

**FCC Fact Sheet\***

**Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems**  
Report and Order and Further Notice of Proposed Rulemaking – IB Docket No. 21-456

**Background:** In recent years, the Commission has received an unprecedented number of satellite license applications for non-geostationary satellite orbit, fixed-satellite service (NGSO FSS) constellations. The International Bureau has also initiated several “processing rounds” for NGSO FSS system applications, in which timely filed applications are considered together on an equal basis. The Commission’s rules establish a default spectrum-splitting procedure absent coordination between two or more NGSO FSS systems.

**What the Report and Order Would Do:**

- Limit the default spectrum-splitting procedure to NGSO FSS systems approved in the same processing round, before sunseting.
- Require NGSO FSS systems approved in a later processing round to coordinate with, or demonstrate they will protect, earlier-round systems.
- Require all NGSO FSS grantees to coordinate with each other in good faith.
- For inter-round sharing, require later-round systems to submit an interference analysis based on a degraded throughput methodology to demonstrate that they will protect earlier-round systems in the event that an earlier- and a later-round system do not reach a coordination agreement.
- Address conflicting views concerning “good faith” coordination and information sharing as part of good-faith coordination.
- Adopt a sunseting provision that entitles NGSO FSS systems to protection from systems approved in a subsequent processing round until ten years after the first authorization or market access grant in that subsequent processing round.
- Apply the rule changes adopted in this Report and Order to all current NGSO FSS licensees and market access grantees, as well as pending and future applicants and petitioners.

**What the Further Notice of Proposed Rulemaking Would Do:**

- Seek comment on the appropriate values and assumptions to be used in the degraded throughput methodology and whether we should adopt a rule limiting aggregate interference from later-round NGSO FSS systems into earlier-round systems.

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\* This document is being released as part of a “permit-but-disclose” proceeding. Any presentations or views on the subject expressed to the Commission or its staff, including by email, must be filed in IB Docket No. 21-456, which may be accessed via the Electronic Comment Filing System (<https://www.fcc.gov/ecfs/>). Before filing, participants should familiarize themselves with the Commission’s *ex parte* rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission’s meeting. See 47 CFR § 1.200 *et seq.*

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

In the Matter of
Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems
IB Docket No. 21-456

REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING\*

Comment Date: [45] Days After Publication in the Federal Register
Reply Comment Date: [75] Days After Publication in the Federal Register

Adopted: [] Released: []

By the Commission:

I. INTRODUCTION

1. In this Report and Order, we revise Commission rules governing spectrum sharing among a new generation of broadband satellite constellations to promote market entry, regulatory certainty, and spectrum efficiency through good-faith coordination. Specifically, we adopt rules clarifying protection obligations between non-geostationary satellite orbit, fixed-satellite service (NGSO FSS) systems authorized through different processing rounds by using a degraded throughput methodology, and subject those protections to a sunset period. After the sunset period, new entrants authorized in later processing rounds will share spectrum on an equal basis with earlier-round incumbents. We also clarify that all NGSO FSS operators licensed or granted market access in the United States must coordinate with each other in good faith, regardless of their processing round status, and we explain our expectations for information sharing during this good-faith coordination. In the accompanying Further Notice of Proposed Rulemaking, we seek comment on which specific metrics should be used to define the protection afforded to an earlier-round NGSO FSS system from a later-round system, and seek specific comment on implementation of the degraded throughput methodology that we are adopting. This Report and Order and Further Notice of Proposed Rulemaking will continue the Commission’s efforts to promote development and competition in broadband NGSO satellite services made possible by the new space age.<sup>1</sup>

\* This document has been circulated for tentative consideration by the Commission at its April 20, 2023 open meeting. The issues referenced in this document and the Commission’s ultimate resolution of those issues remain under consideration and subject to change. This document does not constitute any official action by the Commission. However, the Chairwoman has determined that, in the interest of promoting the public’s ability to understand the nature and scope of issues under consideration, the public interest would be served by making this document publicly available. The FCC’s ex parte rules apply and presentations are subject to “permit-but-disclose” ex parte rules. See, e.g., 47 CFR §§ 1.1206, 1.1200(a). Participants in this proceeding should familiarize themselves with the Commission’s ex parte rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission’s meeting. See 47 CFR §§ 1.1200(a), 1.1203.

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

## II. BACKGROUND

2. This proceeding continues the Commission's recent efforts to update and refine its rules governing NGSO FSS systems.<sup>2</sup> Constellations of NGSO FSS satellites traveling in low- and medium-Earth orbit may provide broadband services to industry, enterprise, and residential customers with lower latency and wider coverage than has previously been available via satellite.<sup>3</sup> The number of applications filed in recent years for NGSO FSS system authorizations, and the number of satellites launched, are unprecedented.<sup>4</sup>

3. *Processing Round Procedure Overview.* Applications for NGSO FSS system licenses and petitions for declaratory ruling seeking U.S. market access for non-U.S.-licensed NGSO FSS systems are considered in groups based on filing date, under a processing round procedure. Pursuant to the Commission's rules, a license application for "NGSO-like"<sup>5</sup> satellite operation, including operation of an NGSO FSS system, that satisfies the acceptability for filing requirements<sup>6</sup> is reviewed to determine whether it is a "competing application" or a "lead application."<sup>7</sup> A competing application is one filed in response to a public notice initiating a processing round.<sup>8</sup> Any other application is a lead application.<sup>9</sup> Competing applications are placed on public notice to provide interested parties an opportunity to file pleadings in response to the application.<sup>10</sup> Lead applications are also placed on public notice.<sup>11</sup> The public notice for a lead application initiates a processing round, establishes a cut-off date for competing NGSO-like satellite system applications, and provides interested parties an opportunity to file pleadings in response to the application.<sup>12</sup>

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<sup>2</sup> *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Notice of Proposed Rulemaking, 36 FCC Rcd 17871 (2021); *Revision of Section 25.261 of the Commission's Rules to Increase Certainty in Spectrum Sharing Obligations Among Non-Geostationary Orbit Fixed-Satellite Service Systems*, Order, RM-11855, FCC 21-123 (2021) (*NPRM*); see also *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order, 32 FCC Rcd 7809 (2017) (*NGSO FSS Report and Order*), *pets. for recon. pending*.

<sup>3</sup> See generally, e.g., *Communications Marketplace Report*, FCC 22-103, para. 6 (2022) (approximately 98% of all satellite launches in 2021 were deployed into low-Earth orbit to provide internet connectivity) (*CMR*).

<sup>4</sup> See generally *Mitigation of Orbital Debris in the New Space Age*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 4156, 4158, para. 3 (2020); see also, e.g., *CMR*, FCC 22-103, para. 6 (noting SpaceX had launched more than 3,350 of its satellites); Letter from Blake Wiles, Market Access Manager, North America, OneWeb, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-MPL-20200526-00062 (filed Jan. 20, 2023) (noting OneWeb had launched 544 of its satellites).

<sup>5</sup> The term "NGSO-like satellite operation" is defined as: (1) Operation of any NGSO satellite system; and (2) operation of a geostationary satellite orbit, mobile-satellite service satellite to communicate with earth stations with non-directional antennas. 47 CFR § 25.157(a).

<sup>6</sup> 47 CFR § 25.112.

<sup>7</sup> 47 CFR §§ 25.156(d)(1), 25.157(c). A non-U.S.-licensed NGSO-like satellite system seeking to serve the United States can be considered contemporaneously with other U.S. NGSO-like satellite systems pursuant to this procedure and considered before later-filed applications of other U.S. satellite system operators if the non-U.S.-licensed satellite system: (1) Is in orbit and operating; (2) has a license from another administration; or (3) has been submitted for coordination to the International Telecommunication Union. 47 CFR § 25.137(c). This procedure does not apply to applications for authority to operate certain replacement space stations. 47 CFR § 25.157(b)(1).

<sup>8</sup> 47 CFR § 25.157(c).

<sup>9</sup> *Id.*

<sup>10</sup> 47 CFR § 25.157(c)(1).

<sup>11</sup> 47 CFR § 25.157(c)(2).

<sup>12</sup> *Id.*

4. The Commission reviews each application in the processing round and all the pleadings filed in response to each application.<sup>13</sup> Based upon this review and consideration of such other matters as it may officially notice, the Commission will grant all the applications for which the Commission finds that the applicant is legally, technically, and otherwise qualified, that the proposed facilities and operations comply with all applicable rules, regulations, and policies, and that grant of the application will serve the public interest, convenience and necessity.<sup>14</sup> The Commission will deny the other applications.<sup>15</sup>

5. *NGSO FSS System Spectrum Sharing Overview.* The Commission has adopted rules for spectrum sharing among NGSO FSS systems.<sup>16</sup> NGSO FSS space station applications granted with a condition to abide by these sharing rules are exempt from frequency band segmentation procedures that otherwise apply to applications for NGSO-like satellite operation.<sup>17</sup> Instead, NGSO FSS operators must coordinate with one another in good faith the use of commonly authorized frequencies.<sup>18</sup> If two or more NGSO FSS satellite systems fail to complete coordination, a default spectrum-splitting procedure applies.<sup>19</sup>

6. Under the default spectrum-splitting procedure, whenever the percentage 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% 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 (i.e., individual links) in accordance with the following: (1) Each of  $n$  (number of) satellite networks involved must select  $1/n$  of the assigned spectrum available in each of these frequency bands; (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% threshold is exceeded; and (3) all affected station(s) may resume operations throughout the assigned frequency bands once the  $\Delta T/T$  of 6% threshold is no longer exceeded.<sup>20</sup> The spectrum selection order for each satellite network is 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.<sup>21</sup>

7. In the *NGSO FSS Report and Order*, the Commission stated that it will “initially limit” sharing under the  $\Delta T/T$  of 6% threshold to qualified applicants in a processing round.<sup>22</sup> The Commission explained that treatment of later applicants would 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

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<sup>13</sup> 47 CFR § 25.157(d).

<sup>14</sup> 47 CFR § 25.156(a).

<sup>15</sup> See 47 CFR § 25.157(d).

<sup>16</sup> 47 CFR § 25.261. These sharing rules apply 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. 47 CFR § 25.261(a).

<sup>17</sup> 47 CFR § 25.157(b)(2), (e), (f), (g).

<sup>18</sup> 47 CFR § 25.261(b).

<sup>19</sup> 47 CFR § 25.261(c).

<sup>20</sup> *Id.*

<sup>21</sup> 47 CFR § 25.261(c)(1); see also *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, 7857, para. 53 & n.77 (2002) (“A[n NGSO FSS] system is deemed operational when at least one of its satellites reaches its intended orbit and initiates transmission and reception of radio signals.”).

<sup>22</sup> *NGSO FSS Report and Order*, 32 FCC Rcd 7809, 7829, para. 61.

entry, as well as any comments filed by incumbent operators and reasoning presented by the new applicant.<sup>23</sup>

8. *NPRM*. The *NPRM* sought comment on rule changes that would clarify the relative obligations between NGSO FSS systems approved in different processing rounds.<sup>24</sup> Specifically, the Commission proposed to limit the existing NGSO FSS spectrum-splitting procedure in section 25.261 to those systems approved in the same processing round, and to require systems approved in a later processing round to coordinate with, or demonstrate they will protect, earlier-round systems. The Commission invited comment on how to quantify inter-round protection and whether it should sunset after a period of time. The Commission also proposed to require all NGSO FSS grantees,<sup>25</sup> regardless of their processing round status, to coordinate with each other in good faith and sought comment on specific information sharing obligations that could facilitate operator-to-operator coordination. In response to the *NPRM*, seventeen comments, fifteen reply comments, and numerous *ex partes* were filed.<sup>26</sup>

### III. DISCUSSION

9. After review of the record, we adopt rule changes that will promote market entry, regulatory certainty, and spectrum efficiency among a new generation of broadband NGSO satellite constellations. Specifically, we adopt three proposals in the *NPRM* that received broad support: 1) limiting the default spectrum-splitting procedure in section 25.261 to NGSO FSS systems approved in the same processing round, before sunseting; 2) requiring NGSO FSS systems approved in a later processing round to coordinate with, or demonstrate they will protect, earlier-round systems; and 3) requiring all NGSO FSS grantees to coordinate with each other in good faith. We also address three issues that produced a diverse record. After reviewing the proposed options for inter-round protection, we conclude that an interference analysis based on a degraded throughput methodology offers the most technically promising path for NGSO FSS inter-round sharing and require later-round systems to use such a methodology when demonstrating that they will protect earlier-round systems. On information sharing requirements, we clarify our expectations as to the necessary exchanges of information that will take place as part of the universal NGSO FSS good-faith coordination requirement we are adopting in this Order. We also conclude that protection of earlier-round NGSO FSS systems must ensure a stable environment for continued service and investment but should not hinder later-round systems indefinitely. Accordingly, we adopt a sunseting provision. NGSO FSS systems will be entitled to protection from systems approved in a subsequent processing round until ten years after the first authorization or market access grant in that subsequent processing round. After that date, all systems in both processing rounds will be treated on an equal basis with respect to spectrum sharing in the absence of a coordination agreement, and the default spectrum-splitting procedure in section 25.261 will also apply between systems in the two rounds. Finally, we apply the rule changes adopted in this Report and Order to all current NGSO FSS licensees and market access grantees as well as pending and future applicants and petitioners.

