



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 25

[IB Docket No. 16-408; FCC 17-122]

Updates Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: In this document, the Federal Communications Commission (Commission) adopts a regulatory framework to facilitate the delivery of broadband services through satellite constellation networks. The Commission updates, clarifies and streamlines the current rules governing non-geostationary satellite orbit, fixed-satellite service systems to better reflect current technology and promote additional operational flexibility.

DATES: Effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, except the amendments to §§ 25.114, 25.115, 25.146, and 25.164, which contain information collection requirements that have not been approved by Office of Management and Budget (OMB). The Commission will publish a document in the Federal Register announcing such OMB approval and the effective date of these rule amendments. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]** except for the material contained in § 25.146. The Commission will publish a document in the Federal Register announcing the approval date of this material.

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Report and Order, FCC 17-122, adopted September 26, 2017, and released September 27, 2017. The full text of the Report and Order is available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-122A1.pdf. It is available for inspection and copying during business hours in the FCC Reference Information Center, Portals II, 445 12th Street SW., Room CY-A257, Washington, DC 20554. To request materials in accessible formats for people with disabilities, send an email to FCC504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

Synopsis

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

17.8-18.3 GHz

We add a secondary FSS allocation in the 17.8-18.3 GHz band. As further explained below, we believe that the power flux-density (PFD) limits we are adopting on space station transmissions in this band will be sufficient to protect the fixed service from harmful interference. In addition, while terrestrial use of this band is significant, there are areas, particularly rural areas, where terrestrial deployment is less dense and by using mitigating techniques like siting considerations, off-axis rejection, and shielding, we expect FSS earth

stations will be able to operate successfully without receiving harmful interference. Even if a mobile-service allocation is introduced in the future, there would still be areas where FSS earth stations would be able to deploy, as terrestrial deployment would not likely cover 100 percent of U.S. territory. If interference does occur, earth stations can switch to other bands not shared with terrestrial users or use alternative mitigation techniques. We decline to adopt a primary FSS allocation at this time because we wish to preserve this band as an unrestrained, potential growth band for the terrestrial fixed service in the future and because the Commission is currently studying potential future terrestrial operations in this band. Accordingly, we adopt a secondary FSS allocation in the 17.8-18.3 GHz band, subject to PFD limits as discussed below.

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

18.3-18.6 GHz and 19.7-20.2 GHz

Consistent with the treatment adopted internationally and in the paired uplink bands, and to permit greater use of these bands, we will allow NGSO FSS systems to operate on an unprotected, non-interference basis with respect to GSO FSS networks in the 18.3-18.6 GHz and

19.7-20.2 GHz bands, subject to international equivalent power flux-density (EPFD) limits as explained below.

18.8-19.3 GHz and 28.6-29.1 GHz

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

With respect to Intelsat's assertion that any limitation of GSO FSS operations in the band to secondary status be applied only to service offered within the United States, we observe that the Commission has historically applied its Ka-band satellite designations to U.S.-licensed operations around the world. While Intelsat asks that we now adopt a regime of priority in the 18.8-19.3 GHz band for operations outside the United States based on ITU filing date, we decline to do so here. The Commission has never previously adopted a priority regime in these bands that relied on the order of an operator's ITU filing. Notably, the ITU's Article 9 coordination procedures do not apply between filings from the same administration. Thus, today, the date of receipt of an ITU coordination request has no bearing on the priority relationship

between two U.S.-filed satellite systems, either at the ITU or with the Commission. We upset no interests of existing GSO FSS operators by adopting a new, secondary designation for their use in the 18.8-19.3 GHz band because under the current Commission rules U.S.-authorized GSO FSS operations in this band have no status vis-à-vis U.S.-authorized NGSO FSS operations anywhere in the world. Further, because of the importance of this NGSO FSS primary band, we agree with SpaceX that this designation should continue to govern the relationship between NGSO and GSO systems licensed by the Commission and operating under a U.S. ITU filing, even for operations outside the United States.

