

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)
)
Comprehensive Review of Licensing and) IB Docket No. 12-267
Operating Rules for Satellite Services)

To: The Commission

COMMENTS OF EHOSTAR CORPORATION

EHOSTAR CORPORATION

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SUMMARY

EchoStar Corporation (“EchoStar”) submits these Comments in response to the Commission’s *Notice of Proposed Rulemaking* in IB Docket No. 12-267 (“*NPRM*”), which initiates a comprehensive review of the Commission’s licensing and operating rules for satellite services. In the *NPRM*, the Commission proposes a broad set of updates that largely promise to make these rules clearer, more usable, and more easily administered, all of which will result in increased efficiencies and cost-savings for the satellite industry. As the operator of a fleet of 22 satellites in the Direct Broadcasting Satellite (“DBS”) service, the Fixed-Satellite Service (“FSS”), and the Mobile-Satellite Service (“MSS”), EchoStar fully supports the Commission’s efforts.

EchoStar has actively participated in the development of the detailed comments that the Satellite Industry Association (“SIA”) is filing in response to the *NPRM*, and supports the positions taken by SIA in those comments. In these Comments, EchoStar provides views and positions on areas of particular additional significance to EchoStar. For the Commission’s ease of reference, EchoStar addresses issues in the order in which the Commission addressed them in the *NPRM*. All proposed revisions to the Commission’s rules are set forth in the Rules Appendix to these Comments.

In its Comments, EchoStar specifically proposes that:

- The Commission should make all geostationary orbit (“GSO”) FSS services offered by foreign satellites eligible for the Permitted Space Station List to increase operational efficiencies.
- Operations in the 20/30 GHz and DBS bands should be made eligible for the Commission’s earth station autogrant procedures as they have sufficiently matured.
- Rain-fade compensation should be made available for GSO FSS earth stations operating in the 28.6-29.1 GHz band, as such techniques will improve the

efficiency of GSO FSS operations in a manner fully consistent with the operations' secondary status in the band.

- The Commission should simplify the fleet management rule and apply the rule in a flexible manner in order to expand its use and achieve increased efficiencies.
- The Commission should eliminate its limitations on the number of outstanding applications and authorized-but-unlaunched satellites as these requirements result in uncertainty in the business environment.
- The Commission should decline to apply its automatic transmitter identification system ("ATIS") requirements to any digital video uplink transmissions other than the high-power, frequently repointed transmissions used for satellite news gathering ("SNG") operations, which represent the principal threat of harmful interference to satellite operators.

TABLE OF CONTENTS

SUMMARY	ii
I. INTRODUCTION AND BACKGROUND	2
II. DISCUSSION	4
A. The Permitted Space Station List Should Encompass the Extended C- and Ku-bands	4
B. 20/30 GHz-Band GSO FSS Earth Stations and DBS Feeder Link Earth Stations Should Be Eligible for the Autogrant Procedure.	5
C. Rain-Fade Compensation Should Be Available to GSO FSS Earth Stations Operating in the 28.6-29.1 GHz Band	6
D. Rules Relating to Applications and Licenses.....	7
1. Section 25.114 “Applications for space station authorizations”	7
2. Section 25.115 “Applications for earth station authorizations”	8
3. Section 25.118 “Modifications not requiring prior authorization”	10
4. Section 25.138 “Blanket licensing provisions of GSO FSS earth stations in the 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) bands”	11
E. The Commission Should Preserve Its Flexibility for Outstanding Authorizations, Missed Milestones or Other Deadlines, and Vacant Slots	13
1. Section 25.159 “Limits on pending applications and unbuilt satellite systems”	13
2. Section 25.161 “Automatic termination of station authorization”	14
F. Rules Relating to Technical Standards for Licensing Earth and Space Stations.....	15
1. Section 25.209 “Earth station antenna performance standards”	15
2. Section 25.218 “Off-axis EIRP envelopes for FSS earth station operations”	16
3. Section 25.281 “Automatic Transmitter Identification System (ATIS)”	16
III. CONCLUSION.....	18

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EchoStar Corporation (“EchoStar”), by its attorneys and pursuant to Section 1.415 of the Commission’s Rules, 47 C.F.R. § 1.415, hereby submits its comments in response to the Commission’s above-captioned proceeding to conduct a comprehensive review of the licensing and operating rules for satellite services.¹ This proceeding is an important first step in updating the rules for satellite services in order to increase regulatory certainty, enable a more efficient and competitive U.S. satellite services sector, and further the Commission’s ability to perform its statutory responsibilities. EchoStar encourages the Commission to move forward to a *Report and Order* expeditiously so that industry, the government, and consumers can share in the benefits of the updated rules in ensuring that satellite services are made available to consumers on a faster and more efficient basis.

¹ Comprehensive Review of Licensing and Operating Rules for Satellite Services, *Notice of Proposed Rulemaking*, 27 FCC Rcd. 11619 (2012) (“*NPRM*”). The deadline for initial comments on the *NPRM* was extended to January 14, 2013. Comprehensive Review of Licensing and Operating Rules for Satellite Services, IB Docket No. 12-267, *Order*, DA 12-2046 (Int’l. Bur., rel. Dec. 19, 2012).

EchoStar has participated as an active member of the Satellite Industry Association (“SIA”) in the development of the comments that the SIA is filing separately.² EchoStar endorses the views stated therein, and incorporates the SIA comments here by reference. EchoStar files these Comments to provide EchoStar’s views on areas of additional significance to the company. All proposed amendments to the Commission’s rules as described below are set forth in the Rules Appendix to these Comments.