#### A. Limiting the Default Spectrum-Splitting Procedure to Systems Approved Through the Same Processing Round, before Sunseting

10. In the *NPRM*, the Commission noted that, while it stated in the 2017 *NGSO FSS Report and Order* that it would “initially limit” the default spectrum-splitting procedure in section 25.261 to

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<sup>23</sup> *Id.*

<sup>24</sup> *NPRM*, FCC 21-123, paras. 12-26.

<sup>25</sup> In this Report and Order and Further Notice of Proposed Rulemaking, the term “grantee” refers to U.S.-licensed satellite operators granted Commission space station licenses and non-U.S. licensed satellite operators granted U.S. market access.

<sup>26</sup> *See* Appx. E.

qualified NGSO FSS applicants in the same processing round,<sup>27</sup> there is no such limitation in the current rule text. Nonetheless, recent NGSO FSS system licenses and grants of market access have included a requirement to apply the spectrum-splitting procedure only among NGSO FSS systems approved within the same processing round.<sup>28</sup> To provide greater regulatory certainty, the Commission proposed to codify this limitation.<sup>29</sup> Doing so would eliminate general “case-by-case” consideration of how to treat later NGSO FSS applicants relative to approved systems,<sup>30</sup> except when considering waiver requests.

11. Commenters broadly welcome the Commission’s proposal,<sup>31</sup> which we adopt to provide greater regulatory stability and predictability to NGSO FSS operators as they deploy their initial constellations, subject to the sunset provision described below. The purpose of the Commission’s recent NGSO FSS processing rounds has been to establish a sharing environment among authorized systems to provide a measure of certainty in lieu of adopting an open-ended requirement to accommodate all future applicants.<sup>32</sup> NGSO FSS operators have planned, invested, and begun deploying thousands of satellites in their initial constellations based in part on their assessment of the specific characteristics of other participants in their processing round, which allows them to estimate the amount of spectrum likely to be available during a situation governed by the spectrum-splitting procedure. Limiting the spectrum-splitting procedure to systems approved within the same processing round is therefore an important element of regulatory stability for NGSO FSS grantees as they deploy their initial constellations, reflected in the licensing decisions taken under the current, case-by-case approach. Over time, this anticipated NGSO FSS sharing environment will change as system authorizations granted in the same processing round are surrendered or not ultimately built out, new entrants are approved in later processing rounds and coordinate with existing systems, and operators’ own system designs are updated for later-generation constellations. Therefore, while we do expect that the need for the stability and predictability offered by limiting the default spectrum-splitting procedure to systems approved through the same processing round will diminish over time and should be counterbalanced with the benefits of promoting new entry, as addressed through the sunset provision discussed below, we conclude that the establishment of an initial sharing environment will promote the development of NGSO FSS systems.

12. While no commenter suggests the Commission grant every new NGSO FSS application filed after a processing round cut-off date on an equal basis with applications filed within the processing round, some parties nonetheless encourage the Commission to retain discretion when considering later-filed NGSO FSS applications.<sup>33</sup> We always retain such discretion in the context of a rule waiver upon a

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<sup>27</sup> See *NGSO FSS Report and Order*, 32 FCC Rcd 7809, 7829, para. 61.

<sup>28</sup> See, e.g., *WorldVu Satellites Limited, Debtor-in-Possession, Petition for Declaratory Ruling Granting Access to the U.S. Market for the OneWeb Non-Geostationary Satellite Orbit Fixed-Satellite Service V-Band System*, Order and Declaratory Ruling, 35 FCC Rcd 10150, 10160, para. 30m (2020) (*OneWeb V-band Grant*); *Kuiper Systems, LLC, Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, Order and Authorization, 35 FCC Rcd 8324, 8344, para. 59b (2020) (*Kuiper Grant*); *ViaSat, Inc., Petition for Declaratory Ruling Granting Access for a Non-U.S.-Licensed Non-Geostationary Orbit Satellite Network*, Order and Declaratory Ruling, 35 FCC Rcd 4324, 4342-43, para. 54 (2020) (*Viasat Grant*); *The Boeing Company, Application for Authority to Launch and Operate a Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service*, Order and Authorization, FCC 21-115, para. 52 (2021) (*Boeing V-band Grant*).

<sup>29</sup> *NPRM*, FCC 21-123, para. 13.

<sup>30</sup> *NGSO FSS Report and Order*, 32 FCC Rcd 7809, 7829, para. 61 (explaining that the case-by-case approach would consider: (1) “the situation at the time”; (2) “the need to protect existing expectations and investments”; (3) the need to “provide for additional entry”; and (4) “any comments filed by incumbent operators and reasoning presented by the new applicant”).

<sup>31</sup> See, e.g., SpaceX Comments at 5; O3b Comments at 5-7; Kepler Comments at 3-4; Telesat Comments at 3-4; SN Space Comments at 6; SpaceLink Comments at 4-8; Hughes Comments at 3-4; Inmarsat Comments at 3.

<sup>32</sup> *NGSO FSS Report and Order*, 32 FCC Rcd at 7829, para. 61.

<sup>33</sup> See AST Comments at 2-3; see also Intelsat Comments at 3-4.

finding of good cause, although we expect such circumstances to be rare.<sup>34</sup> We believe the waiver standard is the appropriate threshold for considering whether an NGSO FSS application submitted after a relevant processing round cut-off date should be treated as if it had been filed within the processing round window and therefore given equal access to spectrum, through the default spectrum-splitting procedure, with timely filed applications.

## B. Protection of Earlier-Round Systems from Later-Round Systems

13. Another important element of regulatory stability for NGSO FSS grantees is the knowledge that they will be protected from harmful interference that might be caused by later-authorized systems. In the NPRM, the Commission proposed to codify an inter-round protection requirement consistent with licensing decisions.<sup>35</sup> The rule would require that, prior to commencing operations, an NGSO FSS licensee or market access recipient must either certify that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or demonstrate that it will not cause harmful interference to any such system with which coordination has not been completed.<sup>36</sup>

14. Commenters broadly support, and none oppose, a requirement for later-round NGSO FSS grantees to protect earlier-round grantees, which we adopt herein.<sup>37</sup> As explained in the NPRM, the protection of an NGSO FSS system from systems approved through a subsequent processing round goes to the heart of the stability of interference environment the Commission intended to create through use of the processing round procedure.<sup>38</sup> Accordingly, to clarify the obligations of later-round grantees and to provide greater regulatory certainty, we codify a requirement that, prior to commencing operations,<sup>39</sup> an NGSO FSS licensee or market access recipient must either submit in the International Communications Filing System (ICFS) a certification that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or submit for Commission approval a showing that it will not cause harmful interference to any such system with which

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<sup>34</sup> 47 CFR § 1.3. Waiver is appropriate only if both (1) special circumstances warrant a deviation from the general rule, and (2) such deviation better serves the public interest. *NetworkIP, LLC v. FCC*, 548 F.3d 116, 125-128 (D.C. Cir. 2008) (citing *Northeast Cellular Telephone Co.*, 897 F.2d 1164, 1166 (1990)). Generally, the Commission may waive any rule for good cause shown and, in making this determination, may take into account considerations of hardship, equity, or more effective implementation of overall policy on an individual basis. *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969), cert. denied, 409 U.S. 1027 (1972) (*WAIT Radio*); *Northeast Cellular*, 897 F.2d at 1164, 1166 (D.C. Cir. 1990) (*Northeast Cellular*); *NetworkIP*, 548 F.3d at 125-128.

<sup>35</sup> See *Kuiper Grant*, 35 FCC Rcd at 8344, para. 59a (2020); *Space Exploration Holdings, LLC, Request for Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System*, Order and Authorization, FCC 22-91, para. 135v (2022) (*SpaceX Gen2 Order*).

<sup>36</sup> NPRM, FCC 21-123, para. 16. The Commission further sought comment on how to quantify such protection, for example using an I/N limit or degraded throughput methodology, and whether to sunset the inter-round protection requirement after a period of time.

<sup>37</sup> See, e.g., Letter from David Goldman, Sr. Director, Satellite Policy, SpaceX, Kimberly Baum, VP, Spectrum Engineering & Strategy, OneWeb, Suzanne Malloy, VP Legal and Regulatory Affairs, O3b, and Nickolas Spina, Director of Regulatory Affairs, Kepler, to Marlene H. Dortch, Secretary, FCC, Exh. A at 1 (field Nov. 22, 2022) (*SpaceX, OneWeb, O3b, and Kepler ex parte*); Telesat Comments at 3; Viasat Comments at 11; Hughes Comments at 3. As discussed below, the inter-round protection requirement is subject to a sunset provision and may be quantified as a result of the Further Notice of Proposed Rulemaking.

<sup>38</sup> NPRM, FCC 21-123, para. 15.

<sup>39</sup> In this context, commencing operations means that the licensee or market access grantee has successfully placed a space station into its approved non-geostationary orbit and begun transmission and reception in conformance with the terms and conditions of the space station license or grant of market access. See 47 CFR § 25.121(b); *The Establishment of Policies and Service Rules for the Non-Geostationary Satellite Orbit, Fixed Satellite Service in the Ka-Band*, Report and Order, 17 FCC Rcd at 7857, para. 53 & n.77 (2002). The operator need not have begun providing service to customers.

coordination has not been completed.<sup>40</sup> If an earlier-round system becomes operational after a later-round system has commenced operations, the later-round licensee or market access recipient must submit a certification of coordination or a compatibility showing with respect to the earlier-round system no later than 60 days after the earlier-round system commences operations as notified under section 25.121(b) or otherwise.<sup>41</sup> Notices of commencement of operations for NGSO FSS systems subject to section 25.261 will be placed on public notice as informative to facilitate the filing of these certifications and showings. Compatibility showings will be placed on public notice for comment by interested parties before action by the Commission.<sup>42</sup> Further, to address the possibility that a later-round system may need to significantly limit its operations to protect a large, planned, earlier-round system of which only one or a few satellites have been launched and are operating,<sup>43</sup> we will allow later-round systems to operate on an unprotected, non-interference basis with respect to an earlier-round system after they have submitted a required compatibility showing for the earlier-round system and while it remains pending with the Commission.<sup>44</sup> By requiring this technical showing before operations on a non-interference basis may begin, we will allow the affected earlier-round operator, and any other interested parties, to provide the Commission with their views on the sufficiency of the showing. At the same time, we guard against an incentive for earlier-round grantees to use Commission processes to delay service by the later-round system by vigorously opposing all compatibility showings by grantees that have not yet completed coordination with them.<sup>45</sup>

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<sup>40</sup> We believe that the public certification of coordination will provide transparency into compliance with this requirement, and decline to remove the certification element and re-order the rule text as proposed by one commenter. See Letter from David Goldman, Sr. Director, Satellite Policy, SpaceX, to Marlene H. Dortch, Secretary, FCC, at 10 (filed Nov. 22, 2022).

