (space-to-Earth) 5.524		19.7-20.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25)
20.1-20.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528			US139	5.525 5.526 5.527 5.528 5.529 US334	
20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) 5.524			20.2-21.2 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) G117	20.2-21.2 Standard frequency and time signal-satellite (space-to-Earth)	

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE		27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 Inter-satellite 5.536	RF Devices (15)
27.5-28.5 FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540			27.5-30	27.5-28.35 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	RF Devices (15) Satellite Communications (25) Upper Microwave Flexible Use (30) Fixed Microwave (101)
28.5-29.1 FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540				28.35-29.1 FIXED-SATELLITE (Earth-to-space) NG165 NG62	Satellite Communications (25)
29.1-29.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540				29.1-29.25 FIXED FIXED-SATELLITE (Earth-to-space) NG166 MOBILE	RF Devices (15) Satellite Communications (25) Fixed Microwave (101)
				29.25-29.5 FIXED-SATELLITE (Earth-to-space) NG535A NG62	Satellite Communications (25)
29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542		29.5-30 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) 5.525 5.526 5.527 5.529 5.543	
29.9-30 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542					
30-31 FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 5.542			30-31 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) G117	30-31 Standard frequency and time signal-satellite (space-to-Earth)	

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NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

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NG57 The use of the band 12.75-13.25 GHz by non-geostationary-satellite systems in the fixed-satellite service is limited to communications with individually licensed earth stations.

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NG62 In the bands 28.5-29.1 GHz and 29.25-29.5 GHz, stations in the fixed-satellite service shall not cause harmful interference to, or claim protection from, stations in the fixed service operating under the following call signs: KEB35, KGB72, KGC79, KIL20, KME49, KQG58, KQH74, KSA96, KSE73, KVH83, KYJ33, KZS88, WAX78, WLT380, WMK817, WML443, WMP367, and WSL69.

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NG164 The use of the band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary-satellite networks.

NG165 In the bands 18.8-19.3 GHz and 28.6-29.1 GHz, geostationary-satellite networks in the fixed-satellite service shall not cause harmful interference to, or claim protection from, non-geostationary-satellite systems in the fixed-satellite service.

NG166 The use of the bands 19.4-19.6 GHz and 29.1-29.25 GHz by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service.

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NG535A The use of the band 29.25-29.5 GHz by the fixed-satellite service is limited to geostationary-satellite networks and to feeder links for non-geostationary-satellite systems in the mobile-satellite service.

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PART 25 – SATELLITE COMMUNICATIONS

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

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

2. In §25.108, revise paragraph (a); remove paragraph (c)(6); redesignate paragraphs (c)(2) through (c)(5) as paragraphs (c)(4) through (c)(7), respectively; and add paragraphs (c)(2), (c)(3), and (c)(8) to read as follows:

§25.108 Incorporation by Reference.

(a) Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. All approved material is available for inspection at the Federal Communications Commission, 445 12th Street SW, Reference Information Center, Room CY-A257, Washington, DC 20554, 202-418-0270, and is available from the sources listed below. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030 or go to http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

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(c) ***

(2) ITU Radio Regulations, Volume 1: Articles, Article 21, “Terrestrial and space services sharing

frequency bands above 1 GHz," Section V, "Limits of power flux-density from space stations," Edition of 2016, http://www.itu.int/pub/R-REG-RR-2016. Incorporation by reference approved for §25.146(a).

(3) ITU Radio Regulations, Volume 1: Articles, Article 22, "Space services," Section II, "Control of interference to geostationary-satellite systems," Edition of 2016, http://www.itu.int/pub/R-REG-RR-2016. Incorporation by reference approved for §§25.146(a), 25.289.

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(8) ITU Radio Regulations, Volume 3: Resolutions, Resolution 76 (Rev.WRC-15), "Protection of geostationary fixed-satellite service and geostationary broadcasting-satellite service networks from the maximum aggregate equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems in frequency bands where equivalent power flux-density limits have been adopted," Edition of 2016, http://www.itu.int/pub/R-REG-RR-2016. Incorporation by reference approved for §25.146(a).

(9) ITU Radio Regulations, Volume 3: Resolutions, Resolution 85 (WRC-03), "Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems," Edition of 2016, http://www.itu.int/pub/R-REG-RR-2016. Incorporation by reference approved for §25.146(c).