I. INTRODUCTION AND BACKGROUND

EchoStar is a diverse and dynamic company. Founded by Charlie Ergen in 1980, EchoStar is a home-grown U.S. satellite operator, services provider, and technology company. Today EchoStar owns, leases, or operates a fleet of 22 satellites in the Broadcasting-Satellite Service (“BSS”), Fixed-Satellite Service (“FSS”), and Mobile-Satellite Service (“MSS”) bands providing innovative, multi-channel video programming distribution with DISH Network Corporation (“DISH”) and state-of-the-art fixed and mobile broadband services among other services. EchoStar is also a leading satellite technology and services company, and employs more than 2,000 engineers focused on creating hardware and service solutions for cable, telecommunications, IPTV, and satellite companies worldwide.

In 2008, the satellite technology, operations, and non-DBS services aspects of EchoStar’s business were spun off into EchoStar Corporation, with the consumer DBS service remaining in the original EchoStar entity under a new name, DISH Network Corporation. Today, DISH’s DBS service provides satellite television service to more than 14 million U.S. consumers, as well

² See Comments of the Satellite Industry Association, IB Docket No. 12-267 (filed Jan. 14, 2013) (“SIA Comments”).

as 2 million Mexican consumers, all of whom EchoStar supports. EchoStar is also taking steps to provide an array of satellite services in Brazil in the near future.

EchoStar acquired Hughes Network Services, LLC (“Hughes”) in 2011 and is now the global leader in providing broadband satellite networks and services for enterprises, governments, small businesses, and consumers. Having pioneered the very small aperture terminal (“VSAT”), Hughes remains the world’s leading provider of enterprise VSAT services, and has built on this expertise to bring high speed satellite broadband service to consumers and small businesses. This broadband business is expanding with the recently launched EchoStar XVII satellite, which is a next-generation, Ka-band, high-throughput satellite that delivers high-speed Internet access. This high speed broadband service is especially important to EchoStar’s consumer and small business customers living or working in rural communities, or in markets with limited terrestrial broadband build-out. Further, these services are invaluable during emergencies when the terrestrial infrastructure is unavailable.

EchoStar applauds the Commission’s efforts to make its rules more effective for the satellite industry and is pleased to assist the Commission in its efforts by submitting these Comments. As set forth below, EchoStar offers certain refinements to some of the Commission’s proposals as set forth in the *NPRM*, suggests an extension of other efficiency-enhancing proposals to additional bands or circumstances, and asks the Commission to explore other changes intended to further efficiencies for the Commission and satellite operators and reduce constraints and uncertainties experienced by satellite operators under the current rules.

Specifically, EchoStar proposes that:

- The Commission should make all geostationary orbit (“GSO”) FSS services offered by foreign satellite eligible for the Permitted Space Station List to increase operational efficiencies.

- Operations in the 20/30 GHz and DBS bands should be made eligible for the Commission’s earth station autogrant procedures as they have sufficiently matured.
- Rain-fade compensation should be made available for GSO FSS earth stations operating in the 28.6-29.1 GHz band, as such techniques will improve the efficiency of GSO FSS operations in a manner fully consistent with the operations’ secondary status in the band.
- The Commission should simplify the fleet management rule and apply the rule in a flexible manner in order to expand its use and achieve increased efficiencies.
- The Commission should eliminate its limitations on the number of outstanding applications and authorized-but-unlaunched satellites as these requirements result in uncertainty in the business environment.
- The Commission should decline to apply its automatic transmitter identification system (“ATIS”) requirements to any digital video uplink transmissions other than the high-power, frequently repointed transmissions used for satellite news gathering (“SNG”) operations, which represent the principal threat of harmful interference to satellite operators.

II. DISCUSSION

A. The Permitted Space Station List Should Encompass the Extended C- and Ku-bands.

EchoStar urges the Commission to expand the definition of the Permitted Space Station List it proposes for Section 25.103 of the rules to encompass all foreign licensed GSO space stations authorized to serve the United States in the FSS services. The Commission already allows all foreign-licensed space stations to seek U.S. market access using a “Letter of Intent.” By including such space stations, at least in the FSS context, an expanded Permitted Space Station List would serve the public interest by allowing more efficient licensing. The expanded Permitted Space Station List—including the integration of the “Ka-band Permitted Space Station List” into the “Permitted Space Station List” for conventional C-band and conventional Ku-band

that EchoStar also supports³—would provide a one-stop venue that would specify the frequencies that a particular foreign-licensed satellite is authorized to use to serve the United States, and identify any conditions imposed on the grant of U.S. market access for that satellite. The Commission would retain its ability to review individual earth station applications for compliance with band-specific rules. Providing earth station applicants the ability to specify the Permitted Space Station List as a point-of-communication (and thus approve in one action communication with all space stations on the list, so long as applicable frequency coordination obligations are satisfied), would reduce the regulatory burden on Commission staff and satellite and earth station operators without causing any degradation in the Commission’s ability to fulfill its oversight role.

B. 20/30 GHz-Band GSO FSS Earth Stations and DBS Feeder Link Earth Stations Should Be Eligible for the Autogrant Procedure.

As the operator of satellites in several services, including multiple DBS satellites and two high-throughput 20/30 GHz-band broadband satellites, and the licensee of numerous earth stations, EchoStar fully supports streamlining the licensing process in order to ensure that consumers are able to receive services on a more cost-effective and timely basis. Such streamlining is particularly appropriate for technologically stable and mature segments of the industry.