<sup>41</sup> Under section 25.121(b), the license term for a non-geostationary orbit space station authorization begins on the date when the licensee notifies the Commission pursuant to section 25.173(b) that operation of an initial space station is compliant with the license terms and conditions and that the space station has been placed in its authorized orbit. 47 § CFR 25.121(b)(2), (3). Non-U.S. licensed satellite operators granted U.S. market access are not subject to section 25.121(b). However, non-U.S. licensed NGSO FSS operators have notified the Commission, and other NGSO FSS grantees, of their commencement of operations with respect to section 25.261(c)(1). See, e.g., Letter from Brian D. Weimer, Sheppard, Mullin, Richter & Hampton LLP, Counsel for OneWeb, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOI-20160428-00041 (filed April 29, 2019); Letter from Nick G. Spina, Director Launch & Regulatory Affairs, Kepler, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOI-20160428-00041 (filed May 13, 2019).

<sup>42</sup> See OneWeb Comments at 13.

<sup>43</sup> See Intelsat Comments at 5.

<sup>44</sup> In the *NPRM*, the Commission proposed to require that, prior to commencing operations, an NGSO FSS licensee or market access recipient must either certify that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or demonstrate that it will not cause harmful interference to any such system with which coordination has not been completed. *NPRM*, FCC 21-123, para. 16 and Appx. A. One commenter specifically proposes that the Commission affirmatively act on any compatibility showings before a grantee may commence operations in the absence of a coordination agreement. OneWeb Comments at 13. Allowing later-round operations on a non-interference basis pending approval of a compatibility showing is consistent with most recent Commission licensing action. See *SpaceX Gen2 Order*, FCC 22-91, para. 135v. Our approach is also simpler and more easily implemented than limiting inter-round protection to those earlier-round systems which have “begun deploying and [are] capable of delivering service, consistent with the scale envisioned by their authorizations,” a vague standard, as suggested by one commenter. See Intelsat Comments at 5. It also allows later-round operators to operate on an unprotected, non-interference basis with respect to the actual, in-orbit operations of an earlier-round system rather than with respect to its entire approved constellation after submission of a required compatibility showing. See *id.*

<sup>45</sup> But see OneWeb Comments at 13 (arguing the Commission should affirmatively act on any compatibility showings before a grantee may commence operations in the absence of a coordination agreement).



### C. Level of Protection for Earlier-Round Systems

15. The *NPRM* identified three principal methods, suggested by satellite operators, by which the Commission could quantify a required level of protection for earlier-round NGSO FSS systems from later-round systems or otherwise ensure their compatible operations.<sup>46</sup> First, the Commission could develop and adopt an interference-to-noise (I/N) limit. The I/N limit could incorporate a standard reference antenna mask and standard noise temperature and specify a percentage of time during which the limit may be exceeded. Applicants in a later processing round could be required to demonstrate that their proposed systems would comply with the I/N limit based on a probabilistic analysis. Second, the Commission could adopt interference protection criteria based upon the percentage of degraded throughput experienced by the earlier-round NGSO FSS system. A degraded throughput method would recognize that most, if not all, modern NGSO systems will use adaptive coding and modulation (ACM) and may be designed to meet performance objectives stated as either the packet error ratio or the spectral efficiency (bit/s/Hz) as a function of carrier-to-noise ratio (C/N). Satellite systems using ACM can maintain a satellite connection despite signal degradation, but at lower throughput rates. Third, the Commission could adopt a modified spectrum-splitting procedure for inter-round sharing. Under this option, when a 6%  $\Delta T/T$  threshold is passed, the earlier-round system would be entitled to use 75% of the commonly authorized spectrum and the later-round system 25% of the available spectrum, instead of the 50%/50% split applicable to NGSO FSS systems approved through the same processing round.

16. Commenters are divided on their preference for an I/N limit,<sup>47</sup> a degraded throughput methodology,<sup>48</sup> or a modified band-splitting option.<sup>49</sup> Supporters of an I/N limit argue that it is easily administrable, familiar to operational NGSO systems engaged in coordination, and less susceptible to misapplication based on subjective carrier characteristics.<sup>50</sup> Commenters that favor a degraded throughput methodology note that it takes into account the design and objectives of modern NGSO systems, including the use of ACM.<sup>51</sup> Proponents of a modified band-splitting option argue that it would encourage both parties to coordinate because both would have to reduce their spectrum use when the interference trigger is reached.<sup>52</sup> Several commenters request the Commission seek further comment on the development of an inter-round protection criteria before it is adopted,<sup>53</sup> and specifically argue that no reference values currently exist for quantifying proposed new criteria.<sup>54</sup>

17. After review of the record in response to the *NPRM*, we believe that pursuing a degraded throughput approach to quantify the level of protection for earlier-round systems from later-round

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<sup>46</sup> *NPRM*, FCC 21-123, paras. 17-21.

<sup>47</sup> See SpaceX at 6-12; Hughes Comments at 6; Kepler Comments at 7; SN Space Comments at 7; OneWeb Reply at 12. SpaceX also states that a degraded throughput method “holds significant promise.” SpaceX Comments at 15.

<sup>48</sup> See Kuiper Comments at 5-12; Intelsat Comments at 6-9; Intelsat Reply, Exh. A; PIO Comments at 8-11; Telesat Comments at 6; Viasat Comments at 12; Letter from Simone La Torre, Director, Spectrum Planning and International Coordination, Stellar Telecommunications SAS, to Marlene H. Dortch, Secretary, FCC (filed Jan. 13, 2023).

<sup>49</sup> See O3b Comments at 8-9; Comments of the Boeing Company at 7-8; Mangata Reply at 3; see also SN Space Reply at 5 n.12.

<sup>50</sup> See generally, e.g., SpaceX Comments at 13-15. While supporting an I/N limit, OneWeb opposes use of standardized system parameters. See OneWeb Reply at 14.

<sup>51</sup> See, e.g., Kuiper Comments at 7-9.

<sup>52</sup> See, e.g., O3b Comments at 9.

<sup>53</sup> See SpaceX, OneWeb, O3b, and Kepler ex parte, Exh. A at 1; Letter from Jennifer A. Manner, Senior Vice President, Regulatory Affairs, Hughes, to Marlene H. Dortch, Secretary, FCC, at 2 (filed June 2, 2022); Telesat Reply at 12; SpaceLink Reply at 6; Inmarsat Comments at 4; see also Viasat Reply at 7 n.19.

<sup>54</sup> See SpaceX, OneWeb, O3b, and Kepler ex parte, Exh. A at 1.

systems is the most technically promising option as it would account for the realities of modern NGSO systems and be based on a key design consideration for such systems. As they transit through the view of an earth station, NGSO satellites operate across a range of path distances, elevation angles, and antenna scan angles.<sup>55</sup> Atmospheric conditions, such as rain attenuation, can also cause link degradations and outages, especially in higher frequency bands and modern NGSO systems use ACM, uplink and downlink power control, and network protocols to provide continuous data services in the face of these varying environmental effects. A degraded throughput methodology would recognize that the mechanisms NGSO FSS systems use to tolerate signal degradation due to path-loss changes and link outages due to weather effects, and would also provide resilience to certain interference from other NGSO FSS systems. Further, degraded throughput analyses submitted on the record demonstrate that the analysis can be performed using widely available satellite system operational information, such as contained in an ITU filing or Commission space station application, and is not unduly difficult to perform.<sup>56</sup> With respect to the issues of potential synchronization loss and taking into account GSO interference and aggregate interference from multiple NGSO FSS constellations, these will be explored through the Further Notice of Proposed Rulemaking below and can be addressed within the framework of a degraded throughput methodology.<sup>57</sup>

18. In contrast, we are concerned that adopting an I/N limit for the protection of earlier-round systems, rather than as a band-splitting trigger for systems in the same processing round, may overprotect<sup>58</sup> earlier-round systems by not taking into account ACM and other methods used by modern NGSO systems to tolerate certain amounts of interference while continuing to provide reliable service to consumers, and therefore weaken their incentives to complete coordination with new entrants. In addition, while a 75%/25% band-splitting procedure between earlier- and later-round systems would provide some incentive to both parties to coordinate, this option may not ensure the continuity of earlier-round operations with existing customer bases if the earlier-round operator were required to reduce its spectrum usage by 25% during an event surpassing the  $\Delta T/T$  threshold with a later-round system with which it has not yet found an appropriate accommodation.<sup>59</sup>

19. Accordingly, we will require an NGSO FSS licensee or market access recipient that has not yet reached a coordination agreement with an earlier-round system to use a degraded throughput methodology in its demonstration that it will protect earlier-round systems. The demonstration should show that the later-round system will not exceed: 1) a single-entry increase of [X]% of the time allowance for the C/N value associated with the shortest percentage of time specified in the short-term performance objective of the earlier-round NGSO FSS system links; and 2) a single-entry permissible allowance of at most [X]% reduction in time-weighted average spectral efficiency calculated on an annual basis for the earlier-round NGSO FSS system links using adaptive coding and modulation.<sup>60</sup> Pending the outcome of the Further Notice of Proposed Rulemaking below, where we invite comment on finalizing the degraded throughput approach for inter-round sharing, later-round operators should select percentage values for the two metrics that conservatively protect the incumbent system based on the specific circumstances and parameters of the two systems. Later-round grantees will bear the burden of justifying these values.

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<sup>55</sup> See, e.g., Kuiper Comments at 7-9.

<sup>56</sup> See Intelsat Reply, Exhs. A and B; Letter from Michael John Carlson, Corporate Counsel, Kuiper Systems LLC, to Marlene H. Dortch, Secretary, FCC, Appx. A (filed Sept. 23, 2022) (*Kuiper Sept. 23, 2022 Ex Parte*).

<sup>57</sup> We can also address, through selection of final percentage metrics, the fact that operators may have service quality commitments that vary by customer. See O3b Comments at 12.

<sup>58</sup> See Intelsat Reply, Exh. A; *Kuiper Sept. 23, 2022 Ex Parte*, Appx. B.

<sup>59</sup> It is also unclear how the unequal spectrum-splitting procedure would apply among multiple systems and/or systems approved through first, second, third, or even later processing rounds. See Intelsat Reply at 5.

<sup>60</sup> We note that 22.5L of the ITU Radio Regulations contains a similar provision for the protection of GSO networks from NGSO systems in certain frequency bands. See International Telecommunication Union, Radio Regulations Articles, Edition of 2020, Chapter VI – Provisions for Services and Stations, 22.5L (2020).

20. This analysis should consist of three steps.<sup>61</sup> The first step is to establish a baseline of performance. To do this, an operator models the earlier-round NGSO system's performance without any additional interference by computing the earlier-round NGSO system's probabilistic C/N level using its published system parameters and a rain-attenuation model.<sup>62</sup> This provides the baseline in terms of: (1) the earlier-round system's time-weighted average throughput (derived by computing the spectral efficiency from the C/N results), and (2) the earlier-round system's link unavailability time percentage (i.e., the percentage of time when the earlier-round system's expected C/N will fall below its minimum usable level). The second step is to repeat the analysis above, adding in the effect of the later-round system's interference into the earlier-round system. This produces a second measurement of time-weighted average throughput and link unavailability time-percentage. The third step is to compare these two sets of figures to measure the effect of any additional interference. If the resulting performance impact exceeds the permissible limits, then the later-round system must adjust its operations to mitigate interference to a permissible level. While we adopt a requirement to use a degraded throughput methodology in demonstrations of compatibility with earlier-round systems because it accounts for ACM and other techniques used by modern NGSO systems and holds the best potential proposed on the record to protect earlier-round systems without unduly burdening later-round systems, we recognize that certain details of its implementation may benefit from further comment, such as the final percentage criteria to be used. The Further Notice of Proposed Rulemaking is dedicated to finalizing these issues. However until the particular issues in the Further Notice are resolved, we conclude that using the degraded throughput methodology as a basis for inter-round protection is more promising than an I/N protection criteria or modified spectrum-splitting option proposed on the record for the reasons discussed above.