3. In §25.114, revise paragraphs (c)(8) and (d)(12) to read as follows:

§25.114 Applications for space station authorizations.

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(c) ***

(8) Calculated maximum power flux-density levels within each coverage area and energy dispersal bandwidths, if any, needed for compliance with §25.208, for the angles of arrival specified in the applicable paragraph(s) of §25.208, except for an NGSO FSS applicant certifying compliance with PFD limits under §25.146(a)(1);

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(d) ***

(12) The information required by §25.146, if the application is for an NGSO FSS system authorization within the 10.7-30 GHz band.

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4. In §25.115, revise paragraphs (c)(1), (e), and (f) and add paragraph (c)(3) to read as follows:

§25.115 Applications for earth station authorizations.

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(c)(1) GSO FSS earth stations in 10.7-12.2 GHz or 14-14.5 GHz. A blanket license application for operation in the 10.7-12.2 GHz or 14-14.5 GHz bands may be filed on FCC Form 312 or Form 312EZ, with a Schedule B for each large (5 meters or larger) hub station antenna and each representative type of small antenna (less than 5 meters) operating within the network; however, blanket licensing in the 10.7-11.7 GHz band is on an unprotected basis with respect to the fixed service.

*****

(e) GSO FSS earth stations in 17.8-30 GHz. (1) An application for a GSO FSS earth station license in the 17.8-19.4 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 paragraph (g) or (j) of this section or by §25.130.

(2) An applicant may request authority for operation of GSO FSS earth stations in the 17.8-19.4 GHz, 19.6-20.2 GHz, 28.35-29.1 GHz, and 29.25-30 GHz bands without specifying the location of user terminals but must specify the geographic area(s) in which they will operate and the location of hub and/or gateway stations; however, blanket licensing in the 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz bands is on an unprotected basis with respect to the fixed service.

(f) NGSO FSS earth stations in 10.7-29.1 GHz. (1) An application for an NGSO FSS earth station license in the 10.7-29.1 GHz band must include the certification described in §25.146(a)(2).

(2) Individual or blanket license applications may be filed for operation in the 10.7-12.7 GHz, 14-14.5 GHz, 17.8-18.6 GHz, 18.8-19.4 GHz, 19.6-20.2 GHz, or 28.35-29.1 GHz bands; however, blanket licensing in the 10.7-11.7 GHz, 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz bands is on an unprotected basis with respect to the fixed service.

(3) Individual license applications only may be filed for operation in the 12.75-13.15 GHz, 13.2125-13.25 GHz, 13.75-14 GHz, or 27.5-28.35 GHz bands.

*****

§25.142 [Amended]

5. In §25.142, remove paragraphs (c) and (d).

§25.143 [Amended]

6. Remove §25.143(d).

§25.145 [Removed]

7. Remove §25.145.

8. Revise §25.146 to read as follows:

§25.146 Licensing and operating provisions for NGSO FSS space stations.

(a) An NGSO FSS applicant proposing to operate in the 10.7-30 GHz frequency range must certify that it will comply with:

(1) Any applicable power flux-density levels in Article 21, Section V, Table 21-4 of the ITU Radio Regulations (incorporated by reference, see §25.108), except that in the 19.3-19.4 GHz and 19.6-19.7 GHz bands applicants must certify that they will comply with the ITU PFD limits governing NGSO FSS systems in the 17.7-19.3 GHz band; and

(2) Any applicable equivalent power flux-density levels in Article 22, Section II, and Resolution 76 of the ITU Radio Regulations (both incorporated by reference, see §25.108).

(b) In addition, an NGSO FSS applicant proposing to operate in the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, 18.8-19.3 GHz, or 28.6-29.1 GHz bands must provide a demonstration that the proposed system is capable of providing FSS on a continuous basis throughout the fifty states, Puerto Rico, and the U.S. Virgin Islands.

(c) Prior to the initiation of service, an NGSO FSS operator licensed or holding a market access authorization to operate in the 10.7-30 GHz frequency range must receive a "favorable" or "qualified favorable" finding by the ITU Radiocommunication Bureau, in accordance with Resolution 85 of the ITU Radio Regulations (incorporated by reference, see §25.108), regarding its compliance with applicable ITU EPFD limits. In addition, a market access holder in these bands must:

(1) Communicate the ITU finding to the Commission; and

(2) Submit the input data files used for the ITU validation software.