Over the last decade or more, the DBS industry has become technologically stable and mature, as has the 20/30 GHz band GSO FSS market. In both cases, objections to technical proposals for earth station operations—even to blanket earth station license applications that are used in the 20/30 GHz-band GSO FSS—are rare, and the Commission has routinely authorized

³ See SIA Comments at § II.A.1.

millions of FSS user terminals. The Commission specifically recognized in the *NPRM* that when autogrant and Form 312EZ were adopted, the 20/30 GHz band service rules were still in development, and that those growing-pain issues have now been resolved.⁴

In the interest of efficiency, the 20/30 GHz GSO FSS service and DBS feeder uplinks in the 17.3-17.8 GHz band should be included in the autogrant rules for the C-band and Ku-band GSO FSS. In particular, the autogrant procedures should be extended to both routine DBS earth station applications and applications for GSO FSS earth stations in all of the blanket-licensed 20/30 GHz bands (i.e., the sub-bands at 28.35-28.6 GHz and 29.25-29.5 GHz, as well as the 29.5-30 GHz band), which are available to GSO FSS networks for the ubiquitous deployment of user terminals on a blanket-licensed basis. The autogrant procedures are more than adequate to provide the necessary regulatory oversight, while providing the satellite industry with the benefits of a more predictable, efficient, and cost-effective licensing process.⁵

C. Rain-Fade Compensation Should Be Available to GSO FSS Earth Stations Operating in the 28.6-29.1 GHz Band

EchoStar, as does SIA, supports the modification of the Part 25 rules to make rain-fade compensation capabilities more widely available, and the proposal to consolidate these provisions into Section 25.204(e).⁶ There is indeed no technical justification for limiting fade compensation capability to either the conventional Ku-band or to routinely processed earth stations. Accordingly, EchoStar urges the Commission to include 28.6-29.1 GHz band GSO FSS earth stations in Section 25.204(e)(3). GSO FSS earth stations operate in this band on a

⁴ *NPRM*, 27 FCC Rcd. at 11631-32 ¶ 34.

⁵ EchoStar provides further elaboration on this in Section II.D.2.a.

⁶ *See NPRM*, 27 FCC Rcd. at 11632-33 ¶ 37; SIA Comments at § II.F.

secondary basis. Rain-fade compensation techniques affect operation in a two-degree spacing environment and do not have any interference impact whatsoever on interservice operations (including with co-frequency, primary non-geostationary-satellite orbit (“NGSO”) FSS systems). Extending Section 25.204(e)(3) to the band where GSO FSS earth stations are secondary to NGSO earth stations will improve GSO operations while still protecting primary NGSO operations.⁷

D. Rules Relating to Applications and Licenses

There are additional areas where Part 25 can be further improved. Many of these improvements will affect Section 25.114. At the same time, Schedule S provides a common format for much of the technical material that accompanies a space station application (or an earth station application to introduce a non-U.S.-licensed space station into the U.S. market). Therefore, there is substantial value in retaining the Schedule S approach, even though the Schedule S itself will have to be updated as a result of this proceeding and could benefit from improvements to make the software more transparent and easier to use.

1. Section 25.114 “Applications for space station authorizations”

The orbital debris mitigation rules would benefit from the inclusion of the Commission’s policy on satellites operating under foreign licenses. The Commission’s 2004 *Orbital Debris Order* provides an alternative to satisfying the disclosure requirements in Section 25.114(d)(14)(i)-(iv) for non-U.S.-licensed space stations, whereby an applicant for U.S. market access demonstrates that the orbital debris mitigation plans of the foreign-licensed spacecraft are

⁷ Operation under this rule would not alter the secondary nature or obligations of FSS earth stations operating with GSO FSS space stations in the 28.6-29.1 GHz band.

subject to direct and effective regulatory oversight by the satellite's national licensing authority.⁸ EchoStar proposes a new subsection 25.114(d)(14)(v) that would remove any ambiguity as to how to meet the rule.

2. Section 25.115 “Applications for earth station authorizations”

EchoStar proposes expanded application of the autogrant procedures in Section 25.115, along with an amendment to Section 25.115(e) to reflect the fact that even when operating on a secondary basis to NGSO FSS earth stations in the 28.6-29.1 GHz band, there is a benefit to having GSO FSS earth stations adhere to the EIRP density masks in Section 25.138 to facilitate operation in a two-degree spacing environment.

When routine earth station applications in the FSS and DBS services seek to access satellites authorized to serve the United States, the autogrant procedures offer substantial efficiencies with little to no downside. EchoStar therefore proposes to extend the autogrant procedures to two additional bands: the 29.25-29.5 GHz band when access is sought for blanket licensed FSS earth stations operating with GSO space stations, and the 17.3-17.8 GHz band for DBS feeder link earth stations in the Earth-to-space direction. Section 25.115(a)(2), as proposed in the *NPRM*, includes the 29.25-29.30 GHz band, and allows both GSO FSS and NGSO MSS feeder link applicants to use that segment pursuant to autogrant procedures.⁹ EchoStar proposes that Section 25.115(a)(2) specify that autogrant be made available for GSO FSS earth stations in the 29.25-29.5 GHz band for *both* single antennas *and* blanket-licensed earth station antennas operating with GSO FSS space stations.

⁸ The existing policy is from Paragraph 95 of the Commission's 2004 *Orbital Debris* order. See Mitigation of Orbital Debris, *Second Report and Order*, 19 FCC Rcd. 11567, 11606 ¶ 95 (2004) (“*Orbital Debris Order*”).

⁹ See *NPRM*, 27 FCC Rcd. at 11675, Appendix A, proposed Section 25.115(a)(2).

Processing of these FSS and DBS earth station applications is routine in practice, with comments or objections rarely filed. The fact that the 50 MHz segment from 29.25-29.3 GHz is shared with NGSO MSS feeder link stations has no bearing on the applicability of the autogrant procedure in this sub-band, as the contents of a GSO FSS earth station application would continue to include all of the information required to determine compatibility with NGSO MSS feeder link operations. The autogrant rule would include the requirement for the GSO FSS earth station applicant to make a showing under Section 25.203(k) of how it will avoid unacceptable interference to the NGSO MSS feeder link operations.¹⁰ Under this approach, the Commission would place the application on public notice, and autogrant would not be available if an opposition is timely lodged. Accordingly, regulatory oversight is retained when an autogrant would not be appropriate.