#### D. Good-Faith Coordination

21. Although the Commission has adopted default rules for spectrum sharing among NGSO FSS systems, it has consistently affirmed that coordination among NGSO FSS operators in the first instance offers the best opportunity for efficient spectrum sharing.<sup>63</sup> Accordingly, the *NPRM* proposed to adopt a rule providing that the good-faith coordination requirement applies among all NGSO FSS grantees, including those approved through different processing rounds.

22. All commenters on this issue support the Commission's proposal to require good-faith coordination among all NGSO FSS grantees,<sup>64</sup> which we adopt.<sup>65</sup> With this requirement, we make clear that all NGSO FSS operators approved by the Commission must engage in good faith when discussing and accommodating the shared use of spectrum with other NGSO FSS operators. We will review any allegations that an NGSO FSS operator has not met the good-faith coordination requirement and may take actions including monetary forfeitures,<sup>66</sup> modification, or termination of the NGSO FSS authorization.

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<sup>61</sup> See Kuiper Comments at 6-7.

<sup>62</sup> Commenters in this proceeding have produced such technical analyses using a degraded throughput methodology based on widely available information, see Intelsat Reply, Exhs. A and B and *Kuiper Sept. 23, 2022 Ex Parte*, Annex A, contrary to concerns that this analysis requires information unavailable to satellite operators. Letter from Suzanne Malloy, Vice President, Regulatory Affairs, O3b Limited, to Marlene H. Dortch, Secretary, FCC, Appx. at 2 (filed Nov. 17, 2022).

<sup>63</sup> *NPRM*, FCC 21-123, para. 16; *NGSO FSS Report and Order*, 32 FCC Rcd at 7825, para. 48.

<sup>64</sup> See AST Comments at 3-4; Astra Comments at 3; Boeing Comments at 17; Inmarsat Comments at 3; Intelsat Comments at 9; Kepler Comments at 8-9; Kuiper Comments at 22-23; Mangata Comments at 3; O3b Comments at 3-7; OneWeb Comments at 15; PIO Comments at 4; SN Space Comments at 3; SpaceX Comments at 5; SpaceLink Comments at 10; Telesat Comments at 5; Hughes Comments at 4.

<sup>65</sup> We agree with commenters that, as drafted in the *NPRM*, the good-faith coordination rule in section 25.261(b) unnecessarily included the phrase "unless otherwise provided by the Commission" and we remove this phrase from the final adopted rule. See Inmarsat Comments at 3-4; OneWeb Comments at 16; O3b Reply at 4-5.

<sup>66</sup> See 47 U.S.C. § 503(b).

We discuss expectations for information sharing in the context of good-faith coordination below.

### E. Information Sharing during Good-Faith Coordination

23. In addition to the overall need for good-faith coordination, the Commission has emphasized that information sharing among NGSO FSS operators is essential to their efficient use of spectrum.<sup>67</sup> In the *NPRM*, the Commission invited comment on whether to require sharing of certain types of information, such as beam-pointing information, that may be necessary for the implementation of any spectrum-sharing solution or protection criteria between NGSO FSS systems. The *NPRM* also sought comment on any practical concerns associated with such information sharing, and how best to address any associated, potential, competitive harms. More broadly, the Commission inquired as to whether it should add a definition of “good faith” coordination in our rules and how it may better encourage efficiency among NGSO FSS systems.

24. The record produced a variety of views regarding information sharing requirements. Commenters generally recognize that more detailed technical discussions may assist parties in reaching an operator-to-operator coordination agreement, but diverge on whether the types of information to be shared should be agreed to by the coordinating parties,<sup>68</sup> or whether the Commission should specify types of information that must be shared in all coordination discussions.<sup>69</sup> Some commenters recommend the development of a third-party clearinghouse or industry-run database to facilitate sharing of NGSO FSS operational information.<sup>70</sup> Commenters raise particular concern that a requirement to share *real-time* beam-pointing information may be impracticable for systems that use dynamic beam pointing and reveal confidential and proprietary traffic trends whose competitive harm may be difficult to address by means such as non-disclosure agreements.<sup>71</sup> Some commenters argue that information sharing requirements

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<sup>67</sup> *NPRM*, FCC 21-123, para. 23.

<sup>68</sup> *See, e.g.*, AST Reply at 3 (“[T]he Commission should decline a blanket mandate for the exchange of highly sensitive and dynamic beam-pointing information at every instance, and should instead permit the parties to any individual coordination to determine what information should be exchanged”); Boeing Reply at 14 (“[T]he Commission must resist injecting itself in the coordination process by delineating the specific information that must be shared between the parties”); O3b Reply at 13 (“[T]he Commission can and should rely on operators engaged in coordination to determine what information they should exchange to facilitate an agreement”); SpaceX Reply at 13-14 (“[T]he Commission should rely on the coordinating NGSO operators to determine which and how much information to share during the coordination process”).

<sup>69</sup> *See* Letter from Michael Carlson, Corporate Counsel, Kuiper Systems LLC, to Marlene H. Dortch, Secretary, FCC, at 5 (filed Dec. 14, 2022) (proposing “the Commission adopt a rule that would require the disclosure of satellite-selection information and gateway location information as part of operators’ obligation to coordinate with each other in good faith.”); Intelsat Reply at 11 (“[T]he Commission should adopt a rule requiring operators to provide key operational parameters in bilateral coordination: (1) satellite tracking strategy, to determine which satellites are active; (2) the number of satellites that can provide service at the same location; (3) the exclusion angle to the GSO arc; (4) the average distance between earth stations; and (5) the minimum earth station elevation angle.”); SN Space Reply at 6 (contending that “sharing as much information as is commercially and operational feasible would be in the interest of all NGSO operators.”); TechFreedom Reply at 6 (arguing the good-faith coordination rules should include a requirement to share all necessary information, including beam locations); Hughes Comments at 6-8 (proposing detailed information requirements in NGSO FSS applications).

<sup>70</sup> *See* SpaceX Comments at 19; Intelsat Comments at 10; PIO Comments at 7-8; Kuiper Reply at 18. *But see* Boeing Comments at 13; Telesat Reply at 9.

<sup>71</sup> *See, e.g.*, Telesat Comments at 7 (“[T]he Commission should not be requiring operators to share beam-pointing information that is only available after the fact, when it could not be acted upon, and that includes sensitive information the disclosure of which would be detrimental to potential customers requiring confidentiality and would facilitate unfair competition.”); Viasat Reply at 12-13; O3b Reply at 13-17; Space Link Comments at 9; *see also* Mangata Reply at 1-2 (supporting the sharing of beam-pointing information between operators in a manner that preserves confidentiality in advance of system implementation, to facilitate operator-to-operator coordination, but

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should be limited to operational NGSO FSS systems,<sup>72</sup> or make other proposals.<sup>73</sup>

25. We decline to codify specific information sharing requirements as part of good-faith NGSO FSS coordination at this time. As an initial matter, we are encouraged that some first-round and second-round NGSO FSS systems have already completed coordination agreements under the Commission's existing regulatory framework, and this demonstrates that systems can effectively coordinate, even absent a third-party clearinghouse or other database to facilitate information sharing.<sup>74</sup> We expect that number will grow as systems proceed in development and deployment. For systems approved in the same processing round, we believe the prospect of splitting spectrum under the default sharing mechanism provides significant incentive for both parties to share the necessary technical information to conclude an agreement that ensures beneficial and stable access to spectrum. For systems approved in different processing rounds, the prospect of a later-round system operating on a non-interference basis after submitting a compatibility showing, which can be made using publicly available information, also may provide an incentive to the earlier-round operator to share additional technical information to ensure its ongoing operations are in fact protected. Beyond these incentives, we expect that certain essential NGSO operating parameters and other information that is typically publicly available, such as the maximum number of satellites that can provide service simultaneously at the same location ( $N_{co}$ ), exclusion angle to the GSO arc, minimum earth station elevation angle, and location of gateway earth stations,<sup>75</sup> will not be withheld during good-faith coordination. We also recognize that satellite selection information, revealing which satellites will be transmitting in a given situation, can be especially important to efficient spectrum sharing between larger and smaller constellations to ensure the smaller constellation is not unnecessarily restricted.<sup>76</sup> When evaluating whether an NGSO FSS operator has acted in good faith in refusing to provide information in coordination, we will consider the relative benefit of the information to the other party, which may increase if the other party is already operational, as well as the relative competitive or other risks to providing the information.<sup>77</sup> However, coordination

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opposing a requirement for operators to exchange dynamic beam-pointing information in real time after system implementation).

<sup>72</sup> See SpaceX Comments at 18-19; OneWeb Comments at 16.

<sup>73</sup> Kepler Comments at 8 (proposing an annual reporting requirement to disclose NGSO FSS operational information); OneWeb Reply at 15-16 (supporting requirements to share beam pointing and satellite selection information and proposing that if "operators still wish to retain the right to abstain from sharing the necessary technical information, the Commission should require that those operators use their own satellite diversity to avoid the interference events that could otherwise be mitigated if the information had been shared").

<sup>74</sup> See Letter from David Goldman, Senior Director, Satellite Policy, SpaceX, and Kimberly Baum, VP, Spectrum Engineering & Strategy, OneWeb, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-MPL-20200526-00062 (filed June 13, 2022) (announcing successful coordination between the first-round and second-round systems of OneWeb and SpaceX "after extensive good faith coordination discussions"); Letter from Julie Zoller, Global Head of Regulatory Affairs, Kuiper Systems LLC, and Torstein Losnedahl, Group Legal Counsel/Contract Manager, Space Norway AS, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-MPL-20220311-00029 (filed Nov. 18, 2022) (announcing successful coordination between the Space Norway first-round system and the Kuiper second-round system); Letter from Julie Zoller, Global Head of Regulatory Affairs, Kuiper Systems LLC, and Elisabeth Neasmith, Director, ITU and Regulatory, Telesat, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOA-20190704-00057 (filed Sept. 21, 2022) (announcing successful coordination between Telesat's first-round system, including "the relevant portion of Telesat's contemplated expansion of this system," and the Kuiper second-round system).

<sup>75</sup> While individually licensed earth station locations are publicly available on the Commission's website, they may not be routinely publicly disclosed in other licensing administrations.

<sup>76</sup> See Intelsat Reply, Exh. C.

<sup>77</sup> As noted above, an NGSO FSS operator found to have not lived up to its good-faith coordination obligation may be subject to forfeiture or modification or termination of license. Given that we are not adopting explicit information sharing requirements during good-faith coordination, however, we also decline to adopt any companion

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discussions typically do not begin only once the two systems are operational. With respect to sharing of real-time beam information, we note the practical difficulties raised in the record for advanced systems with dynamically repointable beams which, in addition to competitive concerns, may not be overcome by use of a third-party clearinghouse or industry-run database because introducing a third-party database between the operator that has changed its beam pointing plans in real time could only further delay the time until other operators receive the updated beam pointing data, adjust their own operations to reflect these changes, and then further de-conflict any interference issues that may arise from the other operators having adjusted their operations which must also be circulated via the third-party database. However, we will monitor the progress of NGSO FSS systems as they proceed in coordination and deployment and may revisit this issue in the future if ongoing coordination difficulties among operational systems suggest that more information sharing requirements are required. We note that the potential benefits for spectrum efficiency of dynamic beam pointing would appear to require some level of information sharing in order to be realized by more than one system so that other operators are not required to protect links that could be used, but are not used at a given time.

26. Beyond a general good-faith coordination requirement, and any related information sharing requirements, OneWeb argues the Commission should adopt a definition of “good faith” that mandates, *inter alia*, “that both parties to the coordination agree to utilize all inherent flexibility and capabilities in the operation of their respective systems to avoid interference between the two systems.”<sup>78</sup> We believe good-faith coordination places obligations on both parties to promote spectral efficiency. OneWeb’s proposed definition, however, could disincentivize investments in more advanced, spectrally efficient systems by requiring all those efficiencies to be used to accommodate systems that have been built with more limited sharing capabilities.<sup>79</sup> We decline to require such a sharing outcome in all cases and therefore do not adopt the proposed definition. As noted above, we intend to monitor compliance with the foregoing requirements and will address the need for further steps in light of our experience.