(d) Coordination will be required between NGSO FSS systems and GSO FSS earth stations in the 10.7-12.75 GHz band when:

(1) The GSO satellite network has receive earth stations with earth station antenna maximum isotropic gain greater than or equal to 64 dBi; G/T of 44 dB/K or higher; and emission bandwidth of 250 MHz; and

(2)The $EPFD_{down}$ radiated by the NGSO satellite system into the GSO specific receive earth station, either within the U.S. for domestic service or any points outside the U.S. for international service, as calculated using the ITU software for examining compliance with EPFD limits exceeds −174.5 dB(W/(m^2/40kHz)) for any percentage of time for NGSO systems with all satellites only operating at or below 2500 km altitude, or −202 dB(W/(m^2/40kHz)) for any percentage of time for NGSO systems with any satellites operating above 2500 km altitude.

(e) An NGSO FSS licensee or market access recipient must ensure that ephemeris data for its constellation is available to all operators of authorized, in-orbit, co-frequency satellite systems in a manner that is mutually acceptable.

9. Add §25.151(a)(12) to read as follows:

§25.151 Public notice.

(a) ***

(12) The receipt of EPFD input data files from an NGSO FSS licensee or market access recipient, submitted pursuant to §§25.111(b) or 25.146(c)(2).

*****

§25.156 [Amended]

10. Remove and reserve §25.156(d)(5).

11. Revise §25.157(b) to read as follows:

§25.157 Consideration of applications for NGSO-like satellite operation.

*****

(b)(1) The procedures in this section do not apply to an application for authority to operate a replacement space station(s) that meets the relevant criteria in §25.165(e)(1) and (2) and that will be launched before the space station(s) to be replaced is retired from service or within a reasonable time after loss of a space station during launch or due to premature failure in orbit.

(2) Paragraphs (e), (f), and (g) of this section do not apply to an NGSO FSS application granted with a condition to share spectrum pursuant to §25.261.

*****

12. In §25.161, revise paragraph (a) and add paragraph (d) to read as follows:

§25.161 Automatic termination of station authorization.

*****

(a)(1) The failure to meet an applicable milestone specified in §25.164(a) or (b), if no authorized space station is functional in orbit;

(2) The failure to meet an applicable milestone specified in §25.164(b)(1) or (b)(2), if at least one authorized space station is functional in an authorized orbit, which failure will result in the termination of authority for the space stations not in orbit as of the milestone date, but allow for technically identical replacements; or

(3) The failure to meet any other milestone or construction requirement imposed as a condition of authorization. In the case of a space station authorization when at least one authorized space station is functional in orbit, however, such termination will be with respect to only the authorization for any space stations not in orbit as of the milestone date.

*****

(d) The failure to maintain 50 percent of the maximum number of NGSO space stations authorized for service following the 9-year milestone period as functional space stations in authorized orbits, which failure will result in the termination of authority for the space stations not in orbit as of the date of noncompliance, but allow for technically identical replacements.

13. In §25.164, revise paragraphs (a), (b), and (g) to read as follows:

§25.164 Milestones.

(a) The recipient of an initial license for a GSO space station, other than a DBS space station, SDARS space station, or replacement space station as defined in §25.165(e), must launch the space station, position it in its assigned orbital location, and operate it in accordance with the station authorization no later than 5 years after the grant of the license, unless a different schedule is established by Title 47, Chapter I, or the Commission.

(b)(1) The recipient of an initial authorization for an NGSO satellite system, other than an SDARS system, must launch 50 percent of the maximum number of space stations authorized for service, place them in their assigned orbits, and operate them in accordance with the station authorization no later than 6 years after the grant of the authorization, unless a different schedule is established by Title 47, Chapter I. This paragraph does not apply to replacement NGSO space stations as defined in §25.165(e).

(2) A licensee that satisfies the requirement in paragraph (b)(1) of this section must launch the remaining space stations necessary to complete its authorized service constellation, place them in their assigned orbits, and operate each of them in accordance with the authorization no later than nine years after the grant of the authorization.

*****

(g) Licensees of satellite systems that include both NGSO satellites and GSO satellites must meet the requirement in paragraph (a) of this section with respect to the GSO satellite(s) and the applicable requirements in paragraph (b) of this section with respect to the NGSO satellites.