Section 25.115(e) requires all 20/30 GHz GSO FSS earth station applications to include information in Section 25.138. However, Section 25.138, as proposed in the *NPRM*, applies only to a subset of the 20/30 GHz-band GSO FSS earth stations.¹¹ To resolve this discrepancy, EchoStar proposes to modify Section 25.138 to align with the scope of Section 25.115(e), and

¹⁰ EchoStar notes that Section 25.203(k) showings have been achieved with showings in that no user terminals operating in the shared 50 MHz segment will be located within the separation distance of the NGSO MSS feeder link earth station in Arizona that is specified in the relevant International Telecommunication Union (“ITU”) recommendation. Recommendation ITU-R S.1419, Interference mitigation techniques to facilitate coordination between non-GSO MSS feeder links and GSO FSS networks in the bands 19.3-19.7 GHz and 29.1-29.5 GHz. The guidelines in this recommendation rely, in part, on spatial separation of earth stations used by the two types of satellite networks (225 kilometers for typical antennas, and as few as 60 kilometers for high-gain/highly directional antennas). Coordination on such basis between NGSO MSS feeder link stations and GSO FSS networks was deemed feasible in the 20/30 GHz-band rulemaking proceedings leading to designation of the 29.25-29.5 GHz band for ubiquitous GSO FSS earth stations. This conclusion was based on the avoidance of main-beam coupling. Such a showing has been deemed sufficient in the blanket licensing of earth stations to operate with EchoStar’s SPACEWAY 3 satellite. See Application of HNS License Sub, LLC, File No. SES-MFS-20110701-00767 (filed July 1, 2011).

¹¹ The 28.6-29.1 GHz band where GSO FSS earth stations may operate on a secondary basis to NGSO FSS earth stations and the corresponding downlink band at 18.8-19.3 GHz where GSO FSS earth stations are authorized only on a non-conforming basis (again with NGSO FSS the primary application), are not included in Section 25.138.

thus allow the obligation stated in Section 25.115(e) to be fulfilled.¹² Section 25.138 forms the basis for a stable two-degree spacing environment in all 20/30 GHz bands available for GSO FSS use. There is value to both industry and the Commission in applying the provisions of Section 25.138 as between “co-secondary” GSO FSS earth stations. Requiring GSO FSS earth stations to comply with the two-degree requirements, even when operating on a secondary or non-conforming basis, will increase the usability and efficiency of the bands without impacting the primary NGSO FSS systems.

To achieve this goal while preserving the integrity of the Commission’s 20/30 GHz band plan, EchoStar proposes to add a new sentence to the end of Section 25.115(e) to specify that the provision of information requested in Section 25.138 by GSO FSS earth stations operating on a secondary basis in the 28.6-29.1 GHz Earth-to-space band and on a non-conforming basis in the 18.8-19.3 GHz space-to-Earth band is for the specific purpose of demonstrating compatibility with other GSO FSS earth stations that operate in the same band pair. This will ensure that the two-degree principles are advanced, but will not result in an elevation of the GSO FSS in these bands above what is already authorized by the Commission. EchoStar requests a corresponding revision for Section 25.138.¹³

3. Section 25.118 “Modifications not requiring prior authorization”

EchoStar supports the Commission’s proposal to modify Section 25.118(e) of its rules to allow DBS operators to relocate a satellite so long as the operator certifies that it will operate within the interference parameters of a pending Region 2 BSS plan modification.¹⁴ EchoStar

¹² The proposal for the scope of Section 25.138 is addressed in Section II.D.4 *infra*.

¹³ See *infra* § II.D.4.

¹⁴ *NPRM*, 27 FCC Rcd. at 11643 ¶ 80.

also urges the Commission to clarify the circumstances in which operators may take advantage of the fleet management rule of Section 25.118(e) as modified and to implement the rule in a flexible manner. Specifically, the Commission should clarify that a satellite capable of operating in the licensed frequencies and within authorized interference parameters can be moved to the reference slot under the rule, even if the satellite has technical differences from the originally licensed satellite for that slot (i.e., in power or beam set-up, etc.). This type of interference-neutral move is precisely the type of move that the fleet management rule was intended to address.¹⁵ Despite the fleet management rule being in existence since 2003,¹⁶ and explicitly expanded to DBS satellites in 2004,¹⁷ the rule has only been successfully invoked **four** times since its inception, and it has been seven years since the last satellite maneuver permitted under the rule.¹⁸ Expanded use of the rule would save satellite operators and the Commission time and resources by automating the licensing process for these types of fleet maneuvers.

4. Section 25.138 “Blanket licensing provisions of GSO FSS earth stations in the 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) bands”

The Commission should conform Section 25.138 to Section 25.115, as noted above, and clarify that Section 25.138 applies generally to GSO FSS earth stations in the 20/30 GHz bands.

¹⁵ See Amendment of the Commission’s Space Station Licensing Rules and Policies, *Second Report and Order*, 18 FCC Rcd. 12507, 12509-11 ¶¶ 6-9 (2003) (adopting, with modifications, the SIA’s fleet management recommendation to streamline the application review procedure).

¹⁶ See *id.*, 18 FCC Rcd. 12507.

¹⁷ See Amendment of the Commission’s Space Station Licensing Rules and Policies, *Fourth Report and Order*, 19 FCC Rcd. 7419 (2004).

¹⁸ See Report No. SAT-00231 (rel. Jul. 30, 2004) (granting File No. SAT-MOD-20040527-00107); Report No. SAT-00244 (rel. Sept. 24, 2004) (granting file no. SAT-MOD-20040726-00147); Report No. SAT-00304 (rel. Mar. 22, 2005) (granting File No. SAT-MOD-20050214-00037); Report No. SAT-00304 (rel. Jul. 1, 2005) (granting File No. SAT-MOD-20050527-00110).