#### **F. Sunsetting of Inter-Round Protection Requirement**

27. In conjunction with the proposal in the *NPRM* to require later-round NGSO FSS systems to protect earlier-round systems absent a coordination agreement, the Commission also inquired as to whether this inter-round protection requirement should sunset after a period of time, and what protection should apply to an NGSO FSS system after any sunsetting.<sup>80</sup> We sought specific comment on how any sunset provision may affect investment in NGSO FSS systems and ongoing operations of earlier-round systems as well as competition and new market entry.

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provision that a party not sharing required information would have to protect the other party using its own satellite diversity, if available. See OneWeb Reply at 15-16.

<sup>78</sup> See OneWeb Comments at 15; see also Intelsat Reply at 13. But see O3b Reply at 5; SpaceX Reply at 4-5. Intelsat alternatively requests that operators be required “to use satellite operational strategies that minimize the probability of in-line events.” Intelsat Reply at 12.

<sup>79</sup> See, e.g., SpaceX Reply at 5 (arguing that under the proposed definition, a system’s “inherent inflexibility and incapability to avoid in-line events would place the entire burden for spectrum sharing on other NGSO systems that have invested in technologies that facilitate efficient spectrum sharing”). Intelsat’s similar proposal raises the same concern and we do not adopt it for the same reason.

<sup>80</sup> *NPRM*, FCC 21-123, para. 25.

28. Commenters suggest a variety of sunset periods. Several oppose any sunset.<sup>81</sup> Some commenters also encourage a further notice of proposed rulemaking on this issue.<sup>82</sup> Proponents of sunset argue that it would encourage innovation and new entry, promote coordination by time limiting the advantages of incumbency, and is consistent with the iterative and dynamic approach of NGSO FSS operators upgrading and modifying their own systems.<sup>83</sup> Opponents argue that any sunset provision would jeopardize quality and continuity of service by operational earlier-round systems, incentivize coordination delays by later-round systems until after an earlier round system's priority expires, and discourage investment by introducing regulatory uncertainty.<sup>84</sup>

29. The proposed sunset periods are: 6 years after the application cut-off date in a processing round;<sup>85</sup> 6 years after grant of the earlier-round system;<sup>86</sup> at the 6-year, 50% deployment milestone of an earlier-round system if the milestone is not met, otherwise at the 9-year, full deployment milestone;<sup>87</sup> less than 10 years after grant of the earlier-round system;<sup>88</sup> less than the 15-year license term of the earlier-round system;<sup>89</sup> at the expiration of the 15-year license term of the earlier-round system;<sup>90</sup> or 10 or 12 years after grant of the first application in a subsequent processing round.<sup>91</sup> Commenters propose that after the sunset period has run, both earlier- and later-round systems would share spectrum on an equal basis under the spectrum-splitting procedure in section 25.261.<sup>92</sup>

30. After review of the record and consideration of furthering development and competition in NGSO FSS systems, we adopt a sunset provision of 10 years after the first grant in a subsequent processing round. As the Commission has repeatedly stated, the purpose of the recent NGSO FSS processing rounds has been to establish a stable sharing environment among authorized systems.<sup>93</sup> But earlier-round advantages should not continue indefinitely.

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<sup>81</sup> See, e.g., Letter from Steve Collar, Chief Executive Officer, SES, S.A., O3b Limited, Matt Desch, Chief Executive Officer, Iridium Communications Inc., David Kagan, Chief Executive Officer, Globalstar, Inc., Dean A. Manson, Executive Vice President, General Counsel & Secretary, EchoStar Satellite Services L.L.C., Hughes Network Systems, LLC, Barry French, Chief Marketing & Communications Officer, Inmarsat, Michael Schwartz, Senior Vice President, Corporate and Business Development, Telesat Corporation, John Janka, Chief Officer, Global Government Affairs & Regulatory, Viasat Inc., and Massimiliano Ladovaz, Chief Technology Officer, WorldVu Satellites Limited, to Marlene H. Dortch, Secretary, FCC (filed Nov. 21, 2022) (*Sunsetting Opponents Ex Parte*); Boeing Comments at 15-16; SpaceLink Comments at 10-11.

<sup>82</sup> See Letter from David Goldman, Sr. Director, Satellite Policy, SpaceX, to Marlene H. Dortch, Secretary, FCC, at 2 (filed Nov. 22, 2022); Intelsat Comments at 11.

<sup>83</sup> See, e.g., Kuiper Comments at 15-18; SpaceX Comments at 15-18.

<sup>84</sup> See *Sunsetting Opponents Ex Parte*.

<sup>85</sup> Intelsat Reply at 15.

<sup>86</sup> Kuiper Comments at 16; PIO Comments at 11; AST Comments at 6.

<sup>87</sup> SN Space Comments at 8.

<sup>88</sup> TechFreedom Reply at 7.

<sup>89</sup> Astra Comments at 3.

<sup>90</sup> Kepler Comments at 9.

<sup>91</sup> SpaceX Reply at 12. See also O3b Comments at 20 (“At a minimum, any sunset rule should be tied to the licensing date of the later-filed system, not the earlier-round system. That way, a new entrant would at least have to build out its proposed fleet before gaining equal sharing rights with established, operational systems.”); Kepler Reply at 9 (agreeing that a sunset provision tied to the licensing date of later-round systems would enable new systems to reach maturity before they are treated on equal footing with earlier licensed systems.).

<sup>92</sup> See SpaceX Comments at 16; Intelsat Reply at 15.

<sup>93</sup> See *NGSO FSS Report and Order*, 32 FCC Red 7809, 7829, para. 61; *NPRM*, FCC 21-123, para. 15.

31. We believe that the protection afforded to an earlier-round system by a later-round system should work in concert with our deployment milestones for NGSO systems to relieve earlier-round grantees of the uncertainty of near-term, equal sharing with new entrants while also giving later-round systems an equal opportunity after they have demonstrated their commitment to provide service and completed their final deployment milestone. To accomplish these goals, the sunset date should be tied to the date of authorization of systems in a subsequent processing round, and define the period during which they will be required to protect any earlier-round systems. With each new processing round, therefore, incumbents will be ensured of a period of time during which they will be protected by systems approved in that processing round, and may plan to accommodate those systems as they proceed through deployment, before the time that they will be required to share spectrum on an equal basis in the absence of a coordination agreement. Fixing a sunset date dependent on the authorization date of the earlier-round system could mean that after the sunset date, any approved later-round system would automatically be afforded equal spectrum sharing with existing, earlier-round systems, without the same lead time that would enable earlier-round systems to assess their likely sharing requirements with the systems that will actually proceed to deployment, and adjust accordingly. In addition, fixing a single date to sunset the protection between systems in two processing rounds simplifies the sharing expectations for all operators in both rounds. By fixing the sunset date at 10 years after the first grant in a subsequent processing round, many later-round systems will be near, or have already passed, their 9-year full deployment milestone depending on their grant date. Thus, later-round systems will be afforded equal spectrum sharing opportunities under the spectrum-splitting procedure once their full service constellations are operational, while earlier-round systems will have had time to adjust to the constellations ultimately deployed by later-round grantees. We believe this period appropriately balances the need for stability for incumbent operations and the possibility for new entrants to compete on an equal footing once they have built out their systems.

32. The length of this sunset period also addresses several concerns on the record. First, we do not expect the sunset period to introduce significant coordination delays because the period is long enough that a later-round grantee would not wish to operate for years, including at near its full constellation size, without an agreement with earlier-round grantees. Second, the iterative nature of NGSO FSS systems, and relatively shorter lifetime of NGSO satellites when compared to GSO satellites,<sup>94</sup> undermines arguments that sunsetting would jeopardize existing services. Rather than maintaining a fixed system design, our experience has been that NGSO FSS operators have proposed to modify and expand their NGSO FSS systems.<sup>95</sup> As earlier-round grantees propose to expand and update their constellations, including through participation in subsequent processing rounds, any burden imposed by sunsetting their inter-round protection rights should be offset by benefits to the later-generations of their systems. Sunsetting also will not upset existing expectations of interference protection because, under Commission policy in effect prior to this Order, later-round applicants were considered on a case-by-case basis as to whether they will be entitled to share spectrum on an equal basis with earlier-round systems – as such there was never a guarantee that earlier-round grantees would be entitled to protection from all later-round systems. Nor do we believe that sunsetting will discourage overall investment in NGSO FSS systems or hamper efforts to promote broadband in underserved areas – on the contrary, we

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<sup>94</sup> For example, SpaceX satellites have a service life of 5-7 years. *Space Exploration Holdings, LLC Request for Modification of the Authorization for the SpaceX NGSO Satellite System*, Order and Authorization and Order on Reconsideration, 36 FCC Red 7995, para. 63 (2021).

<sup>95</sup> See, e.g., O3b Limited, Application to Modify U.S. Market Access Grant for the O3b Ka-band Satellite System, IBFS File No. SAT-MOD-20200526-00058 (filed May 26, 2020); WorldVu Satellites Limited, Modification to OneWeb Market Access Grant for the OneWeb Ku- and Ka- Band System, IBFS File No. SAT-MPL-20200526-00062 (filed May 26, 2020); Space Exploration Holdings, LLC, Application for the SpaceX Gen2 NGSO Satellite System, IBFS File No. SAT-LOA- 20200526-00055 (filed May 26, 2020); Telesat Canada, Application to Modify Petition for Declaratory Ruling to Grant Access to the U.S. Market for Telesat’s NGSO Constellation, IBFS File No. SAT-MPL-20200526-00053 (filed May 26, 2020); Viasat, Inc., Application for Modification of Viasat NGSO System, IBFS File No. SAT-MPL- 20200526-00056 (filed May 26, 2020).



expect that increased competition facilitated by sunseting inter-round protections will spur investment and development of new systems while providing appropriate returns for earlier-round systems initial constellations. Finally, the iterative development of NGSO FSS systems and evolving spectrum sharing requirements counsels in particular in favor of a sunseting provision in this instance, as compared to other instances where the Commission has preferred to maintain incumbent protections indefinitely. As noted, many earlier-round grantees have proposed updated, second-generation systems filed in a later processing round that will enhance the services these grantees intend to provide. Therefore, incumbents themselves will benefit from sunseting for their second-generation systems. The nature of NGSO FSS systems, which must be designed to endure changing environmental effects, also renders them more capable of sharing spectrum than other system designs. After sunseting, incumbents will be subject to equal spectrum sharing with the new entrants; but they will have had a significant period of time during which to reach a coordination agreement through good faith discussions that improves both operators' spectrum usage possibilities. Given the dynamic nature of NGSO FSS systems and the benefits of competition and new entry, we conclude that a 10-year sunset period beginning on the date of the first grant in a subsequent processing round appropriately balances the interests involved.

### G. Application of Rule Changes

33. The *NPRM* invited comment on whether to apply all, or some, of the rule changes adopted in this proceeding to existing grantees and pending applicants or only to new license applications, license modification applications, application amendments, and market access petitions filed after the new rules go into effect.<sup>96</sup>

34. Most commenters on this issue support the general applicability of rule changes in this proceeding to existing grantees and applicants as well as future applicants.<sup>97</sup> Some argue that applying certain rule changes to already approved systems would be onerous, as it may require reconsideration of the design and operation of the systems.<sup>98</sup>

35. We will apply all rule changes adopted in this Report and Order to current NGSO FSS licensees and market access grantees, pending applicants and petitioners, as well as future applicants and petitioners.<sup>99</sup> With respect to pending applications, 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.<sup>100</sup> Applying our new rules and procedures to pending space

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<sup>96</sup> *NPRM*, FCC 21-123, para. 26.