*****

14. In §25.165, revise paragraphs (c) and (d) to read as follows:

§25.165 Surety bonds.

*****

(c) A licensee will be considered to be in default with respect to a bond filed pursuant to paragraph (a) of this section if it surrenders the license before meeting the applicable milestone requirement(s) in §25.164(a) and/or (b)(1) or if it fails to satisfy any such milestone.

(d) A licensee will be relieved of its bond obligation under paragraph (a) of this section upon a Commission finding that the licensee has satisfied the applicable milestone requirement(s) in §25.164(a) and/or (b)(1) for the authorization.

*****

15. Revise §25.202(a)(1) to read as follows:

§25.202 Frequencies, frequency tolerance, and emission limits.

(a)(1) In addition to the frequency-use restrictions set forth in §2.106 of this chapter, the following restrictions apply:

(i) In the 27.5-28.35 GHz band, the FSS (Earth-to-space) is secondary to the Upper Microwave Flexible Use Service authorized pursuant to part 30 of this chapter, except for FSS operations associated with earth stations authorized pursuant to §25.136.

(ii) Use of the 37.5-40 GHz band by the FSS (space-to-Earth) is limited to individually licensed earth stations. Earth stations in this band must not be ubiquitously deployed and must not be used to serve individual consumers.

(iii) The U.S. non-Federal Table of Frequency Allocations, in §2.106 of this chapter, is applicable between Commission space station licensees relying on a U.S. ITU filing and transmitting to or receiving from anywhere on Earth, including airborne earth stations, in the 17.7-20.2 GHz or 27.5-30 GHz bands.

*****

16. In §25.208, revise the section heading and paragraph (c) introductory text and remove and reserve paragraphs (e) through (m), to read as follows:

§25.208 Power flux-density limits.

*****

(c) For a GSO space station in the 17.7-19.7 GHz, 22.55-23.55 GHz, or 24.45-24.75 GHz bands, or for an NGSO space station in the 22.55-23.55 GHz or 24.45-24.75 GHz bands, the PFD at the Earth's surface produced by emissions for all conditions and for all methods of modulation must not exceed the following values:

*****

(e)-(m) [Reserved]

*****

17. In §25.217, revise paragraphs (b)(1) and (c)(1) to read as follows:

§25.217 Default service rules.

*****

(b)(1) For all NGSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in §25.157 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§25.143(b)(2)(ii) (except NGSO FSS systems), (iii), 25.204(e), 25.210(f), (i).

*****

(c)(1) For all GSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in §25.158 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§25.143(b)(2)(iv), 25.204(e), 25.210(f), (i), (j).

*****

18. Revise §25.261 to read as follows:

§25.261 Sharing among NGSO FSS space stations.

(a) Scope. This section applies to NGSO FSS operation with earth stations with directional antennas anywhere in the world under a Commission license, or in the United States under a grant of U.S. market access.

(b) Coordination. NGSO FSS operators must coordinate in good faith the use of commonly authorized frequencies.

(c) Default procedure. Absent coordination between two or more satellite systems, whenever the increase in system noise temperature of an earth station receiver, or a space station receiver for a satellite with on-board processing, of either system, $\Delta T/T$, exceeds 6 percent due to interference from emissions originating in the other system in a commonly authorized frequency band, such frequency band will be divided among the affected satellite networks in accordance with the following procedure:

(1) Each of n (number of) satellite networks involved must select 1/n of the assigned spectrum available in each of these frequency bands. The selection order for each satellite network will be determined by the date that the first space station in each satellite system is launched and capable of operating in the frequency band under consideration;

(2) The affected station(s) of the respective satellite systems may operate in only the selected (1/n) spectrum associated with its satellite system while the $\Delta T/T$ of 6 percent threshold is exceeded;

(3) All affected station(s) may resume operations throughout the assigned frequency bands once the threshold is no longer exceeded.

§25.271 [Amended]

19. Remove and reserve §25.271(e).

20. Add §25.289 to read as follows:

§25.289 Protection of GSO networks by NGSO systems.