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

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

Given the relatively small and fragmented nature of the 19.3-19.4 GHz, 19.6-19.7 GHz, and 29.3-29.5 GHz band segments, we believe that consistent treatment with international allocations will allow for additional FSS operations without unduly complicating the regulatory environment for satellite operators. Accordingly, we will allow both GSO FSS and NGSO FSS operations in the 19.3-19.4 GHz and 19.6-19.7 GHz bands, subject to PFD limits to protect terrestrial stations as discussed below. Consistent with No. 5.523D of the ITU Radio

Regulations, GSO FSS networks will be co-equal with NGSO MSS feeder links in this band. In addition, because both NGSO MSS feeder links and NGSO FSS systems have been proposed in these bands in the current processing rounds, sharing among them will be done under the same sharing mechanism of $\Delta T/T$ of 6 percent applicable between NGSO FSS systems, discussed below. This band will continue to be shared on a co-primary basis with the fixed service on the basis of first-in-time coordination. To ensure that both types of operation will be enabled, and consistent with international treatment, we will require NGSO FSS systems to operate on a secondary basis with respect to GSO FSS networks in these bands.

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

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

Codification of Frequency Uses

For clarity, the Notice proposed to codify the Ka-band Plan's satellite designations into footnotes to the U.S. Table of Frequency Allocations, and to remove duplicative notes in section

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

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

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

Parties further argue that blanket licensing of earth stations should be permitted on a secondary basis to the fixed service in these bands. We agree that blanket licensing in the 10.7-

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

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

Since we are relocating most of the frequency-use restrictions in this paragraph to the Table of Frequency Allocations, we believe that a bare list of FSS frequencies, without notations of status (primary or secondary), other primary uses, restrictions to certain types of FSS systems or designations among FSS systems, coordination obligations, etc., would not be useful even if maintained accurately. And section 25.202(a)(1) has not been accurate since at least 1996, and is incomplete today. Allocated FSS frequency bands above 50.2 GHz are presently omitted from section 25.202(a)(1). These omissions falsely imply, pursuant to section 25.202(b), that the missing frequencies are subject to case-by-case licensing rather than licensing under default service rules in section 25.217. Because of its potential to generate confusion and no apparent

benefit, we delete the FSS frequency list in section 25.202(a)(1). We also reject SpaceX's suggestion to note the Ka-band designations in both section 25.202(a)(1) and the Table of Frequency Allocations. We do not wish to recreate the Table in section 25.202(a)(1), an invitation for discrepancies, and see no reason to single out the Ka-band designations over the many other limitations noted in the Table.

Protection of Terrestrial Services

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

Sharing with Other Platforms. The Notice also inquired how we should take into account sharing between NGSO FSS systems and non-satellite technologies and platforms. Lockheed

offers considerations for sharing between NGSO FSS systems and stations on aerial platforms that operate in the fixed service, and notes that further study is needed. We agree that this issue warrants future consideration. However, we are not in a position now to prescribe sharing rules for this scenario and do not find a basis in the record for initiating such a proceeding in this docket, including the question of fixed service operations in bands not designated for this service today.

Protection of GSO Networks

Ka-band EPFD Limits. We adopt the ITU EPFD limits in the 17.8-30 GHz frequency range, which will harmonize our rules with international regulations and provide greater certainty for NGSO FSS operators. While we recognize that these limits were not developed with the most advanced modern GSO networks in mind, ViaSat has not proposed any new EPFD limits, and it would not be advisable to remain without Ka-band EPFD limits in our rules pending such deliberations. Similarly, we decline to adopt Boeing's suggestion to incorporate an ITU Recommendation, which is not an international requirement, because this would be inconsistent with our desire to harmonize the treatment of NGSO FSS systems with global regulations. We will require NGSO FSS licensees to comply with existing aggregate EPFD limits as well, and may intervene if operators cannot agree among themselves how to ensure the aggregate limits are met.

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

Default GSO-NGSO Sharing. We believe that section 25.156(d)(5) is unnecessarily restrictive, and that an equivalent to the ITU provision No. 22.2, which applies internationally,

will serve as a better default. Generally, both GSO networks and NGSO FSS systems can operate using the same frequencies if NGSO systems are required to protect GSO networks. If NGSO systems are not required to protect GSO networks, GSO networks may be precluded entirely, because as a general matter they have less flexibility to avoid causing harmful interference to NGSO systems or protecting themselves while operating in the same band. Accordingly, to allow both types of uses by default, we will require NGSO systems to protect GSO FSS and GSO BSS networks, similar to the ITU provision. However, the extent of the protection of GSO networks can be more or less restrictive depending on the specific EPFD limits NGSO FSS systems may have to meet within a given frequency band. We expect that EPFD limits will continue to be useful in facilitating sharing and will likely be developed in additional bands in the future. Once adopted, NGSO operators will be provided greater certainty with respect to their obligations to protect GSO networks.