<sup>97</sup> See Boeing Comments at 18; Kuiper Comments at 24; Hughes Comments at 10; SpaceLink Comments at 11; SpaceX Comments at 20; Intelsat Reply at 19-20; TechFreedom Reply at 8.

<sup>98</sup> See Kepler Comments at 11 (arguing that "any new NGSO FSS sharing regimes or establishment of specific protection criteria" should apply only to systems which have yet to be granted licenses); see also AST Comments at 6 (arguing that pending NGSO FSS applications should continue to be evaluated on a case-by-case basis); O3b Comments at 21-22 (contending that any sunset provision or requirement to share beam-pointing information should not be applied to existing grantees).

<sup>99</sup> An agency order is impermissible as "primarily retroactive" if it "alters the *past* legal consequences of past actions." *Mobile Relay Assocs. v. FCC*, 457 F.3d 1, 11 (D.C. Cir. 2006) (quoting *Bowen v. Georgetown Univ. Hosp.*, 488 U.S. 204, 219 (1988) (Scalia, J., concurring) (emphasis in original)). An order can be primarily retroactive if it (1) "increase[s] a party's liability for past conduct"; (2) "impair[s] rights a party possessed when he acted"; or (3) "impose[s] new duties with respect to transactions already completed." *Landgraf v. USI Film Prods.*, 511 U.S. 244, 280 (1994). An agency order that "alters the future effect, not the past legal consequences" of an action or that "upsets expectations based on prior law" is not primarily retroactive. *Mobile Relay Assocs.*, 457 F.3d at 11 (citations and quotations omitted). Rather, such an order is considered secondarily retroactive and will be upheld if "reasonable, *i.e.*, if it is not arbitrary or capricious," both "in substance and in being made retroactive." *Id.*; *U.S. Airwaves, Inc. v. FCC*, 232 F.3d 227, 233 (D.C. Cir. 2000).

<sup>100</sup> *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

(continued....)

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. Similarly, with respect to current NGSO FSS licensees and market access grantees, none of the actions we take here (that is, limiting the default spectrum-splitting procedure to NGSO FSS systems approved in the same processing round (subject to a sunset), requiring later-round systems to coordinate with or protect earlier-round systems, and requiring all NGSO FSS grantees to coordinate with each other in good faith), increase liability for past conduct, impair rights a party possessed when he acted, or impose new duties with respect to transactions already completed. Rather, all of these actions take effect in the future, after the rules become effective. While some commenters claim that some of the rule changes here, such as the sunset of interference protections, upset their expectations,<sup>101</sup> NGSO FSS grants have been conditioned upon the outcome of future rulemakings and thus licensees and grantees have been on notice that the regulatory environment in which they are operate was subject to change.<sup>102</sup> Moreover, even under the rules in effect prior to this Order, first round systems were not guaranteed protection from later round systems; rather, this issue was to be considered on a "case-by-case" basis.<sup>103</sup> Accordingly, applying these rule changes to existing licenses and grants of market access will not upset any grantee's reasonable expectations. Further, we have crafted the sunset provision to provide incumbent NGSO FSS grantees sufficient time to evaluate and adapt to the eventual, equal sharing environment with systems ultimately deployed in each subsequent processing round. Not applying the sunset provision to existing grantees, while applying the other rule changes to them, would substantially frustrate the purpose of sunset by locking in incumbent protections that are not assured under the current, case-by-case regime. Sunsetting the inter-round protection requirement, and allowing later-round systems an opportunity to share spectrum on an equal basis with earlier-round systems after the sunset period, removes a barrier to entry and therefore promotes competition and will favor technological innovation among earlier-round systems that facilitates their sharing with new entrants. Whereas exempting first-round systems from sunset, which includes some large constellations, would destroy these benefits for all new entrants in second and later processing rounds for as long as the first-round systems remain active.

## H. Digital Equity and Inclusion

36. The Commission, as part of its continuing effort to advance digital equity for all,<sup>104</sup> including people of color, persons with disabilities, persons who live in rural or Tribal areas, and others who are or have been historically underserved, marginalized, or adversely affected by persistent poverty

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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).

<sup>101</sup> See Kepler Comments at 11; AST Comments at 6; O3b Comments at 21-22; see also generally *Sunsetting Opponents Ex Parte*.

<sup>102</sup> See, e.g., *OneWeb V-band Grant*, 35 FCC Rcd 10150, 10161, para. 31; *Kuiper Grant*, 35 FCC Rcd 8324, para. 65; *Viasat Grant*, 35 FCC Rcd 4324, 4342, para. 52e; *Boeing V-band Grant*, FCC 21-115, para. 50c.

<sup>103</sup> See *NGSO FSS Report and Order*, 32 FCC Rcd 7809, 7829, para. 61.

<sup>104</sup> Section 1 of the Communications Act of 1934 as amended provides that the FCC “regulat[es] interstate and foreign commerce in communication by wire and radio so as to make [such service] available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex.” 47 U.S.C. § 151.

or inequality, invited comment on any equity-related considerations<sup>105</sup> and benefits (if any) that may be associated with the proposals and issues discussed in the *NPRM*.<sup>106</sup>

37. Commenters support the Commission’s ongoing efforts to bridge the digital divide and highlight the role of satellite services in providing broadband access to underserved communities.<sup>107</sup> They support technology inclusive policies that ensure regulatory certainty and spectrum access for satellite operators.<sup>108</sup> We believe that the rule amendments in this Report and Order will encourage a more stable and competitive environment for the development of NGSO FSS systems well suited to reaching underserved areas with new broadband capacity, and therefore that this rulemaking will enhance digital equity and inclusion.

### I. Other Issues Raised in Comments

38. Some commenters also suggest the Commission pursue broader rule changes regarding NGSO FSS systems to tackle a variety of issues, including addressing orbital debris concerns,<sup>109</sup> verifying NGSO compliance with equivalent power-flux density limits for the protection of GSO networks,<sup>110</sup> revisiting the spectrum-splitting procedure in section 25.261,<sup>111</sup> updated in 2017,<sup>112</sup> or the NGSO milestone requirements,<sup>113</sup> revised in 2015 and 2017,<sup>114</sup> or taking up other suggestions not treated in the *NPRM*.<sup>115</sup> Other commenters caution against expanding the scope of the current proceeding.<sup>116</sup> Given the complexity and diversity of issues raised and their differing procedural statuses, some reiterating arguments in petitions for reconsideration or petitions for rulemaking,<sup>117</sup> we decline to create an

<sup>105</sup> The term “equity” is used here consistent with Executive Order 13985 as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. *See* Exec. Order No. 13985, 86 Fed. Reg. 7009, Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (January 20, 2021).

<sup>106</sup> *NPRM*, FCC 21-123, para. 27.

<sup>107</sup> *See* SIA Reply; AST Comments at 6-7; Hughes Comments at 11; SN Space Comments at 9-10; Kuiper Comments at 25-27; PIO Comments at 12-13; Boeing Comments at 18-20.

<sup>108</sup> SIA Reply at 3.

<sup>109</sup> *See* Viasat Comments at 5-6.

<sup>110</sup> *See* Viasat Comments at 6-7; Hughes Comments at 8-10; OneWeb Reply at 28; O3b Reply at 29.

<sup>111</sup> *See* Viasat Comments at 5-6, 9-11; OneWeb Comments at 9-10, 11; Intelsat Comments at 7; SN Space Comments at 6-7; Kuiper Comments at 14-15; SpaceX Comments at 10-12; AST Reply at 2-3.

<sup>112</sup> *NGSO FSS Report and Order*, 32 FCC Rcd at 7823-29, paras. 45-61.

<sup>113</sup> *See* Intelsat Comments at 12-13.

<sup>114</sup> *NGSO FSS Report and Order*, 32 FCC Rcd at 7830-31, paras. 66-67; *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, 14738 para. 59 (2015).

<sup>115</sup> *See* Viasat Comments at 5-6; OneWeb Comments at 5-6; Intelsat Comments at 11-12.

<sup>116</sup> *See* SpaceX Reply at 18 (arguing the Commission should “reject the invitation to introduce extraneous issues into this proceeding”); O3b Reply at 29-30 (“[T]he primary result of any such [rulemaking] consolidation would be to unnecessarily slow down Commission action on the time-critical matters at issue here.”).

<sup>117</sup> *See generally* Viasat Petition for Reconsideration, IB Docket 16-408 (filed Jan. 17, 2018); OneWeb Petition for Reconsideration, IB Docket 16-408 (filed Jan. 17, 2018); Kuiper Systems LLC, Petition for Rulemaking, RM-11861 (filed July 9, 2020); SpaceX Petition for Rulemaking, Revision of Section 25.261 of the Commission’s Rules to

(continued....)

“omnibus” NGSO rulemaking at this time and instead move immediately in the Further Notice of Proposed Rulemaking below to propose to finalize the remaining key issue raised in the *NPRM*.

#### IV. FURTHER NOTICE OF PROPOSED RULEMAKING

39. In the Report and Order above, we adopt a requirement that, prior to commencing operations, an NGSO FSS licensee or market access recipient must either certify that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or submit a showing for Commission approval that it will not cause harmful interference to any such system with which coordination has not been completed using a degraded throughput methodology. In this Further Notice of Proposed Rulemaking, we propose to finalize the details of the degraded throughput methodology and invite specific comment on the appropriate values and assumptions to be used in this requirement and whether we should adopt a rule limiting aggregate interference from later-round NGSO FSS systems into earlier-round systems.

40. Specifically, noting that 3% values for both requirements have been suggested in the record,<sup>118</sup> we invite comment on the appropriate values for these limits, including their technical justification. What is the appropriate baseline to consider for the earlier-round system, and should it include existing sources of interference, such as interference from GSO networks or intra-system interference?<sup>119</sup> Should a degraded throughput methodology compare an incumbent’s baseline level of performance given only natural degradation to that same incumbent’s expected performance given a single new entrant’s operations? Should we use standardized antenna patterns and noise temperatures for the computation of  $C/(I+N)$  in a degraded throughput method? Are additional means needed to protect earlier-round systems against loss of synchronization due to potentially high levels of short term interference? Should the earlier-round operator be able to specify two  $C/N$  objectives – one relative to the  $C/N$  level below which the victim modem would lose lock and another relative to the  $C/N$  level below which the victim link would become unavailable because it is not able to offer the minimum wanted throughput? What mitigation techniques would be appropriate if degraded throughput thresholds were not otherwise satisfied? We also note concerns on the record about aggregate interference from multiple NGSO systems.<sup>120</sup> What is a permissible aggregate interference level for protecting priority NGSO systems in a frequency band, as part of an earlier processing round? Should we expect that there will be a maximum number of NGSO FSS systems that can be accommodated in a given frequency band and if so, how should that affect any inter-round protection criteria and the opening of additional processing rounds? How does this methodology accommodate multiple NGSO systems that span multiple processing rounds?

41. *Digital Equity and Inclusion.* Finally, the Commission, as part of its continuing effort to advance digital equity for all,<sup>121</sup> including people of color, persons with disabilities, persons who live in

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Increase Certainty in Spectrum Sharing Obligations Among Non-Geostationary Orbit Fixed-Satellite Service Systems, RM-11855, (filed Apr. 30, 2020).

<sup>118</sup> See Kuiper Comments at 5-6; Kuiper Reply at 4; *Kuiper Sept. 23, 2022 Ex Parte* at 3-4; *Kuiper Feb. 17, 2023 Ex Parte* at 6-10.

<sup>119</sup> See Intelsat Reply at 9, Exh. B (providing study results showing that “for the hypothetical NGSO systems considered and a notional throughput degradation criterion of 3%, only a 3° avoidance angle is needed when GSO interference is considered. By contrast, if GSO interference is not considered, the necessary avoidance angle would be 18°.”).