Unless otherwise provided in this chapter, an NGSO system licensee must not cause unacceptable interference to, or claim protection from, a GSO FSS or GSO BSS network. An NGSO FSS licensee operating in compliance with the applicable equivalent power flux-density limits in Article 22, Section II of the ITU Radio Regulations (incorporated by reference, see §25.108) will be considered as having fulfilled this obligation with respect to any GSO network.

APPENDIX B

Adopted Ka-band Plan[1]

17.7-20.2 GHz Band

U.S. Non-Fed. Allocation	FS FSS (↑) US271 US334	FS fss (↓) US334 US519	FSS (↓) US139 US334	FSS (↓) US255 NG164 EESS & SRS (passive) US139 US254 US334	FSS (↓) NG165 US139 US334	FS FSS (↓) NG166 US334			FSS (↓) MSS (↓) 5.525 5.526 5.527 5.528 5.529 US334
Ka-band Plan	FS	FS fss (↓)	GSO FSS (↓) ngso fss (↓)	GSO FSS (↓)	NGSO FSS (↓) gso fss (↓)	FS GSO FSS (↓) NGSO MSS FL (↓) ngso fss (↓)	FS NGSO MSS FL (↓)	FS GSO FSS (↓) NGSO MSS FL (↓) ngso fss (↓)	GSO FSS (↓) ngso fss (↓)
Total MHz	100 MHz	500 MHz	300 MHz	200 MHz	500 MHz	100 MHz	200 MHz	100 MHz	500 MHz

17.7 17.8 18.3 18.6 18.8 19.3 19.4 19.6 19.7 20.2 GHz

27.5-30 GHz Band

U.S. Non-Fed. Allocation	FS FSS (↑) MS	FSS (↑) NG165 NG62		FS FSS (↑) NG166 MS	FSS (↑) NG535A NG62	FSS (↑) MSS (↑) 5.525 5.526 5.527 5.529 5.543
Ka-band Plan	UMFUS fss (↑)	GSO FSS (↑) ngso fss (↑)	NGSO FSS (↑) gso fss (↑)	LMDS NGSO MSS FL (↑)	GSO FSS (↑) NGSO MSS FL (↑)	GSO FSS (↑) ngso fss (↑)
Total MHz	850 MHz	250 MHz	500 MHz	150 MHz	250 MHz	500 MHz

27.5 28.35 28.6 29.1 29.25 29.5 30 GHz

[1] In these charts, capitalized acronyms indicate primary services, and lower-case acronyms indicate secondary services. The abbreviations used are as follows: Earth exploration-satellite service (EESS); feeder link (FL); fixed-satellite service (FSS); fixed service (FS); geostationary-satellite orbit (GSO); Local Multipoint Distribution Service (LMDS); mobile-satellite service (MSS); mobile service (MS); non-geostationary-satellite orbit (NGSO); space research service (SRS); and Upper Microwave Flexible Use Service (UMFUS). The "↑" symbol denotes the Earth-to-space direction for transmissions (uplink); the "↓" symbol denotes the space-to-Earth direction for transmissions (downlink).

Selected footnotes:

NG62 In the bands 28.5-29.1 GHz and 29.25-29.5 GHz, stations in the fixed-satellite service shall not cause harmful interference to, or claim protection from, stations in the fixed service operating under the following call signs: KEB35, KGB72, KGC79, KIL20, KME49, KQG58, KQH74, KSA96, KSE73, KVH83, KYJ33, KZS88, WAX78, WLT380, WMK817, WML443, WMP367, and WSL69.

NG164 The use of the band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary-satellite networks.

NG165 In the bands 18.8-19.3 GHz and 28.6-29.1 GHz, geostationary-satellite networks in the fixed-satellite service shall not cause harmful interference to, or claim protection from, non-geostationary-satellite systems in the fixed-satellite service.

NG166 The use of the bands 19.4-19.6 GHz and 29.1-29.25 GHz by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service.

NG535A The use of the band 29.25-29.5 GHz by the fixed-satellite service is limited to geostationary-satellite networks and to feeder links for non-geostationary-satellite systems in the mobile-satellite service.

US139 Fixed stations authorized in the band 18.3-19.3 GHz under the provisions of 47 CFR 74.502(c), 74.602(g), 78.18(a)(4), and 101.147(r) may continue operations consistent with the provisions of those sections.

US271 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.

