

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

In the Matter of
2000 Biennial Regulatory Review --
Streamlining and Other Revisions of
Part 25 of the Commission's Rules
Governing the Licensing of, and
Spectrum Usage by, Satellite Network
Earth Stations and Space Stations
Streamlining the Commission's Rules and
Regulations for Satellite Applications and
Licensing Procedures
IB Docket No. 00-248
IB Docket No. 95-117

EIGHTH REPORT AND ORDER
AND ORDER ON RECONSIDERATION

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By the Commission:

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I. INTRODUCTION

1. In this *Eighth Report and Order*, we further streamline the Commission's non-routine earth station processing rules, by adopting a new earth station procedure that will enable the Commission to treat more applications routinely than is possible under the current earth station procedures.¹ By expediting the processing of such earth station applications, the rules adopted in this Order today will facilitate the provision of broadband Internet access services.²

¹ 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Sixth Report and Order and Third Further Notice of Proposed Rulemaking*, IB Docket No. 00-248, 20 FCC Rcd 5593, 5622 (2005) (*Third Further Notice*). When we cite to the *Sixth Report and Order* portions of the document, we will refer to it as the *Sixth Report and Order*. When we cite to the *Third Further Notice* portions of the document, we will refer to it as the *Third Further Notice*.

² See 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Notice of Proposed Rulemaking*, IB Docket No. 00-248, 15 FCC Rcd 25128, 25131 (para. 4) (2000) (*Notice*); 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Further Notice of Proposed Rulemaking*, IB Docket No. 00-248, 17 FCC Rcd 18585, 18588-59 (para. 4) (2002) (*Further Notice*).

The Commission has determined that satellite facilities provide a competitive platform for delivery of broadband services, which is especially well suited for extending these services to rural and unserved areas.³ In other words, satellite services employ cost-effective technology to serve communities with low penetration rates, especially those in remote areas.⁴ In addition, the threat of competition from satellite-based broadband Internet access and other alternatives will stimulate deployment of broadband infrastructure, including more advanced infrastructure such as fiber to the home.⁵ Moreover, the number of consumers who receive their broadband connection through satellite or other wireless technologies will continue to increase as new satellite services are launched.⁶

2. Specifically, in this *Eighth Report and Order*, we adopt an off-axis equivalent isotropically radiated power (EIRP)⁷ envelope approach as one method for applicants to apply for Fixed Satellite Service (FSS) earth station licenses in the conventional C-band and Ku-band.⁸ The Commission proposed off-axis EIRP envelopes for FSS earth stations based on recommendations from satellite industry commenters in an earlier phase in this proceeding.⁹ In fact, throughout this proceeding, the Commission has provided multiple opportunities for interested parties to recommend rule revisions.¹⁰

3. This off-axis EIRP approach gives earth station applicants the flexibility to reduce their power levels to compensate for a small antenna diameter. Thus, using these envelopes as criteria for licensing should enable us to license more earth station applications routinely, expediting the provision of satellite services to consumers and enhancing the types of services available, without increasing the likelihood of harmful interference to adjacent satellite operators or to terrestrial wireless operators. In addition, we address a number of petitions for

³ Use of Returned Spectrum in the 2 GHz Mobile Satellite Service Frequency Bands, *Order*, IB Docket Nos. 05-220 and 05-221, 20 FCC Rcd 19696, 19710 (para. 30) (2005) (*2 GHz MSS Spectrum Assignment Order*).

⁴ *2 GHz MSS Spectrum Assignment Order*, 20 FCC Rcd at 19710 (para. 30).

⁵ Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, *Report and Order and Notice of Proposed Rulemaking*, CC Docket No. 02-33, 20 FCC Rcd 14853, 14884 (para. 57) (2005).

⁶ Written Statement of the Honorable Kevin J. Martin, Chairman, Federal Communications Commission, Before the Committee on Commerce, Science & Transportation, U.S. Senate, February 1, 2007, 2007 WL 283773 (F.C.C.).

⁷ Isotropically Radiated Power (EIRP) is the product of the gain of the antenna in a given direction relative to an isotropic antenna and the power supplied to that antenna. 47 C.F.R. § 2.1.