<sup>120</sup> See *SpaceX, OneWeb, O3b, and Kepler ex parte* at 3; Letter from David Goldman, Sr. Director, Satellite Policy, SpaceX, to Marlene H. Dortch, Secretary, FCC, Appx. A (filed Nov. 22, 2022);

<sup>121</sup> Section 1 of the Communications Act of 1934 as amended provides that the FCC “regulat[es] interstate and foreign commerce in communication by wire and radio so as to make [such service] available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex.” 47 U.S.C. § 151.

rural or Tribal areas, and others who are or have been historically underserved, marginalized, or adversely affected by persistent poverty or inequality, invites comment on any equity-related considerations<sup>122</sup> and benefits (if any) that may be associated with the proposals and issues discussed herein. Specifically, we seek comment on how our proposals may promote or inhibit advances in diversity, equity, inclusion, and accessibility, as well the scope of the Commission’s relevant legal authority

## V. PROCEDURAL MATTERS

### A. Ex Parte Rules - Permit-But-Disclose

42. The proceeding this Notice initiates shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.<sup>123</sup> Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter’s written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with section 1.1206(b). In proceedings governed by section 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. Filing Requirements—Comments and Replies

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

- *Electronic Filers.* Comments may be filed electronically using the Internet by accessing the ECFS: <http://apps.fcc.gov/ecfs>.
- *Paper Filers.* Parties who choose to file by paper must file an original and one copy of each filing.
  - Filings can be sent by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission’s Secretary, Office of the Secretary, Federal Communications Commission.

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<sup>122</sup> The term “equity” is used here consistent with Executive Order 13985 as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. See Exec. Order No. 13985, 86 Fed. Reg. 7009, Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (January 20, 2021).

<sup>123</sup> 47 CFR § 1.1200 *et seq.*

- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701. U.S. Postal Service first-class, Express, and Priority mail must be addressed to 45 L Street NE Washington, DC 20554.
- Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. See FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy, Public Notice, DA 20-304 (March 19, 2020). <https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy>.
- *Persons with Disabilities.* To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

### C. Regulatory Flexibility Act

44. *Regulatory Flexibility Analysis.* The Regulatory Flexibility Act of 1980, as amended (RFA),<sup>124</sup> requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.”<sup>125</sup> Accordingly, we have prepared a Final Regulatory Flexibility Analysis (FRFA) concerning the possible impact of the rule changes contained in this *Report and Order* on small entities. The FRFA is set forth in Appendix B.

45. We have also prepared an Initial Regulatory Flexibility Analysis (IRFA) concerning the potential impact of the rule and policy changes contained in the *Further Notice*. The IRFA is set forth in Appendix C. Written public comments are requested on the IRFA. Comments must be filed by the deadlines for comments on the *Further Notice* indicated on the first page of this document and must have a separate and distinct heading designating them as responses to the IRFA.

### D. Paperwork Reduction Act

46. The Report and Order 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.

47. In this document, we have assessed the effects of requiring later-round NGSO FSS grantees to submit compatibility showings with respect to earlier-round grantees with whom coordination has not yet been reached. We find that doing so will serve the public interest and is unlikely to directly affect businesses with fewer than 25 employees.

48. In addition, the Further Notice of Proposed Rulemaking 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

<sup>124</sup> 5 U.S.C. §§ 601–612. The RFA 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).

<sup>125</sup> 5 U.S.C. § 605(b).

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

**E. Congressional Review Act**

49. [The Commission will submit this draft Report & Order to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, for concurrence as to whether this rule is “major” or “non-major” under the Congressional Review Act, 5 U.S.C. § 804(2).] 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. ORDERING CLAUSES**

50. 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, Part 25 of the Commission’s rules IS AMENDED as set forth in Appendix A, and this Further Notice of Proposed Rulemaking IS ADOPTED.

51. IT IS FURTHER ORDERED that this Report and Order SHALL BE effective 30 days after publication in the Federal Register, except Section 25.261(d) which contains new or modified information collection requirements and will be submitted for approval by the Office of Management and Budget under the Paperwork Reduction Act and shall become effective after the Commission publishes a notice in the Federal Register announcing such approval and the relevant effective date.

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

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

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

## APPENDIX A

## Final Rules

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

## PART 25 – SATELLITE COMMUNICATIONS

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

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

2. Amend § 25.151 by revising paragraphs (a)(10)-(12) and adding paragraph (a)(13).

§ 25.151 Public notice.

(a) \* \* \*

(10) The receipt of space station application information filed pursuant to § 25.110(b)(3)(iii);

(11) The receipt of notifications of non-routine transmission filed pursuant to § 25.140(d);

(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); and

(13) The receipt of NGSO FSS compatibility showings filed pursuant to § 25.261(d).

\* \* \* \* \*

3. Amend § 25.261 by revising paragraph (b), revising the first sentence in paragraph (c)(1), and adding paragraphs (d) and (e) to read as follows:

§25.261 Sharing among NGSO FSS space stations.

\* \* \* \* \*

(b) *Coordination.* NGSO FSS licensees and market access recipients must coordinate in good faith the use of commonly authorized frequencies regardless of their processing round status.

(c) \* \* \*

(1) Each of n (number of) satellite networks involved that were licensed or granted market access through the same processing round, except as provided in paragraph (e) of this section, must select 1/n of the assigned spectrum available in each of these frequency bands. \* \* \*

(d) *Protection of earlier-round systems.* Prior to commencing operations, an NGSO FSS licensee or market access recipient must either certify that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or submit for Commission approval a compatibility showing which demonstrates by use of a degraded throughput methodology that it will not cause harmful interference to any such system with which coordination has not been completed. If an earlier-round system becomes operational after a later-round system has commenced operations, the later-round licensee or market access recipient must submit a certification of coordination or a compatibility showing with respect to the earlier-round system no later than 60 days after the earlier-round system commences operations as notified pursuant to § 25.121(b) or otherwise.

(1) Compatibility showings will be placed on public notice pursuant to § 25.151(a)(13).

(2) While a compatibility showing remains pending before the Commission, the submitting NGSO FSS licensee or market access recipient may commence operations on an unprotected, non-interference basis



with respect to the operations of the system that is the subject of the showing.

(e) *Sunsetting*. Ten years after the first authorization or grant of market access in a processing round, the systems approved in that processing round will no longer be required to protect earlier-rounds systems under paragraph (d) of this section, and instead will be required to share spectrum with earlier-round systems under paragraph (c) of this section.

**APPENDIX B****Final Regulatory Flexibility Analysis**

1. As required by the Regulatory Flexibility Act of 1980 (RFA), as amended,<sup>1</sup> an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, Notice of Proposed Rulemaking (NPRM) in December 2021 in this proceeding.<sup>2</sup> The Commission sought written public comment on the proposals in the NPRM, including comment on the IRFA. No comments were filed addressing the IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.<sup>3</sup>

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

2. In recent years, the Commission has received an unprecedented number of applications for non-geostationary satellite orbit (NGSO) space station licenses, including for NGSO fixed-satellite service (FSS) systems. Traveling closer to the Earth than a traditional GSO satellite, low- and medium-orbit NGSO FSS satellite constellations are capable of providing broadband services to industry, enterprise, and residential customers with lower latency and wider coverage than was previously available via satellite. This rulemaking continues to facilitate the deployment of NGSO FSS systems capable of providing broadband and other services on a global basis, and will promote competition among NGSO FSS system proponents, including the market entry of new competitors.

3. The Order amends the Commission's rules governing the treatment of NGSO FSS systems filed in different processing rounds. In particular, the Order adopts rules specifying that the Commission's existing spectrum sharing mechanism for NGSO FSS systems will be limited to those systems approved in the same processing round. The Order also adopts a rule providing that later-round NGSO FSS systems will have to protect earlier-round systems by using a degraded throughput methodology. In addition, the Order adopts a sunset provision after which earlier-round grantees and later-round grantees will share spectrum on an equal basis under the existing spectrum sharing mechanism for 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 proposed rules and policies presented in the IRFA.

**C. Legal Basis:**

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

**D. Response to Comments by the Chief Counsel for Advocacy of the Small Business**

6. 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.<sup>4</sup> The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

**E. Description and Estimate of the Number of Small Entities to Which the Rules Will**

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<sup>1</sup> See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996, (SBREFA) Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Notice of Proposed Rulemaking, 36 FCC Rcd 17871 (2021).

<sup>3</sup> See 5 U.S.C. § 604.

<sup>4</sup> 5 U.S.C. § 604(a)(3).

## Apply

7. 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.<sup>5</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>6</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>7</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).<sup>8</sup> Below, we describe and estimate the number of small entities that may be affected by the adoption of the final rules.

8. **Satellite Telecommunications.** This industry comprises firms “primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.”<sup>9</sup> Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$38 million or less in annual receipts as small.<sup>10</sup> U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year.<sup>11</sup> Of this number, 242 firms had revenue of less than \$25 million.<sup>12</sup> Additionally, based on Commission data in the 2021 Universal Service Monitoring Report, as of December 31, 2020, there were 71 providers that reported they were engaged in the provision of satellite telecommunications services.<sup>13</sup> Of these providers, the Commission estimates that approximately 48 providers have 1,500 or fewer employees.<sup>14</sup> Consequently using the SBA’s small business size standard, a little more than half of these providers can be considered small entities.

9. **All Other Telecommunications.** The “All Other Telecommunications” category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.<sup>15</sup> This industry also includes

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<sup>5</sup> *Id.*

<sup>6</sup> 5 U.S.C. § 601(6).

<sup>7</sup> 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.”

<sup>8</sup> 15 U.S.C. § 632.

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

<sup>10</sup> See 13 CFR § 121.201, NAICS Code 517410.

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

<sup>12</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see [https://www.census.gov/glossary/#term\\_ReceiptsRevenueServices](https://www.census.gov/glossary/#term_ReceiptsRevenueServices).

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

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

<sup>15</sup> See U.S. Census Bureau, 2017 NAICS Definition, “517919 All Other Telecommunications,” <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017>.

establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.<sup>16</sup> Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.<sup>17</sup> The SBA has developed a small business size standard for “All Other Telecommunications,” which consists of all such firms with annual receipts of \$35 million or less.<sup>18</sup> For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.<sup>19</sup> Of those firms, a total of 1,400 had annual receipts of less than \$25 million and 15 firms had annual receipts of \$25 million to \$49, 999,999.<sup>20</sup> Thus, the Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

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

10. The Order amends rules that are applicable to space station operators requesting a license or authorization from the Commission, or entities requesting that the Commission grant a request for U.S. market access. Specifically, the Order adopts changes to the spectrum sharing requirements among NGSO FSS satellite systems and requires space station licensees and market access grantees that were authorized through a later processing round to submit a technical demonstration that they will not cause harmful interference to space station licensees and market access grantees that were authorized through an earlier processing round, prior to the sunset period, if the later-round grantees have not certified that they have reached a coordination agreement with the earlier-round grantees. The technical demonstration of compatibility between the later-round system and the earlier-round system is based on a degraded throughput methodology that consists of three steps. The first step is to establish a baseline of performance. To do this, an operator models the earlier-round NGSO system’s performance without any additional interference by computing the earlier-round NGSO system’s probabilistic carrier-to-noise (C/N) level using its published system parameters and a rain-attenuation model. This provides the baseline: (1) the earlier-round system’s time-weighted average throughput (derived by computing the spectral efficiency from the C/N results), and (2) the earlier-round system’s link unavailability time percentage (i.e., the percentage of time when the earlier-round system’s expected C/N will fall below its minimum usable level). The second step is to repeat the analysis above, adding in the effect of the later-round system’s interference into the earlier-round system. This produces a second measurement of time-weighted average throughput and link unavailability time-percentage. The third step is to compare these two sets of figures to measure the effect of any additional interference. If the resulting performance impact exceeds the permissible limits, then the later-round system must adjust its operations to mitigate interference to a permissible level.

11. Because of the costs involved in developing and deploying an NGSO FSS satellite constellation, we anticipate that few NGSO FSS operators affected by this rulemaking would qualify under the definition of “small entity.”

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<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> See 13 CFR § 121.201, NAICS Code 517919.

<sup>19</sup> See U.S. Census Bureau, 2012 Economic Census of the United States, Table ID: EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012, NAICS Code 517919, <https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=517919&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false>.