Rule Consolidation and Streamlining

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

certify that they will meet the international EPFD limits. After licensing, we will require NGSO FSS operators to successfully undergo ITU review of their EPFD demonstrations and to provide the Commission with the input data files used for public disclosure.

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

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

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

deletion of section 25.146(h) will simply remove a redundant provision without affecting the rights or obligations of any licensee or applicant, we find, for good cause, that the notice and public procedure rulemaking requirements specified in the Administrative Procedure Act (APA) is unnecessary.

Spectrum Sharing among NGSO FSS Systems

Default Sharing. We believe that coordination among NGSO FSS operators in the first instance offers the best opportunity for efficient spectrum sharing. Before resorting to a default mechanism, we will require authorized NGSO FSS operators to discuss their technical operations in good faith with an aim to accommodating both systems. If a question arises as to whether one operator is coordinating in good faith, the matter may be brought to the Commission and we may intervene to enforce the condition and aid the parties to find a solution. Such good faith coordination also offers the best means to mitigate potentially unequal burdens for smaller NGSO FSS systems or those in highly elliptical orbits. And while we encourage similar industry cooperation in the form of a “clearinghouse” or other organization, the current record is insufficient to mandate the creation of such an entity.

Should coordination remain ongoing at the time both systems are operating, or if good faith coordination otherwise proves unsuccessful, we will require band-splitting when the $\Delta T/T$ of an interfered link exceeds 6 percent. While the Commission once found this long-term interference criterion to be unsuited for NGSO FSS sharing, based on the current record we conclude that this approach is the best method for characterizing the situations in which there is potential for interference between NGSO FSS systems. Although we recognize that this will be a complex calculation, as noted in the record, using this threshold will provide both equal access to spectrum and a flexible mechanism that is specific to the particular interference situation and systems involved. Further, the single avoidance angle method previously adopted has now been

shown to not address all of the varieties of new proposed systems. This is equally true if a fixed avoidance angle is coupled with a further interference criterion, such as a $\Delta T/T$ of 25 percent. Further, to provide regulatory certainty while operators pursue the development of their constellations, we will not consider this issue in a Further Notice without first gaining experience in its implementation. After monitoring the development of NGSO FSS systems, we may revisit our specific threshold for spectrum-splitting in light of the matured technical designs of those systems that have continued to progress.

In contrast to a $\Delta T/T$ of 6 percent threshold, Telesat's proposal to award priority to a single NGSO FSS operator according to the date of receipt of its ITU coordination request would give no certainty to other operators that they may use any portion of the spectrum absent that operator's consent. In other words, absent coordination, Telesat asks the Commission to pick a single "winner"—Telesat, in many frequency bands—that would be given certainty of operations in wide swaths of spectrum without offering any certainty to a multitude of other proposals in the same bands. This regime could unduly chill investment in competing systems. If the first priority system is not ultimately deployed, it could delay the provision of NGSO FSS broadband by lower-priority systems fearful of a hypothetical sharing environment. And it gives the highest priority system weaker incentives to accommodate competing NGSO FSS systems. In contrast, our default sharing solution sets all applicants in a processing round on an equal basis. This equality will form the basis of the necessary coordination discussions. We expect more accommodation, more sharing, and ultimately, more competition, will result from treating NGSO FSS applicants equally than by a first-come, first-served regime in a potentially challenging sharing environment. In addition, Telesat's proposal would cause confusion because the ITU dates of receipt for any two U.S.-licensees would not have any international significance, since coordination between these two U.S. systems is a domestic matter and not subject to ITU rules.

Accordingly, to set all NGSO FSS applicants and market access petitioners in the processing rounds on an equal footing and because no one angle is appropriate for all systems, we adopt a $\Delta T/T$ of 6 percent threshold to define the default sharing required among NGSO FSS systems.