US519 The band 18-18.3 GHz is also allocated to the meteorological-satellite service (space-to-Earth) on a primary basis. Its use is limited to geostationary satellites and shall be in accordance with the provisions of Article 21, Table 21-4 of the ITU *Radio Regulations*.

APPENDIX C

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 the Notice of Proposed Rulemaking in this proceeding.[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 Rules

2. The Order adopts several proposals relating to the Commission's rules and policies for satellite services, especially those concerning non-geostationary-satellite (NGSO), fixed-satellite service (FSS) systems. Adoption of these changes will, among other things, provide for more flexible use of the 17.8-20.2 GHz bands for FSS; promote shared use of spectrum among NGSO FSS satellite systems; and remove unnecessary design restrictions on NGSO FSS systems.

3. The Order adopts several changes to 47 CFR parts 2 and 25. Principally, it:

1) Allocates additional spectrum for use by FSS systems on a secondary basis in the 17.8-18.3 GHz band, subject to power flux-density limits designed to protect primary terrestrial services.

2) Allows additional operation of NGSO FSS systems in segments of the 17.8-20.2 GHz band within limits protective of FSS satellite systems in the geostationary-satellite orbit (GSO).

3) Allows GSO FSS operation in the 18.8-19.3 GHz band on an unprotected, non-interference basis with regard to NGSO FSS systems, to provide additional operational flexibility.

4) Amends the Commission's satellite milestone policies and geographic coverage rules to provide additional regulatory flexibility to operators of NGSO FSS systems.

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

4. There were no comments filed that specifically addressed the IRFA.

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

5. 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.

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[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] *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Notice of Proposed Rulemaking, 31 FCC Rcd 13651, 13692, Appx. D (2016).

[3] *See* 5 U.S.C. § 604.

[4] 5 U.S.C. § 604(a)(3).

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

6. 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 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 entity licensees that may be affected by adoption of the final rules.

7. **Satellite Telecommunications.** This category comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications."[9] The category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules.[10] For this category, Census Bureau data for 2012 show that there were a total of 333 firms that operated for the entire year.[11] Of this total, 299 firms had annual receipts of less than $25 million.[12] Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

The rule changes adopted in this Order will affect space station applicants and licensees. Generally, space stations cost hundreds of millions of dollars to construct, launch, and operate. Consequently, we do not anticipate that any space station operators are small entities that would be affected by our actions.

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 operators. As noted above, these parties rarely qualify as small entities.

9. For example, we allow additional uses of certain frequencies within the 17.8-20.2 GHz band, subject to compliance with power limits designed to protect other users of the bands. We also modify rules for satellite system implementation to provide additional flexibility to operators. And we

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[5] 5 U.S.C. § 604(a)(3).

[6] 5 U.S.C. § 601(6).

[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] U.S. Census Bureau, 2012 NAICS Definitions, "517410 Satellite Telecommunications"; http://www.census.gov/naics/2007/def/ND517410.HTM.

[10] 13 C.F.R. § 121.201, NAICS code 517410.

[11] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517410 http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2012_US_51SSSZ4&prodType=table.

[12] *Id.*

eliminate a geographic service requirement that restricts the design possibilities of certain NGSO FSS satellite systems. 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 Significant Economic Impact on Small Entities, and Significant Alternatives Considered

10. 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."[13]

11. In this Order, the Commission relaxes or removes requirements on NGSO FSS operators, including changing the 100 percent deployment milestone after six years to a 50 percent milestone at that time, and allowing three additional years to launch the remaining constellation; removing geographic coverage requirements; and allowing applicants to certify, rather than demonstrate, that they will comply with equivalent power-flux density limits. In addition, the Order provides greater flexibility to both geostationary and non-geostationary satellite operators to provide service in additional portions of the 17.8-20.2 GHz frequency band. Overall, we believe the actions in this document will reduce burdens on the affected licensees, including any small entities.

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

12. None.

13. **Report to Congress:** The Commission will send a copy of the *Report and Order*, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.[14] 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.[15]

[13] 5 U.S.C. § 603(c)(1)-(4).

[14] 5 U.S.C. § 801(a)(1)(A).

[15] *See* 5 U.S.C. § 604(b).

APPENDIX D

List of Commenters

The Boeing Company

EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC

Inmarsat Inc.

Intelsat License LLC

Iridium Satellite LLC

Kepler Communications Inc.

LeoSat MA, Inc.