Accordingly, EchoStar proposes that the caption to Section 25.138 be simplified to make it clear that the rule applies to the 20/30 GHz bands.¹⁹

In Section 25.115(e) as revised by EchoStar above, GSO FSS earth station applicants specifying operations in the 28.6-29.1 GHz Earth-to-space band, where NGSO FSS earth stations are designated as primary, would be permitted to provide information compliant with Section 25.138 for the purpose of demonstrating compatibility with co-frequency GSO FSS operations.²⁰ Because Section 25.138 addresses GSO-to-GSO relationships, EchoStar proposes that it be extended to secondary GSO operations in the 28.6-29.1 GHz band. Applying a GSO-to-GSO sharing rule in a band where GSO FSS earth stations are secondary to NGSO earth stations would improve GSO operations, but would not alter the secondary nature or obligations of FSS earth stations operating with GSO FSS space stations in the 28.6-29.1 GHz band.

With respect to the off-axis EIRP density masks that apply in the 20/30 GHz bands (and in any band where earth stations operate with GSO FSS space stations that are subject to a two-degree spacing environment), EchoStar proposes that the Commission harmonize the start angles of the off-axis EIRP density masks at 2 degrees off axis. Section 25.138(a) uses a 2-degree start angle, but Section 25.138(e) synchs protection for 20/30 GHz band GSO FSS earth station downlink reception to Sections 25.209(a) and (b), which include start angles of 1.5 degrees and 1.8 degrees, respectively. In order to align protection of 20/30 GHz-band GSO FSS downlink reception with the two-degree spacing environment, the Commission could either replace Section

¹⁹ The caption to Section 25.138 would be amended to read, “§ 25.138 Licensing requirements for GSO FSS earth stations in the 20/30 GHz bands.”

²⁰ See *supra* § II.D.2.

25.138(e)'s reference to Sections 25.209(a) and (b) with a reference to Section 25.138(a), or modify the start angles in Section 25.209 to 2 degrees.²¹

This change comports fully with the two-degree spacing environment for GSO FSS frequency bands. In the 20/30 GHz band there are upwards of 650,000 user terminals operating in compliance with an off-axis EIRP density mask that starts at 2 degrees, and there have been no reported difficulties. Several million terminals operate in the Ku-band frequencies at 14-14.5 GHz under the Section 25.220 process without reported difficulties. On the other hand, securing the additional coordination agreements that are required with an off-axis EIRP density mask that starts at 1.5 degrees is burdensome on all operators, slows the licensing of earth stations, and produces no benefits in terms of interference reduction. Accordingly, the Commission should modify the masks in Sections 25.218 and 25.209(a) and (b) to start at two degrees off-axis.

E. The Commission Should Preserve Its Flexibility for Outstanding Authorizations, Missed Milestones or Other Deadlines, and Vacant Slots

1. Section 25.159 “Limits on pending applications and unbuilt satellite systems”

EchoStar supports revisions to Section 25.159(a), which limits the number of applications and licensed-but-unlaunched satellites a single applicant (and its affiliates) can have. The size of today's satellite fleets and the long lead times for satellite procurement activities means that even a limit of five applications in a particular frequency band (Section 25.159(a)) can materially hinder an operator. The limits artificially constrain an operator's options by limiting its ability to

²¹ See § II.E.1 *infra*. The replacement of the reference to Sections 25.209(a) and (b) would lead to the first sentence of Section 25.138(e) reading, in pertinent part, as follows: “. . . is based on the antenna performance specified in paragraph (a) of this section, or the actual receiving earth station antenna performance” With the two-degree spacing environment for GSO FSS satellites being the driving consideration, EchoStar urges that a similar set of changes should be made in Section 25.218, to modify the start angles of the various masks in Sections 25.218(c), (d), (e), (f), (g), and (h) to begin at 2 degrees rather than 1.5 degrees. EchoStar's proposals for modifications to the Section 25.218(c)-(h) off-axis EIRP density masks are addressed in Section II.E.2 *infra*.

pursue substantial fleet upgrades or expansions on a simultaneous or near simultaneous basis with the business and financial certainty that comes from holding Commission authorizations.

The cost to operators—and by extension to U.S. consumers—of this limitation outweighs its marginal benefit to deterring speculation.²² The Commission’s interest in preventing speculation is served first and foremost by Section 25.165’s bond requirement, which replaced the financial qualification standards that the Commission previously employed.²³ The bond requirement is more meaningful because of the milestones it is tied to. Taken together, the bond and milestone requirements restrain unwarranted speculation without negatively impacting licensees by artificially constraining operators and undermining the certainty that U.S. fleet operators need to plan for and seek financing for future satellites. The Commission should therefore eliminate Section 25.159(a)’s limitation.

2. Section 25.161 “Automatic termination of station authorization”

Section 25.161 uses absolute language, “[a] station authorization shall be automatically terminated,” when a milestone, construction, or renewal deadline is missed, or when a slot is vacant for more than 90 days. Despite this strong language, the Commission always maintains discretion to waive a rule for good cause shown,²⁴ and there are times when the Commission must consider a waiver request or make a determination as to whether a deadline has been met or not. These considerations often extend beyond the date of the deadline in question. As currently written, Section 25.161 creates uncertainty as to whether a license is terminated while the waiver

²² See Amendment of the Commission’s Space Station Licensing Rules and Policies, *First Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd. 10760, 10846-49 ¶¶ 228-33 (2003).

²³ See *id.* at 10824-27 ¶¶ 166-72.

²⁴ 47 C.F.R. § 1.3.

or other Commission proceeding is pending. In order to address this ambiguity, EchoStar proposes that the Commission revise Section 25.161 to read: “Upon notice to licensee, the Commission may terminate without further consideration a station authorization in whole or in part upon” Under this revised section, the Commission would retain its authority to terminate licenses for missed deadlines while eliminating uncertainty and unnecessary regulatory process that arise under the current formulation of the rule.