Scope of Default Sharing Mechanism. Above, we chose a spectrum splitting sharing mechanism that is triggered when a $\Delta T/T$ threshold of 6 percent is exceeded. This approach is suited to varying NGSO FSS system designs. We also believe this threshold is appropriate for NGSO FSS systems in any of the currently envisioned frequency bands because it takes into account each specific system design in any band. Accordingly, we will apply this criterion by default to NGSO FSS systems in any frequency band. We do not see merit in considering band segmentation. In a worst case scenario, when the $\Delta T/T$ threshold of 6 percent threshold is exceeded 100 percent of the time, the result is the equivalent to band segmentation. Thus, our method of spectrum sharing allows for the possibility of co-frequency operation absent a coordination agreement, but is in no case less favorable to licensees than strict band segmentation would be.

SpaceX and SES/O3b ask that we clarify the geographic scope of our NGSO FSS sharing method as it relates to non-U.S.-licensed satellite systems granted U.S. market access. While SpaceX argues that it should govern such operations worldwide, a grant of market access typically considers radiofrequency operations only within the United States. Sharing between systems of different administrations internationally is subject to coordination under Article 9 of the ITU Radio Regulations. We believe this international regime is the appropriate forum to consider NGSO FSS radiofrequency operations that fall outside the scope of a grant of U.S. market access. Because ITU coordination procedures do not apply between two U.S. systems, our spectrum splitting sharing mechanism triggered when a $\Delta T/T$ threshold of 6 percent is exceeded will govern such operations both within and outside the United States.

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

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

Applications after a Processing Round. The purpose of the recent processing rounds was to establish a sharing environment among NGSO systems, to provide a measure of certainty in lieu of adopting an open-ended requirement to accommodate all future applicants. At the same time, it is uncertain how many of the pending system applications will proceed to full deployment. While we will initially limit sharing under the $\Delta T/T$ of 6 percent threshold to qualified applicants in a processing round, treatment of later applicants to approved systems must

necessarily be case-by-case based on the situation at the time, and considering both the need to protect existing expectations and investments and provide for additional entry as well as any comments filed by incumbent operators and reasoning presented by the new applicant.

Milestones

NGSO Milestones. Our chosen milestone approach seeks to accomplish two goals. First, it should be simple, clear, and easy to administer. Second, it should discourage applicants from seeking authorizations for oversized, unrealistic constellations, even if those applicants eventually provide substantial service to the public. Such unused authorizations for spectrum-orbit resources can create unnecessary coordination burdens and uncertainty for other operators. These may deter an operator that is able to proceed with its authorized satellite system. Proposals that allow applicants to set their own milestone objectives, that set more complex milestones, or that re-engage the Commission in construction determinations would not achieve our dual milestone goals.

Instead, given the desire for additional flexibility evident in the record, we conclude that requiring launch and operation of 50 percent of the authorized satellite system within six years of grant strikes an appropriate balance between providing flexibility for the licensee and a measure of certainty for other operators. If a licensee fails to meet this milestone, its authorization will be reduced to the number of satellites in use on the milestone date, and the bond will be forfeit. Operators that successfully complete the first milestone will have an additional three years to deploy the remainder of their constellation, free of bond obligations. After the milestone period, we will require licensees to maintain 50 percent of their authorized constellation in orbit at all times, or have their constellation size similarly reduced to conform to their diminished operations. Reducing the first milestone requirement from 75% deployment, as proposed in the Notice, to 50% deployment will not necessarily affect the coverage of the authorized system. A

constellation may be able to achieve its full coverage despite having only 50% of its satellites deployed. Further, licensees will be required to complete their authorized constellations within 9 years. Finally, because operators of smaller satellite systems may also benefit from deployment flexibility, we will apply these milestones and requirements equally to all NGSO systems, regardless of size.

We decline to extend the bond period to nine years. Under our “escalating” bond requirement, liability increases from \$1,000,000 to \$5,000,000 progressively over the six-year bond period. Extending this period to nine years, without appropriately increasing the maximum liability, would weaken the incentive of the bond and is unsupported by the record. In addition, because it could vitiate our percentage-based milestone requirement, we will not allow a modification of the authorized number of satellites to reduce a licensee’s milestone obligation after grant. Further, a licensee may request to modify its authorization at any time to deploy additional satellites. These applications will be considered on a case-by-case basis as “NGSO-like” applications filed after a processing round. Given this additional opportunity for modification and public comment when plans have matured, we decline to extend the milestone period beyond 9 years, or to forgo a fixed completion milestone altogether, as creating undue uncertainty for other operators.