⁸ For purposes of this Order, the conventional C-band is the 3700-4200 MHz and 5925-6425 MHz bands. The conventional Ku-band is the 11.7-12.2 GHz and 14.0-14.5 GHz bands.

⁹ See *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

¹⁰ See 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Fifth Report and Order*, IB Docket No. 00-248, 20 FCC Rcd 5666, 5672 (para. 13) (2005) (*Fifth Report and Order*).

reconsideration of several previous streamlining proceedings, particularly the *Fifth Report and Order* and *Sixth Report and Order*.¹¹

II. BACKGROUND

A. Two-Degree Spacing Framework

4. The Communications Act mandates that transmitting radiocommunication facilities must be licensed before they can operate.¹² The rules governing transmit-only and transmit/receive earth stations are contained in Part 25 of the Commission's rules.¹³ The rules are intended primarily to ensure that satellite networks of space stations and earth stations can operate with a minimum of interference with respect to each other and with respect to other telecommunications services. Earth stations provide a critical link between satellites and terrestrial networks, and satellite networks depend on the Commission's earth station licensing rules to maintain an operating environment with a minimum of interference to other users operating in the band.¹⁴

5. As the satellite industry developed in the 1980s, the Commission instituted a 2° orbital spacing policy to maximize the number of in-orbit satellites operating in either the C-band or the Ku-band.¹⁵ Previously, satellites had been operating 3° to 4° apart. Under the 2° orbital spacing framework, the Commission assigns adjacent in-orbit satellites to orbit locations 2° apart in longitude. This framework also established technical rules to govern earth stations communicating with these satellites, to ensure that their operations do not cause unacceptable interference to adjacent satellite systems. Primarily, earth station technical requirements consist of minimum antenna size and maximum power level limits.¹⁶

¹¹ *Fifth Report and Order*, 20 FCC Rcd 5666 (2005); 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Sixth Report and Order and Third Further Notice of Proposed Rulemaking*, IB Docket No. 00-248, 20 FCC Rcd 5593 (2005) (*Sixth Report and Order*).

¹² 47 U.S.C. § 301, cited in *Fifth Report and Order*, 20 FCC Rcd at 5670 (para. 8); *Sixth Report and Order*, 20 FCC Rcd at 5595 (para. 2).

¹³ 47 C.F.R. Part 25, cited in *Fifth Report and Order*, 20 FCC Rcd at 5670 (para. 8); *Sixth Report and Order*, 20 FCC Rcd at 5595 (para. 2).

¹⁴ *Fifth Report and Order*, 20 FCC Rcd at 5670 (para. 8); *Sixth Report and Order*, 20 FCC Rcd at 5595 (para. 2); *Notice*, 15 FCC Rcd at 25130 (para. 3).

¹⁵ *Fifth Report and Order*, 20 FCC Rcd at 5674 (para. 17); *Sixth Report and Order*, 20 FCC Rcd at 5595 (para. 3). See also *Notice*, 15 FCC Rcd at 25132 (para. 7), citing Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, *Report and Order*, CC Docket No. 81-704, FCC 83-184, 54 Rad. Reg. 2d 577 (released Aug. 16, 1983); summary printed in Licensing Space Stations in the Domestic Fixed-Satellite Service, 48 F.R. 40233 (Sept. 6, 1983) (*Two Degree Spacing Order*). See also Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, *Report and Order*, CC Docket No. 81-704, 99 FCC 2d 737 (1985) (*Two Degree Spacing Reconsideration Order*).

¹⁶ *Fifth Report and Order*, 20 FCC Rcd at 5674 (para. 17); *Sixth Report and Order*, 20 FCC Rcd at 5595-96 (para. 3).

6. Antenna size is important because it affects the antenna gain. The antenna gain is the ratio of the power required at the input of a loss-free reference antenna to the power supplied to the input of a given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance.¹⁷ When not specified otherwise, the gain refers to the direction of maximum radiation.¹⁸ In other words, gain refers to an antenna's ability to collect, concentrate, and direct energy in a particular fashion, *i.e.*, a beam.¹⁹ Many antennas are shaped like parabolas, or like large, curved bowls. The "axis," or boresight, is the line running through the center of the bowl and perpendicular to the plane of the edge of the bowl.²⁰ The boresight should extend directly into the antenna on the satellite with which the earth station is communicating. The majority of the energy is transmitted along the boresight in what is called the main beam of the antenna. The "off-axis" angle is the angle formed by the axis and any other line running through the center of the bowl.²¹ The energy transmitted from an antenna forms "ripples," alternately increasing and decreasing in magnitude as the off-axis angle increases.²² These ripples are called "side lobes."²³