F. Rules Relating to Technical Standards for Licensing Earth and Space Stations

1. Section 25.209 “Earth station antenna performance standards”

EchoStar urges the Commission to clarify that the antenna pattern requirements in Section 25.209(a) and (b) apply to NGSO FSS earth stations—including NGSO MSS feeder link earth stations that operate on a co-equal basis in frequency bands shared with the GSO FSS.²⁵ The Commission must continue to require the tighter antenna pattern for such NGSO FSS earth stations, at least when the earth stations transmit to satellites in the vicinity of the geostationary arc. If it does not, and allows instead a less restrictive antenna pattern, interservice coordination between GSO FSS networks and NGSO systems in bands shared with equal rights will become more technically challenging in that there is a higher potential for unacceptable interference to GSO FSS networks from an NGSO antenna pattern that does not meet the requirements of Section 25.209(a) and (b). EchoStar emphasizes that this precaution is necessary only when NGSO and GSO earth stations are operating on a co-primary basis.²⁶

²⁵ The most prominent example is the 29.25-29.5 GHz band designated for operation both of blanket-licensed GSO FSS user terminals and limited NGSO MSS feeder link earth station use.

²⁶ Such precautions are unnecessary for NGSO FSS earth stations that operate either on a primary basis (as in the 28.6-29.1 GHz band) or on a secondary basis subject to EPFD limits (as they would in the 29.5-30 GHz band).

In addition, as noted above,²⁷ EchoStar urges the Commission to harmonize the start angle of the off-axis EIRP masks in Sections 25.209(a) and (b) at two degrees, rather than 1.5 or 1.8 degrees. These changes would apply to the tables in Sections 25.209(a)(1), (a)(2), and (b)(1) and would streamline licensing without causing any increase in the interference received at the next adjacent satellite two degrees away.²⁸

2. Section 25.218 “Off-axis EIRP envelopes for FSS earth station operations”

With respect to Section 25.218,²⁹ EchoStar urges the Commission to harmonize the start angle of the off-axis EIRP masks in Sections 25.218(c) through (h) at two degrees, rather than at the current 1.5 degrees start figure. These changes would apply to the tables in Sections 25.218(c)(1), (d)(1), (e)(1), (f)(1), (g)(1), and (h)(1) and would streamline licensing without causing any increase in the interference received at the next adjacent satellite two degrees away.³⁰

3. Section 25.281 “Automatic Transmitter Identification System (ATIS)”

EchoStar does not support the Commission’s proposed approach to ATIS requirements in the revisions to Section 25.281 that are proposed in the *NPRM*.³¹ ATIS should only be required for satellite news gathering (“SNG”) video carriers, which represent the principal threat of harmful interference to satellite operators. EchoStar believes such an approach is premature since carrier identification technologies are not sufficiently mature.

²⁷ See II.D.4 *supra*.

²⁸ As the minimum spacing between GSO FSS satellites is set at 2degrees, starting the off-axis EIRP density protections at 2 degrees, rather than 1.5 or 1.8 degrees, means no diminution in protection of adjacent satellites.

²⁹ See II.D.4 *supra*.

³⁰ *Id.*

³¹ See SIA Comments at § I.3.

Applying ATIS requirements to digital SNG video carriers makes sense from a technology perspective, as the equipment is largely standardized among the SNG user community, high power levels are involved, there is frequent antenna re-pointing, and polarization and transponder assignment changes typical of SNG use can result in interference-causing mistakes. On the other hand, there is much less urgency to apply ATIS on a digital carrier where the space segment is not shared and the user equipment is in operation for extended periods of time at a single location. Considering the current technological flux, and recognizing that satellite operators and users of satellite capacity both have strong incentive to minimize interference, the Commission should not regulate ATIS beyond the analog FM and SNG DVB-S cases.

Further, there is no need for ATIS on VSAT networks. VSAT networks share space segment through multiple access techniques,³² and the power levels on the transmit side are low (especially relative to SNG users).³³ A VSAT terminal cannot transmit to a satellite without first receiving an “enabling” signal from the hub earth station.³⁴

³² VSAT terminals in the Hughes Ku-band FSS VSAT network use time-division multiple access to share limited bandwidth more efficiently. Each packet of data is short and already includes a header. It would be very costly and time-consuming for Hughes to develop a one-off system that can independently catch a packet on the fly and extract that header information. The development, deployment, and maintenance of specific hardware and software would be required. Hughes is not prepared either to pay for such a development or to pass the high cost for the same off to its customers in a competitive marketplace.

³³ In most cases, the interference level received at an adjacent satellite would be too low for the operator to be able to extract information bits from the interfering signal.

³⁴ 47 C.F.R. § 25.134(h).

EchoStar Corporation Rules Appendix

<u>Comments Section</u>	<u>Rule Text</u>
II.A	<p><u>Insert for § 25.103:</u></p> <p><u>Permitted Space Station List.</u> A list of all U.S.-licensed geostationary-orbit space stations providing Fixed-Satellite Service in the conventional C-, extended C-, conventional Ku-, extended Ku-, and 20/30 GHz bands, as well as those non-U.S.-licensed geostationary-orbit space stations approved for U.S. market access to provide Fixed-Satellite Service in the conventional C-, extended C-, conventional Ku-, extended Ku-, and 20/30 GHz bands.</p>
II.C	<p><u>Revision to § 25.204(e)(3):</u></p> <p>(3) FSS earth stations transmitting to geostationary satellites in the 28.35-29.1 GHz and/or 29.25-30.0 GHz bands may employ uplink adaptive power control or other methods of fade compensation. For stations employing uplink power control, the values in paragraphs (a)(1), (a)(2), and (a)(4) of § 25.138 may be exceeded by up to 20 dB under conditions of uplink fading due to precipitation. The amount of such increase in excess of the actual amount of monitored excess attenuation over clear sky propagation conditions must not exceed 1.5 dB or 15 percent of the actual amount of monitored excess attenuation in dB, whichever is larger, with a confidence level of 90 percent except over transient periods accounting for no more than 0.5 percent of the time during which the excess is no more than 4.0 dB.</p>
II.D.1	<p><u>New § 25.114(d)(14)(v):</u></p> <p>(v) For non-U.S.-licensed space stations, the requirement to disclose a description of the design and operational strategies that will be used to mitigate orbital debris can be satisfied by showing that the satellite system's debris mitigation plans are subject to direct and effective regulatory oversight by the satellite system's national licensing authority.</p>