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

International Coverage

Sections 25.145 and 24.146. Sections 25.145(c)(1) and 25.146(i)(2) require certain NGSO FSS systems to be capable of providing service anywhere between 70° North Latitude and 55° South Latitude for at least 18 hours of every day. The Notice proposed to delete these international coverage requirements, noting they prohibit the use of certain non-geostationary orbits and system designs. Every commenter on the issue agrees that removing this requirement would afford operators greater design flexibility. We agree with this assessment and therefore delete the international coverage requirements in these sections.

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

Pending Applications

The motivating purpose for this rulemaking was to update our rules and policies to prepare for a new generation of NGSO FSS satellite systems. Many of these applications are now pending before the Commission. Accordingly, as of their effective date, we will apply the rules and procedures we adopt in this Report and Order to pending space station applications and petitions for U.S. market access. In addition, we will allow current licensees and market access recipients to submit a simple letter request to modify particular conditions in their grants consistent with the rule changes adopted in this Order. The Commission may apply new procedures to pending applications if doing so does not impair the rights an applicant possessed when it filed its application, increase an applicant's liability for past conduct, or impose new duties on applicants with respect to transactions already completed. 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. Accordingly, applying our new rules and procedures to pending space station applications will not impair the rights any applicant had at the time it filed its application. Nor will doing so increase an applicant's liability for past conduct.

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

PAPERWORK REDUCTION ACT

This document contains modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, other

Federal agencies, and the general public will be invited to comment on the modified information collection requirements contained in this document. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees.

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

CONGRESSIONAL REVIEW ACT

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).

FINAL REGULATORY FLEXIBILITY ANALYSIS

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

A. Need for, and Objectives of, the Rules

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

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

- 1) Allocates additional spectrum for use by FSS systems on a secondary basis in the 17.8-18.3 GHz band, subject to power flux-density limits designed to protect primary terrestrial services.
- 2) Allows additional operation of NGSO FSS systems in segments of the 17.8-20.2 GHz band within limits protective of FSS satellite systems in the geostationary-satellite orbit (GSO).
- 3) Allows GSO FSS operation in the 18.8-19.3 GHz band on an unprotected, non-interference basis with regard to NGSO FSS systems, to provide additional operational flexibility.
- 4) Amends the Commission's satellite milestone policies and geographic coverage rules to provide additional regulatory flexibility to operators of NGSO FSS systems.

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

There were no comments filed that specifically addressed the IRFA.

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

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. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

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

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. The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.” In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act. 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). Below, we describe and estimate the number of small entity licensees that may be affected by adoption of the final rules.

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

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

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

The Order adopts several rule changes that would affect compliance requirements for space station operators. As noted above, these parties rarely qualify as small entities. For example, we allow additional uses of certain frequencies within the 17.8-20.2 GHz band, subject to compliance with power limits designed to protect other users of the bands. We also modify rules for satellite system implementation to provide additional flexibility to operators. And we eliminate a geographic service requirement that restricts the design possibilities of certain NGSO FSS satellite systems. In total, the actions in this Order are designed to achieve the Commission's mandate to regulate in the public interest while imposing the lowest necessary burden on all affected parties, including small entities.

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

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.”

In this Report and Order, the Commission relaxes or removes requirements on NGSO FSS operators, including changing the 100 percent deployment milestone after six years to a 50 percent milestone at that time, and allowing three additional years to launch the remaining constellation; removing geographic coverage requirements; and allowing applicants to certify, rather than demonstrate, that they will comply with equivalent power-flux density limits. In addition, the Order provides greater flexibility to both geostationary and non-geostationary

satellite operators to provide service in additional portions of the 17.8-20.2 GHz frequency band. Overall, we believe the actions in this document will reduce burdens on the affected licensees, including any small entities.

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

None.

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

Incorporation by Reference

This final rule incorporates by reference four elements of the ITU Radio Regulations, Edition of 2016, into part 25 for specific purposes:

- (1) ITU Radio Regulations, Volume 1: Articles, Article 21, “Terrestrial and space services sharing frequency bands above 1 GHz,” Section V, “Limits of power flux-density from space stations,” Edition of 2016.