7. The antenna gain at various off-axis angles provides a measure of the interference potential of that earth station to other in-orbit satellites. For example, the antenna gain in the vicinity of 2° off-axis provides a measure of the potential of that earth station to cause interference to satellites located 2° away in orbit from the satellite with which the earth station is communicating. The gain of any earth station antenna must fall within the limits defined by equations in the Commission's rules. In other words, the main beam and side lobes of an antenna must fall within the limits specified by those equations.²⁴ Decreasing the antenna diameter produces wider main beams and larger side lobes. Thus, the antenna gain pattern envelope results in a minimum earth station antenna diameter because at some point the main beam will become wide enough to potentially cause unacceptable interference to adjacent satellites.²⁵

¹⁷ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4).

¹⁸ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9), 47 C.F.R. § 2.1.

¹⁹ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9).

²⁰ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9). This is true for center-fed antennas. However, since any portion of the bowl will effectively reflect the energy from the feed in the direction of the boresight, "offset fed antennas" can be constructed where the boresight is not necessarily perpendicular to the plane of the antenna's edge.

²¹ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9).

²² *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9). Examples of these ripples can be seen in the antenna gain pattern diagrams in Appendix A of the *Notice*, 15 FCC Rcd at 25162-73 (App. A).

²³ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 4), *citing Notice*, 15 FCC Rcd at 25133 (para. 9).

²⁴ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 5), *citing Notice*, 15 FCC Rcd at 25133 (para. 10), 47 C.F.R. § 25.209.

²⁵ *Sixth Report and Order*, 20 FCC Rcd at 5596 (para. 5), *citing Notice*, 15 FCC Rcd at 25133 (para. 11), *Two Degree Spacing Order*, 54 Rad. Reg. 2d at 605 (para. 93).

B. Current Earth Station Licensing Procedures

8. Currently, we "routinely" license C-band and Ku-band earth station facilities that meet the 2° orbital spacing technical requirements set forth in Part 25 of the Commission's rules.²⁶ In other words, if the earth station meets certain antenna diameter and power level restrictions,²⁷ we grant the earth station application without conducting a further technical review to verify that the earth station will not cause unacceptable interference into other satellite systems.²⁸ However, as the Commission explained previously in this proceeding, it is possible in some cases for an earth station that does not meet all of the technical standards of Part 25 to operate without causing unacceptable interference in a 2° orbital spacing environment.²⁹ The Commission explained further that it conducts a case-by-case review of each of these "non-routine" earth stations to determine whether the application can be granted.³⁰

C. Procedural History

9. Over the years, we have taken action to streamline our satellite and earth station licensing rules and procedures when warranted.³¹ In addition, Section 11 of the Communications Act requires that the Commission, in every even-numbered year beginning in 1998, review all regulations that apply to the operations and activities of any provider of telecommunications service and determine whether any of these regulations are no longer necessary as the result of meaningful economic competition between providers of the service.³² Section 11 further instructs the Commission to "repeal or modify any regulation it determines to be no longer necessary in the public interest."³³ Accordingly, in 2000, the Commission initiated a comprehensive review of

²⁶ *Fifth Report and Order*, 20 FCC Rcd at 5674 (para. 17); *Sixth Report and Order*, 20 FCC Rcd at 5597 (para. 6). See also *Notice*, 15 FCC Rcd at 25132 (para. 7), citing 47 C.F.R. Part 25.

²⁷ 47 C.F.R. §§ 25.134, 25.209, 25.211, 25.212. See also *Routine Licensing of Earth Station in the 6 GHz and 14 GHz Bands Using Antennas Less than 9 Meters and 5 Meters in Diameter, respectively, for Both Full Transponder and Narrowband Transmissions, Declaratory Order*, 2 FCC Rcd 2149 (Com. Car. Bur., 1987), cited in 47 C.F.R. § 25.134.