II.D.2.a	<p><u>Revision to § 25.115(a)(2):</u></p> <p>(2) Unless the Commission requires otherwise through an Order, an application for transmitting earth stations in the Fixed-Satellite Service that meets all of the following criteria will be deemed granted 35 days after the date of the public notice that the application has been accepted for filing, provided no petition to deny or other objection under §25.154(a) is filed during the 30-day notice period:</p> <ul style="list-style-type: none">(i) the earth station antenna(s) will transmit to geostationary space stations in the 5925-6425 MHz band, the 14.0-14.5 GHz band, the 17.3-17.8 GHz band, the 28.35-28.6 GHz band, and/or the 29.25-30.0 GHz band;(ii) if the station will transmit in the 5925-6425 MHz band or the 17.3-17.8 GHz band, the application is for a single station with only one transmitting antenna;(iii) the earth station will not be installed in ships, aircraft, or other moving vehicles and operated while the vehicles are in motion;(iv) if the station will transmit in the 5925-6425 MHz band or the 14.0-14.5 GHz band, the performance of the proposed antenna comports with the standards in § 25.209(a) and (b) and is verified in accordance with applicable provisions of § 25.132;(v) if the station will transmit in the 5925-6425 MHz band or the 14.0-14.5 GHz band, off-axis EIRP density will not exceed the levels specified in § 25.218;(vi) if the station will transmit in the 28.35-28.6 GHz and/or 29.25-30.0 GHz band, off-axis EIRP density will not exceed the levels specified in § 25.138(a);(vii) if the station will transmit in the 5925-6425 MHz band, operation of the proposed station has been successfully coordinated with terrestrial systems;(viii) if the station is to transmit in the 29.25-29.5 GHz band, the demonstration or certification required by § 25.203(k) has been provided;(ix) the applicant has provided an environmental impact statement pursuant to § 1.1311 of the Commission's rules, if required; and(x) the applicant does not propose to communicate via non-U.S.-licensed satellites unless such satellites have been granted U.S. market access and the applicant proposes to operate within the conditions of such market access grants.
II.D.2.b	<p><u>Revision to § 25.115(e):</u></p> <p>(e) <u>Earth stations operating in the Fixed-Satellite Service in the 20/30 GHz band:</u> License applications for Fixed-Satellite Service earth stations that would communicate via geostationary satellites in the 18.3-18.8 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz, and 29.25-30.0 GHz bands must include the information required by § 25.138. Such earth stations may be licensed on a blanket basis. An application for a blanket license for such earth stations must specify the number of terminals to be covered by the license. License applications for Fixed-Satellite Service earth stations that would communicate via geostationary satellites in the 18.8-19.3 GHz and 28.6-29.1 GHz bands may also include the information required by §25.138, for the specific purpose of showing compatibility with other co-frequency earth stations that would communicate via geostationary satellites.</p>

II.D.3	<p><u>Revision to § 25.118(e):</u></p> <p>(e) Space station modifications. A space station operator may modify its license without prior authorization, upon 30 days prior notice to the Commission and any potentially affected licensed spectrum user, provided that the operator meets the following requirements. This notification must be filed electronically on Form 312 through the International Bureau Filing System (IBFS) in accordance with the applicable provisions of part 1, subpart Y of this chapter:</p> <ol style="list-style-type: none">(1) The space station licensee will relocate a Geostationary Satellite Orbit (GSO) space station to another orbit location that is assigned to that licensee;(2) The relocated space station licensee will operate within the original satellite's authorized and/or coordinated parameters;(3) The space station licensee certifies that it will comply with all the conditions of its original license and all applicable rules after the relocation;(4) The space station licensee certifies that it will comply with all applicable coordination agreements at the newly occupied orbital location;(5) The space station licensee certifies that it has completed coordination with regards to station-keeping volume;(6) The space station licensee certifies that it will limit operations of the space station to Tracking, Telemetry, and Control (TT&C) functions during the relocation and satellite drift transition period;(7) The space station licensee certifies that the relocation of the space station does not result in a lapse of service for any current customer. The space station licensee certifies that it has completed any necessary coordination of its space station at the new location with other potentially affected space station operators, including coordination of station-keeping volume;(8) A DBS space station licensee must certify that there will be no increase in interference due to the operations of the relocated space station that would require the Commission to submit a proposed modification to the ITU Appendix 30 Broadcasting-Satellite Service (BSS) Plan and/or the Appendix 30A feeder link Plan to the ITU Radiocommunication Bureau; and(9) For DBS licensees, the space station licensee must certify that it will meet the geographic service requirements in § 25.148(c).
II.D.4	<p><u>Revision to § 25.138(e):</u></p> <p>(e) Protection of downlink reception from adjacent satellite interference is based on either the antenna performance specified in § 25.209(a) and (b), or the actual receiving earth station antenna performance, if actual performance provides greater isolation from adjacent satellite interference. For purposes of ensuring the correct level of protection, the applicant must provide, for each earth station antenna type, antenna performance plots for the 18.3-18.8 GHz and 19.7-20.2 GHz bands in the format prescribed in paragraph (d) of this section. Downlink reception in the 18.8-19.3 GHz band is unprotected, as any operations in this band are permitted only on a non-conforming basis.</p>