Article 21 of the ITU Radio Regulations contains power limits on satellite transmissions to protect terrestrial and other services. The Commission requires under §25.146(a) that non-geostationary, fixed-satellite service (NGSO FSS) satellite operators certify compliance with these limits. Applicants and licensees affected by §25.146(a) should become familiar with the incorporated materials.

- (2) ITU Radio Regulations, Volume 1: Articles, Article 22, “Space services,” Section II, “Control of interference to geostationary-satellite systems,” Edition of 2016.

Article 22 of the ITU Radio Regulations contains power limits on NGSO FSS satellite systems to protect geostationary satellite networks from unacceptable interference. The Commission requires under §25.146(a) that NGSO FSS operators certify compliance with these limits. In addition, compliance with the Article 22 limits satisfies the requirement in §25.289 that an NGSO FSS satellite operator not cause unacceptable interference to geostationary satellite networks. Applicants and licensees affected by §25.146(a) or 25.289 should become familiar with the incorporated materials.

- (3) ITU Radio Regulations, Volume 3: Resolutions and Recommendations, Resolution 76 (Rev.WRC-15), “Protection of geostationary fixed-satellite service and geostationary broadcasting-satellite service networks from the maximum aggregate equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems in frequency bands where equivalent power flux-density limits have been adopted,” Edition of 2016.

Resolution 76 of the ITU Radio Regulations contains aggregate power limits on NGSO FSS satellite transmissions to protect geostationary satellite networks, related to the per-system power limits in Article 22. The Commission requires under §25.146(a) that NGSO FSS satellite operators also certify compliance with these aggregate limits. Applicants and licensees affected by §25.146(a) should become familiar with the incorporated materials.

- (4) ITU Radio Regulations, Volume 3: Resolutions and Recommendations, Resolution 85 (WRC-03), “Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems,” Edition of 2016.

Resolution 85 of the ITU Radio Regulations concerns the assessment of compliance with the power limits on NGSO FSS systems in Article 22. The Commission requires under 25.146(c)

that NGSO FSS operators receive a favourable or qualified favourable finding under this Resolution. Applicants and licensees affected by §25.146(a) should become familiar with the incorporated materials.

Materials (1) through (4) above are available for free download at <http://www.itu.int/pub/R-REG-RR-2016>. In addition, copies of all of the materials are available for purchase from the ITU through the contact information provided in section 25.108, and are available for public inspection at the Commission address noted in the rule as well.

ORDERING CLAUSES

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

IT IS FURTHER ORDERED that this Report and Order SHALL BE effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, except that those amendments which contain new or modified information collection requirements that require approval by the Office of Management and Budget under the Paperwork Reduction Act WILL BECOME EFFECTIVE after the Commission publishes a document in the Federal Register announcing such approval and the relevant effective date.

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

IT IS ORDERED, pursuant to 47 U.S.C. 154(i), 157(a), 160, 161, 303(c), 303(f), 303(g), 303(r), 308(b), that this Report and Order is adopted, the policies, rules, and requirements discussed herein are adopted, and part 25 of the Commission's rules is amended as set forth below.

IT IS FURTHER ORDERED that the International Bureau is delegated authority to issue Public Notices consistent with this Report and Order.

IT IS FURTHER ORDERED that the International Bureau will issue a Public Notice announcing the effective date for all of the changes adopted in this Report and Order.

IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

List of Subjects

47 CFR Part 2

Earth stations, Radio, Satellites.

47 CFR Part 25

Administrative practice and procedure, Earth stations, Incorporation by reference, Satellites.

FEDERAL COMMUNICATIONS COMMISSION.

Katura Jackson,
Federal Register Liaison Officer.
Office of the Secretary

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 2 and 25 as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;

GENERAL RULES AND REGULATIONS

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

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

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

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

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

The revisions and additions read as follows:

§2.106 Table of Frequency Allocations.

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

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

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

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

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

NG62 In the bands 28.5-29.1 GHz and 29.25-29.5 GHz, stations in the fixed-satellite service shall not cause harmful interference to, or claim protection from, stations in the fixed service operating under the following call signs: KEB35, KGB72, KGC79, KIL20, KME49, KQG58, KQH74, KSA96, KSE73, KVVH83, KYJ33, KZS88, WAX78, WLT380, WMK817, WML443, WMP367, and WSL69.