²⁸ *Fifth Report and Order*, 20 FCC Rcd at 5674 (para. 17); *Sixth Report and Order*, 20 FCC Rcd at 5597 (para. 6); *Notice*, 15 FCC Rcd at 25132 (para. 7). For purposes of this Order, we define "routine" earth stations as those that can be licensed without a case-by-case review. The Commission also grants "non-routine" earth station applications, but those applications require a case-by-case review to ensure that they will not cause harmful interference in a two-degree spacing environment.

²⁹ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25132 (para. 7).

³⁰ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25132 (para. 7).

³¹ Amendment of Part 25 of the Commission's Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at Reduced Orbital Spacing and to Revise Application Processing Procedures for Satellite Communications Services, *First Report and Order*, CC Docket No. 86-496, 6 FCC Rcd 2806 (1991) (*1991 Streamlining Order*); Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, IB Docket No. 95-117, 11 FCC Rcd 21581 (1996) (*1996 Streamlining Order*). See also *Fifth Report and Order*, 20 FCC Rcd at 5670-71 (para. 9).

³² See *Fifth Report and Order*, 20 FCC Rcd at 5671 (para. 10), citing 47 U.S.C. § 161(a).

³³ See *Fifth Report and Order*, 20 FCC Rcd at 5671 (para. 10), citing 47 U.S.C. § 161(b).
(continued . . .)

telecommunications and other regulations to promote meaningful deregulation and streamlining where competition and other considerations warrant such action.³⁴

10. At the time the Commission started this review, its policy was to require non-routine earth station applicants to submit a technical study demonstrating that the proposed earth station will not cause unacceptable interference to 2°-complaint operations.³⁵ The preferred form of that technical study was the Adjacent Satellite Interference Analysis (ASIA) program as described in Section 25.134(b).³⁶ This analysis was often difficult and time consuming to perform, because the information needed for the analysis is not readily available from any one source, and the ASIA results can be subject to interpretation.³⁷ Some of the data needed for ASIA are available only from individual satellite operators.³⁸ Further, the operation of the non-compliant earth station antenna must still be coordinated with adjacent satellite operations.³⁹

11. The Commission proposed and later adopted several earth station streamlining measures in this proceeding. Among other things, it established a 15-year license term for earth station licenses,⁴⁰ and eliminated the licensing requirement for receive-only earth stations

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³⁴ Federal Communications Commission Biennial Regulatory Review 2000, *Staff Report*, CC Docket No. 00-175, 15 FCC Rcd 21084 (2000) (*2000 Biennial Review Staff Report*), cited in *Fifth Report and Order*, 20 FCC Rcd at 5671 (para. 10).

³⁵ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25134 (para. 13), 47 C.F.R. § 25.209(f).

³⁶ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25134 (para. 13), 47 C.F.R. § 25.134(b). Concurrently with the *Two Degree Spacing Reconsideration Order*, the Commission formed an Advisory Committee to obtain technical and operational expertise in implementing Two Degree Spacing standards. Establishment of an Advisory Committee on Implementation of Reduced Orbit Spacing Between Domestic Fixed Satellites, *Order*, 102 FCC 2d 390 (1985). Among the Advisory Committee's recommendations was to adopt ASIA as the generally accepted procedure for calculating adjacent satellite interference. The Commission confirmed this determination in 1996, but also decided to permit licensees and applicants to use their own interference analysis programs, provided that the program is made available to the Commission and the public for review. *1996 Streamlining Order*, 11 FCC Rcd at 21601-02 (para. 50).

³⁷ Conducting an interference assessment using the ASIA program requires the collection of very specific modulation and link budget parameters for all of the communication links being analyzed. Parameters such as modulation indices, baseband frequencies, data and error correction coding rates, noise temperatures, antenna gains, powers, and sometimes carrier frequency plans are required for the interfering and desired communication links. Once these parameters are collected, the ASIA computer program computes carrier-to-interference (C/I) ratios between the desired and interfering links. Such detailed parameters are not collected in the earth station licensing process and are generally available only from the individual satellite system operators. See *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25134 (para. 13).

³⁸ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25134 n.24.

³⁹ *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18), citing *Notice*, 15 FCC Rcd at 25134 (para. 13).