<sup>20</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard of annual receipts of \$35 million or less.

### **G. Steps Taken to Minimize the Significant Economic Impact on Small Entities**

12. 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.”<sup>21</sup>

13. The Order adopts a requirement for NGSO FSS systems authorized through a later processing round to either complete a coordination agreement with, or submit a technical demonstration using a degraded throughput methodology that they will not interfere with, NGSO FSS systems authorized through an earlier processing round. The Commission adopted this requirement to ensure that earlier-round NGSO FSS systems will continue to have their services protected as new entrants deploy their systems. The Commission selected a degraded throughput methodology as the basis for the technical demonstration because it offers the most promising technical path for protection of earlier-round systems without unduly burdening the operations of later-round systems. The Commission also considered use of an interference-to-noise ratio (I/N) as a protection criteria for earlier-round systems, or use of a modified band-splitting approach in which earlier-round systems and later-round systems would have to operate in different spectrum bands, with the earlier-round system entitled to more spectrum than the later-round system, in the event that an interference threshold is surpassed. The Commission did not adopt an I/N protection criteria because it may unduly burden the operations of later-round systems, and did not adopt a modified band-splitting approach because the Commission preferred a technically grounded inter-round sharing solution. While a technical demonstration using a degraded throughput methodology might be more burdensome to produce than a demonstration using an I/N level, the record demonstrated the feasibility of degraded throughput analyses and their superior ability to model contemporary NGSO FSS systems and more precisely account for the likelihood of harmful interference.

14. As noted above, because of the high costs typically involved in the development of NGSO FSS constellations, we anticipate that few small entities will be required to submit such technical demonstrations. However, for small entities seeking to operate NGSO FSS systems, adoption of a sunset provision combined with use of degraded throughput methodology will provide operators incentive to innovate and to coordinate with other systems, which will increase spectral efficiency and permit entities to implement newer socially-valuable technologies.

### **H. Report to Congress**

15. The Commission will send a copy of this Report and Order, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.<sup>22</sup> 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 this Second Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.

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<sup>21</sup> 5 U.S.C. § 603(c)(1)-(4).

<sup>22</sup> 5 U.S.C. § 801(a)(1)(A).

## APPENDIX C

## Initial Regulatory Flexibility Analysis

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

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

2. In recent years, the Commission has received an unprecedented number of applications for non-geostationary satellite orbit (NGSO) space station licenses, including for NGSO fixed-satellite service (FSS) systems. Traveling closer to the Earth than a traditional geostationary-satellite orbit (GSO) satellite, low- and medium-orbit NGSO FSS satellite constellations are capable of providing broadband services to industry, enterprise, and residential customers with lower latency and wider coverage than was previously available via satellite. This rulemaking continues to facilitate the deployment of NGSO FSS systems capable of providing broadband and other services on a global basis, and will promote competition among NGSO FSS system proponents, including the market entry of new competitors.<sup>4</sup>

3. This Further Notice seeks public comment on proposed revisions to the Commission's rules governing the treatment NGSO FSS systems filed in different space station processing rounds. Specifically, this Further Notice seeks comment on details regarding the implementation of a degraded throughput methodology.

**B. Legal Basis:**

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

**C. Description and Estimate of the Number of Small Entities to Which the Proposed Rulemaking Will Apply:**

5. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules and policies, if adopted.<sup>5</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>6</sup> In addition, the term "small business" has

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<sup>1</sup> 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601-612 has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 847 (1996).

<sup>2</sup> 5 U.S.C. § 603(a).

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

<sup>4</sup> *See generally* Executive Order No. 14036, Promoting Competition in the American Economy, 86 FR 36987 (July 9, 2021 ("The heads of all agencies shall consider using their authorities to further the policies set forth in section 1 of this order, with particular attention to: (i) the influence of their respective regulations, particularly any licensing regulations, on concentration and competition in the industries under their jurisdiction; and..."). Executive Order at 86 FR 36991.

<sup>5</sup> 5 U.S.C. § 603(b)(3).

<sup>6</sup> 5 U.S.C. § 601(6).

the same meaning as the term “small business concern” under the Small Business Act.<sup>7</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.<sup>8</sup>

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

7. ***All Other Telecommunications.*** The “All Other Telecommunications” category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.<sup>15</sup> This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.<sup>16</sup> Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.<sup>17</sup> The SBA has developed a small business size standard for “All Other

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<sup>7</sup> 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.”

<sup>8</sup> 15 U.S.C. § 632.

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

<sup>10</sup> See 13 CFR § 121.201, NAICS Code 517410.

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

<sup>12</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see [https://www.census.gov/glossary/#term\\_ReceiptsRevenueServices](https://www.census.gov/glossary/#term_ReceiptsRevenueServices).

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

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

<sup>15</sup> See U.S. Census Bureau, *2017 NAICS Definition, “517919 All Other Telecommunications,”* <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017>.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

Telecommunications”, which consists of all such firms with annual receipts of \$35 million or less.<sup>18</sup> For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.<sup>19</sup> Of those firms, a total of 1,400 had annual receipts less than \$25 million and 15 firms had annual receipts of \$25 million to \$49, 999,999.<sup>20</sup> Thus, the Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

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

8. The Commission seeks comment on potential changes to the spectrum sharing requirements among NGSO FSS satellite systems. Specifically, comment is sought on how to implement the degraded throughput methodology. Because of the costs involved in developing and deploying an NGSO FSS satellite constellation, we anticipate that few NGSO FSS operators affected by this rulemaking would qualify under the definition of “small entity.”

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

9. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rules for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.”<sup>21</sup>

10. The Commission adopted a requirement that, prior to commencing operations, an NGSO FSS licensee or market access recipient must either certify that it has completed a coordination agreement with any operational NGSO FSS system licensed or granted U.S. market access in an earlier processing round, or submit a showing for Commission approval that it will not cause harmful interference to any such system with which coordination has not been completed using a degraded throughput methodology. This Further Notice invites comment on which specific metrics should be used to define the protection afforded to an earlier-round NGSO FSS system from a later-round system.

11. The Commission seeks comment on the appropriate values and assumptions to be used with the degraded throughput requirement. The Commission also seeks comment on whether to adopt a rule limiting aggregate interference from NGSO FSS systems that were authorized in a later processing round into NGSO FSS systems authorized in an earlier processing round. The Commission also seeks comment on alternative means of protection of earlier-round NGSO FSS systems.

12. The Further Notice also seeks comment on whether the Commission should expect that there will be a maximum number of NGSO FSS systems that can be accommodated in a given frequency band and if so, how should that affect any inter-round protection criteria and the opening of additional processing rounds. The Further Notice also seeks comment on how the degraded throughput methodology accommodates multiple NGSO systems that span multiple processing rounds.

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<sup>18</sup> See 13 CFR § 121.201, NAICS Code 517919.

<sup>19</sup> See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012*, NAICS Code 517919, <https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=517919&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false>.

<sup>20</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard of annual receipts of \$35 million or less.

<sup>21</sup> 5 U.S.C. § 603(c)(1)–(c)(4).



13. To assist in the Commission's evaluation of the economic impact on small entities, as a result of actions that have been proposed in the Further Notice, and to better explore options and alternatives, the Commission seeks comment on whether any of the burdens associated with the filing, recordkeeping and reporting requirements described above can be minimized for small entities.<sup>22</sup> Additionally, the Commission seeks comment on whether any of the costs associated with any of the proposed requirements to eliminate unlawful robocalls can be alleviated for small entities.<sup>23</sup> The Commission expects to more fully consider the economic impact and alternatives for small entities based on its review of the record and any comments filed in response to the Further Notice and this IRFA.

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

14. None

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<sup>22</sup> *Id.* at para. 92.

<sup>23</sup> *Id.*

**APPENDIX D**  
**List of Commenters**

**Comments in IB Docket No. 21-456**

AST&Science LLC (AST)  
Astra Space Platform Services LLC (Astra)  
The Boeing Company (Boeing)  
Hughes Network Systems, LLC (Hughes)  
Inmarsat Inc. (Inmarsat)  
Intelsat License LLC (Intelsat)  
Kepler Communications Inc. (Kepler)  
Kuiper Systems LLC (Kuiper)  
Mangata Networks LLC (Mangata)  
New America's Open Technology Institute, Public Knowledge, the Center for Rural Strategies, Next Century Cities, the Benton Institute for Broadband & Society, Oregon Fiber Partnership (dba Link Oregon), and Access Humboldt (collectively, Public Interest Organizations or PIOs)  
O3b Limited (O3b)  
SN Space Systems Limited (SN Space Systems)  
SpaceLink Corporation (SpaceLink)  
Space Exploration Holdings, LLC (SpaceX)  
Telesat Canada (Telesat)  
Viasat, Inc. (Viasat)  
WorldVu Satellites Limited (OneWeb)

**Reply Comments in IB Docket No. 21-456**

AST  
Boeing  
Intelsat  
Kepler  
Kuiper  
Mangata  
OneWeb  
O3b  
The Satellite Industry Association (SIA)  
SN Space Systems  
SpaceLink  
SpaceX  
TechFreedom  
Telesat  
ViaSat

**Ex Parte Filings in IB Docket No. 21-456**

Letter from Doris Matsui and Brett Guthrie, Members of U.S. Congress (filed Apr. 11, 2022)  
Kuiper (filed May 18, 2022)  
Kuiper (filed May 24, 2022)  
Kuiper (filed May 24, 2022)  
Kuiper (filed May 25, 2022)  
Kuiper (filed May 25, 2022)  
Hughes (filed June 2, 2022)

Kuiper (filed Aug. 4, 2022)  
Intelsat (filed Aug. 15, 2022)  
Viasat (filed Aug. 24, 2022)  
Kuiper (filed Sept. 6, 2022)  
SpaceX (filed Sept. 7, 2022)  
Viasat (filed Sept. 20, 2022)  
Kuiper (filed Sept. 23, 2022)  
SpaceX (filed Sept. 28, 2022)  
Kuiper (filed Oct. 13, 2022)  
SpaceX (filed Oct. 21, 2022)  
O3b (filed Oct. 26, 2022)  
SpaceX (filed Nov. 17, 2022)  
O3b (filed Nov. 17, 2022)  
EchoStar Satellite Services LLC and Hughes, Globalstar, Inc., Iridium Communications Inc., Inmarsat, OneWeb, O3b, Telesat, Viasat (filed Nov. 21, 2022)  
Kepler, OneWeb, O3b, SpaceX (filed Nov. 22, 2022)  
SpaceX (filed Nov. 22, 2022)  
SpaceX (filed Nov. 23, 2022)  
Intelsat (filed Dec. 1, 2022)  
Viasat (filed Dec. 2, 2022)  
Kuiper (filed Dec. 14, 2022)  
SpaceX (filed Dec. 16, 2022)  
PIOs (filed Dec. 16, 2022)  
PIOs (filed Dec. 16, 2022)  
PIOs (filed Dec. 20, 2022)  
PIOs (filed Dec. 20, 2022)  
Stellar Telecommunications SAS (Stellar) (filed Jan. 13, 2023)  
PIOs (filed Feb. 1, 2023)  
SpaceX (filed Feb. 7, 2023)  
Kuiper (filed Feb. 17, 2023)  
Kuiper (filed Feb. 23, 2023)  
Kuiper (filed Feb. 28, 2023)  
SpaceX (filed Feb. 28, 2023)  
Mangata (filed Mar. 1, 2023)  
Public Knowledge (filed Mar. 3, 2023)  
Kuiper (filed Mar. 3, 2023)  
Mangata (filed Mar. 10, 2023)  
SES & O3b (filed Mar. 13, 2023)  
Mangata (filed Mar. 15, 2023)  
Open Technology Institute at New America and Public Knowledge (filed Mar. 15, 2023)  
Kuiper (filed Mar. 16, 2023)  
OneWeb (filed Mar. 2, 2023)  
SpaceX (filed Mar. 22, 2023)  
Mangata (filed Mar. 23, 2023)