Lockheed Martin Corporation

WorldVu Satellites Limited, d/b/a OneWeb

Planet Labs Inc. and Spire Global, Inc.

SES S.A. and O3b Limited

Satellite Industry Association

Space Norway AS

Space Exploration Technologies Corp.

Telesat Canada

ViaSat, Inc.

APPENDIX E

Proposed Rule

The Federal Communications Commission proposes to amend title 47, part 25 of the Code of Federal Regulations as follows:

PART 25 – SATELLITE COMMUNICATIONS

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

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

§25.146 [Amended]

2. In §25.146, remove paragraph (b) and redesignate paragraphs (c), (d), and (e) as paragraphs (b), (c), and (d).

3. Revise §25.217(b)(1) to read as follows:

§25.217 Default service rules.

*****

(b)(1) For all NGSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in §25.157 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§25.143(b)(2)(ii) (except NGSO FSS systems), (iii) (except NGSO FSS systems), 25.204(e), 25.210(f), (i).

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APPENDIX F

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 for comments on the Notice provided above in Section V.B. 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. The Further Notice of Proposed Rulemaking proposes to delete the requirement that non-geostationary, fixed-satellite service systems provide continuous coverage of the fifty United States, Puerto Rico, and the U.S. Virgin Islands, in order to afford operators greater design flexibility.

B. Legal Basis

3. The proposed action is authorized under Sections 4(i), 7(a), 10, 303, 308(b), and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 157(a), 160, 303, 308(b), 316.

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

4. The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by the proposed rules, if adopted.[4] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[5] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[6] 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).[7]

5. **Satellite Telecommunications.** This category comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or

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

[2] *See* 5 U.S.C. § 603(a).

[3] *Id.*

[4] 5 U.S.C. § 603(b)(3)

[5] 5 U.S.C. § 601(6).

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

[7] Small Business Act, 15 U.S.C. § 632 (1996).

reselling satellite telecommunications."[8] The category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules.[9] For this category, Census Bureau data for 2012 show that there were a total of 333 firms that operated for the entire year.[10] Of this total, 299 firms had annual receipts of less than $25 million.[11] Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

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

6. The NPRM proposes to delete a requirement that non-geostationary, fixed-satellite service systems demonstrate that they will provide continuous domestic coverage. This would reduce paperwork costs for such satellite operators.

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

7. 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."[12]

8. The NPRM proposes to delete a requirement to demonstrate coverage of the United States. This would wholly eliminate the economic and other impacts of this rule. However, the Commission invites comment on this change and any alternatives.

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

9. None.

[8] U.S. Census Bureau, 2012 NAICS Definitions, "517410 Satellite Telecommunications"; http://www.census.gov/naics/2007/def/ND517410.HTM.

[9] 13 C.F.R. § 121.201, NAICS code 517410.

[10] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517410 http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2012_US_51SSSZ4&prodType=table.

[11] *Id.*

[12] 5 U.S.C. § 603(c)(1)-(c)(4).

STATEMENT OF
CHAIRMAN AJIT PAI

Re: *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408

As we strive to close the digital divide, we must be open to any and every technology that could connect consumers across the country. That's why we once again look to the skies for inspiration—and in particular, to new satellite constellations that offer potential for bridging this gap.

Today, the FCC updates the framework that will govern non-geostationary-satellite orbit (NGSO) satellite systems. And it's high time: It's been over a decade since we first adopted rules for these types of constellations. In the years since, innovation has brought exciting potential to connect consumers across the nation, especially in rural, remote, and tribal areas. The rules we adopt will promote the next generation of NGSO systems, which could expand broadband access where it's needed most.

I'm also pleased to announce that I have circulated for my colleagues' consideration orders that would grant U.S. market access to two more NGSO systems in the Ku- and Ka- spectrum bands. This is possible thanks to the International Bureau staff, which has steadily worked to process these and other market access applications for NGSO satellite systems. As I said in June with the FCC's approval of OneWeb's application, these satellites could be a gateway to more broadband competition, benefiting consumers.

Thank you to all the staff that worked on this item: Jose Albuquerque, Clay DeCell, Chip Fleming, Jennifer Gilsenan, Sankar Persaud, Tom Sullivan, and Troy Tanner from the International Bureau; Bahman Badipour, Michael Ha, Tom Mooring, and Nick Oros from the Office of Engineering and Technology; Stephen Buenzow, Peter Daronco, John Schauble, and Blaise Scinto from the Wireless Telecommunications Bureau; and Deborah Broderson and David Horowitz from the Office of General Counsel.

STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN

Re: *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408

A couple of months ago, I traveled to Marietta, Ohio to participate in an enlightening and engaging conversation on broadband connectivity in Appalachia. Dozens of small business owners, students, local government leaders, and parents spoke about the challenges they face when it comes to availability and affordability of broadband services in their communities. I heard stories from students who were forced to complete their homework assignments in parking lots, and entrepreneurs on the verge of shutting their doors because of substandard service quality and/or the high cost for broadband.

It saddens me to confirm the obvious: that these stories are not uncommon in rural America, as millions of our non-urban neighbors remain trapped on the wrong side of the digital and opportunities divide. Over the past year, the Commission has initiated several proceedings to promote more affordable and faster broadband service for areas that remain unserved, so like many of you who care about these communities, I was particularly pleased to see movement on the Mobility Fund Phase II and Connect America Fund proceedings.

Today, we take yet another step to close those gaping divides by updating and streamlining rules to facilitate the deployment of NGSO FSS systems, which have the potential to provide ubiquitous broadband services to all of our communities. I am excited by the proposals proffered by the many satellite companies participating in the NGSO FSS processing rounds, and look forward to reviewing the pending petitions under the updated framework we adopt today, beginning with the two circulated just this morning.

I would like to thank the International Bureau team, including, Tom Sullivan, Troy Tanner, Jennifer Gilsenan, Jose Albuquerque, Chip Fleming, Clay DeCell, and Sankar Persaud for your diligent and commendable work on this important item and the many more that will follow.

STATEMENT OF
COMMISSIONER MICHAEL O'RIELLY

Re: *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408

I am supportive of today's order setting forth the technical rules for next-generation non-geostationary-satellite orbit (NGSO) fixed systems. Hopefully, our decision will provide applicants with the needed certainty to further explore and invest in these new constellations. These NGSO systems bring the promise of high speeds and low latency, which ultimately may bring gigabit broadband to all, including remote areas, but several are ambitious undertakings involving hundreds and thousands of small satellites.

What has become apparent is that satellite operators have designed very different orbital systems. This poses quite the challenge for the Commission, as the satellite industry is not in agreement on some of the issues decided in this item. For instance, there is real concern over how the potential for in-line interference should be handled. While the hope is that operators will enter into coordination agreements, if this does not occur, the Commission has adopted a default sharing mechanism that some entities seem to support, some support with some modifications, while still others articulate quite convincingly that it won't work at all. I'm not so sure those internally believe it would work as planned if actually triggered. This scheme may need to be revisited on reconsideration or, potentially, in the future when these systems are more mature. Some also question whether there are sufficient launch capabilities to get all of these satellites into orbit in time to meet the performance benchmarks. This is also something worth monitoring and waivers may, or may not, be necessary in the future.

Ultimately, we may need to see how these systems develop and how many come to fruition and, based on the actual systems deployed, rule tweaks may be necessary. I think we all know that twelve NGSO systems – and this does not include the V-band constellations – are unlikely. For the time being, we have done our best to provide the necessary framework and environment for investment. I wish the satellite industry the best of luck and look forward to seeing this engineering feat come to reality.

STATEMENT OF
COMMISSIONER BRENDAN CARR

Re: *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters,* IB Docket No. 16-408

We have seen a tremendous amount of innovation in the satellite sector over the past few years. One result is that companies are now proposing to launch a new generation of constellations. These large and ambitious new systems have the potential to introduce additional competition into the market, bring affordable broadband to more consumers, and become part of our 5G future.

But, in order for consumers to realize these benefits, the Commission's rules must keep pace with these technological advances. Today's Order does just that. While the details are certainly complex, the bottom line is that we take rules that are more than a decade old and bring them into the modern era. In the process, we remove regulatory barriers and help promote the deployment of new satellite systems. Indeed, by updating and streamlining our rules, we give satellite operators more flexibility to design and deploy their systems and more regulatory certainty as they continue to invest and innovate.

For these reasons, this item has my support. And I also want to note this Order required a lot of hard work by the agency's staff, and I thank them for their efforts.