<p>II.E.1</p>	<p><u>Revision to § 25.159:</u> § 25.159 (a) In the event that a licensee misses three or more milestones within any three-year period, the Commission will presume that the licensee obtained one or more of those licenses for speculative purposes. Unless the licensee rebuts this presumption, it will not be permitted to apply for a GSO-like satellite or an NGSO-like satellite system in any frequency band if it has two or more satellite applications pending, or two licensed-but-unbuilt satellite systems of any kind. This limit will remain in effect until the licensee provides adequate information to demonstrate that it is very likely to construct its licensed facilities if it were allowed to file more applications. (b) For purposes of this section, “frequency band” means one of the paired frequency bands available for satellite service listed in § 25.202.</p>																
<p>II.E.2</p>	<p><u>Revision to § 25.161:</u> § 25.161 Termination of station authorization. Upon notice to licensee, the Commission may terminate without further consideration a station authorization in whole or in part upon: * * * * *</p>																
<p>II.F.1</p>	<p><u>Revision to § 25.209:</u> (a) The gain of any antenna to be employed in transmission from an earth station in the fixed-satellite service shall lie below the envelope defined below: (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location, for earth stations not operating in the 20/30 GHz band or conventional Ku-band:</p> <table border="1" data-bbox="367 933 1911 1226"> <tr> <td>29-25log₁₀θ</td> <td>dBi</td> <td>For</td> <td>2° ≤ θ ≤ 7°</td> </tr> <tr> <td>8</td> <td>dBi</td> <td>For</td> <td>7° < θ ≤ 9.2°</td> </tr> <tr> <td>32-25log₁₀θ</td> <td>dBi</td> <td>For</td> <td>9.2° < θ ≤ 48°</td> </tr> <tr> <td>-10</td> <td>dBi</td> <td>For</td> <td>48° < θ ≤ 180°</td> </tr> </table> <p>where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for θ between 1.5 and 7.0 degrees. For θ greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB. (2) In the plane of the geostationary satellite orbit as it appears at the particular earth station location, for earth stations operating in the 20/30</p>	29-25log ₁₀ θ	dBi	For	2° ≤ θ ≤ 7°	8	dBi	For	7° < θ ≤ 9.2°	32-25log ₁₀ θ	dBi	For	9.2° < θ ≤ 48°	-10	dBi	For	48° < θ ≤ 180°
29-25log ₁₀ θ	dBi	For	2° ≤ θ ≤ 7°														
8	dBi	For	7° < θ ≤ 9.2°														
32-25log ₁₀ θ	dBi	For	9.2° < θ ≤ 48°														
-10	dBi	For	48° < θ ≤ 180°														

GHz band or conventional Ku-band:

$29-25\log_{10}\theta$	dBi	For	$2^\circ \leq \theta \leq 7^\circ$
8	dBi	For	$7^\circ < \theta \leq 9.2^\circ$
$32-25\log_{10}\theta$	dBi	For	$9.2^\circ < \theta \leq 48^\circ$
-10	dBi	For	$48^\circ < \theta \leq 85^\circ$
0	dBi	For	$85^\circ < \theta \leq 180^\circ$

* * * * *

(b) The off-axis cross-polarization gain of any antenna to be employed in transmission from an earth station to a space station in the fixed-satellite service shall be defined as follows:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$19-25\log_{10}\theta$	dBi	For	$2^\circ < \theta \leq 7^\circ$
-2	dBi	For	$7^\circ < \theta \leq 9.2^\circ$

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator.

(2) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths:

* * * * *

II.F.2

Revisions to Section 25.218:

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(c) *C-band analog earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$29.5-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
8.5	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$32.5-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
-9.5	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ is the angle in degrees from the line connecting the focal point of the antenna to the target satellite, and the geostationary orbit plane is determined by the focal point of the antenna and the line tangent to the arc of the geostationary satellite orbit at the position of the target satellite. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB.

* * * * *

(d) *C-band digital earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$26.3-10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
$5.3-10\log_{10}(N)$	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$29.3 - 10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
$-12.7-10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ and the plane of the geostationary satellite orbit are defined in paragraph (c)(1) of this section, and N is defined below. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB. For digital SCPC using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For digital SCPC using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

* * * * *

(e) *Conventional Ku-band analog earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$21-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
0	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$24-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
-18	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$
-8	dBW/4 kHz	For	$85^\circ < \theta \leq 180^\circ$

where θ and the plane of the geostationary satellite are defined in paragraph (c)(1) of this section. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB.

* * * * *

(f) *Conventional Ku-band digital earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$15-10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
$-6-10\log_{10}(N)$	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$18-10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
$-24-10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$
$-14-10\log_{10}(N)$	dBW/4 kHz	For	$85^\circ < \theta \leq 180^\circ$

where θ and the plane of the geostationary satellite orbit are defined in paragraph (c)(1) of this section, and N is defined below. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB. For digital SCPC using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For digital SCPC using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

* * * * *

(g) *Extended Ku-band analog earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$21-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
0	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$24-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
-18	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ and the plane of the geostationary satellite orbit are defined in paragraph (c)(1) of this section. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB.

* * * * *

(h) *Extended Ku-band digital earth station operations.* (1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$15-10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$2^\circ \leq \theta \leq 7^\circ$
$-6-10\log_{10}(N)$	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
$18-10\log_{10}(N)-25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
$-24-10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ and the plane of the geostationary satellite orbit are defined in paragraph (c)(1) of this section, and N is defined below. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 2° and 7.0° . For θ greater than 7.0° , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB. For digital SCPC using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For digital SCPC using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.