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

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

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

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

PART 25 – SATELLITE COMMUNICATIONS

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

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

4. In §25.108:

a. Revise paragraph (a);

b. Remove paragraph (c)(6) and redesignate paragraphs (c)(2) through (5) as paragraphs (c)(4) through (7);

c. Add new paragraphs (c)(2) and (3); and

d. Add paragraphs (c)(8) and (9).

The revisions and additions read as follows:

§25.108 Incorporation by reference.

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

(c) ***

(2) ITU Radio Regulations, Volume 1: Articles, Article 21, “Terrestrial and space services sharing frequency bands above 1 GHz,” Section V, “Limits of power flux-density from space

stations,” Edition of 2016, copyright 2016, <http://www.itu.int/pub/R-REG-RR-2016>.

Incorporation by reference approved for §25.146(a).

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

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

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

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

§25.114 Applications for space station authorizations.

(c) ***

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

(d) ***

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

6. In §25.115, revise paragraphs (c)(1) introductory text, (e), and (f) to read as follows:

§25.115 Applications for earth station authorizations.

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

(e) *GSO FSS earth stations in 17.8-30 GHz.* (1) An application for a GSO FSS earth station license in the 17.8-19.4 GHz, 19.6-20.2 GHz, 27.5-29.1 GHz, or 29.25-30 GHz bands not filed on FCC Form 312EZ pursuant to paragraph (a)(2) of this section must be filed on FCC Form 312, Main Form and Schedule B, and must include any information required by paragraph (g) or (j) of this section or by §25.130.

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

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

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

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

§25.142 [Amended]

7. In §25.142, remove paragraph (d).

§25.143 [Amended]

8. In §25.143, remove paragraph (d).

§25.145 [Removed]

9. Remove §25.145.

10. Revise §25.146 to read as follows:

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

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

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

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

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

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

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

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

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

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

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

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

11. In §25.151:

a. Remove “and” from the end of paragraph (b)(10);

b. Remove the period at the end of paragraph (b)(11) and add “; and” in its place; and

c. Add paragraph (a)(12) to read as follows:

§25.151 Public notice.

(a) ***

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

§25.156 [Amended]

12. In §25.156, remove and reserve paragraph (d)(5).

13. In §25.157, revise paragraph (b) to read as follows:

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

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

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

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

§25.161 Automatic termination of station authorization.

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

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

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

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

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

§25.164 Milestones.

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

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

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

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

16. In §25.165, revise paragraph (c) and add paragraph (d) to read as follows:

§25.165 Surety bonds.

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

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

17. In §25.202, revise paragraph (a)(1) to read as follows:

§25.202 Frequencies, frequency tolerance, and emission limits.

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

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

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

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

18. In §25.208:

- a. Revise the section heading and the introductory text to paragraph (c), and
- b. Remove and reserve paragraphs (e) and (g) through (m).

The revisions read as follows:

§25.208 Power flux-density limits.

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

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

§25.217 Default service rules.

(b)(1) For all NGSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in §25.157 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical

requirements, notwithstanding the frequency bands specified in these rule provisions:

§§25.143(b)(2)(ii) (except NGSO FSS systems) and (iii), 25.204(e), and 25.210(f) and (i).

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

§§25.143(b)(2)(iv), 25.204(e), and 25.210(f), (i), and (j).

20. Revise §25.261 to read as follows:

§25.261 Sharing among NGSO FSS space stations.

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

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

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

- (1) Each of n (number of) satellite networks involved must select 1/n of the assigned spectrum available in each of these frequency bands. The selection order for each satellite network will be determined by the date that the first space station in each satellite system is launched and capable of operating in the frequency band under consideration;
- (2) The affected station(s) of the respective satellite systems may operate in only the selected (1/n) spectrum associated with its satellite system while the $\Delta T/T$ of 6 percent threshold is exceeded;
- (3) All affected station(s) may resume operations throughout the assigned frequency bands once the threshold is no longer exceeded.

§25.271 [Amended]

21. In §25.271, remove and reserve paragraph (e).
22. Add §25.289 to subpart D to read as follows:

§25.289 Protection of GSO networks by NGSO systems.

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

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