⁴⁰ See *Notice*, 15 FCC Rcd at 25143-44 (paras. 44-45); Amendment of the Commission's Space Station Licensing Rules and Policies, 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part (continued . . .)

receiving transmissions from non-U.S.-licensed satellites on the Permitted List.⁴¹ The Commission has also adopted a streamlined form for routine earth station applications, called Form 312 EZ, eliminated several outdated rules, and mandated electronic filing for all earth station filings.⁴²

12. The primary focus of the *Notice*, however, was to streamline processing for two types of non-routine earth station applications: (1) those seeking authority to operate an earth station with an antenna diameter too small to meet the routine processing standards of Part 25,⁴³ and (2) those seeking authority to operate an earth station at a power level greater than those specified in Part 25.⁴⁴ For applications seeking authority to use a small antenna, the Commission proposed two alternative procedures. One procedure would allow the Commission to require the applicant proposing a small antenna to operate at a lower power level to compensate for the smaller antenna diameter.⁴⁵ The second procedure, as proposed by the Commission in the *Notice*, would allow applicants to submit certifications from target satellite operators, verifying that the

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25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Notice of Proposed Rulemaking and First Report and Order*, IB Docket Nos. 02-34 and 00-248, 17 FCC Rcd 3847, 3894-96 (paras. 139-46) (2002) (*First Report and Order*).

⁴¹ Amendment of the Commission's Space Station Licensing Rules and Policies, 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Second Report and Order*, IB Docket Nos. 02-34 and 00-248, 18 FCC Rcd 12507 (2003) (*Second Report and Order*). For more on the Permitted List, see Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States, *Order*, IB Docket No. 96-111, 15 FCC Rcd 7207 (1999) (*DISCO II First Reconsideration Order*).

⁴² Amendment of the Commission's Space Station Licensing Rules and Policies, 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Third Report and Order and Second Further Notice of Proposed Rulemaking*, IB Docket Nos. 02-34 and 00-248, 18 FCC Rcd 13486 (2003) (*Third Report and Order*); Amendment of the Commission's Space Station Licensing Rules and Policies, 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Fourth Report and Order*, IB Docket Nos. 02-34 and 00-248, 19 FCC Rcd 7419 (2004) (*Fourth Report and Order*).

⁴³ The smallest diameter antenna routinely licensed at C-band is 4.5 meters, and the smallest antenna routinely licensed at Ku-band is 1.2 meters in diameter. See *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), *citing Notice*, 15 FCC Rcd at 25133 (para. 11). The size of the earth station antenna is important since, in general, smaller antennas produce wider transmission beams, which, in turn, can create more potential interference to adjacent satellite operations. *Notice*, 15 FCC Rcd at 25132 (para. 7).

⁴⁴ See 47 C.F.R. §§ 25.134 (VSAT networks), 25.211 (video transmissions), 25.212 (narrowband transmissions). See also *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), *citing Notice*, 15 FCC Rcd at 25140 (para. 31).

⁴⁵ As explained further below, reducing the diameter of an earth station antenna increases the side lobes. Reducing the transmit power of the earth station reduces the off-axis EIRP, however, and so can compensate for the reduction in antenna diameter. See *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), *citing Notice*, 15 FCC Rcd at 25135-36 (paras. 15-19).

operation of the small earth station antenna has been coordinated with other satellite operators potentially affected by the proposed non-routine earth station.⁴⁶ For applications to operate at non-routine power levels, the Commission proposed a certification procedure substantially similar to that it proposed for applications for earth stations with non-routine antenna diameters.⁴⁷ Finally, the Commission proposed codifying these procedures in Section 25.220 of its rules.⁴⁸

13. A significant number of parties commented on the proposals in the *Notice*.⁴⁹ In addition, SIA filed several *ex parte* statements proposing a different approach.⁵⁰ Although the Commission had serious concerns with SIA's proposal, it adopted a *Further Notice* to allow interested parties to comment on it.⁵¹ Based on the record developed in response to the *Notice* and the *Further Notice*, the Commission decided in the *Fifth Report and Order* not to adopt SIA's alternative procedure for non-routine earth stations because it was unduly complex and unnecessarily burdensome for earth station applicants.⁵² The Commission instead adopted its original proposal as described in the *Notice*.⁵³

14. In addition, in response to the *Notice*, some parties recommended increasing the starting point for the earth station antenna gain pattern envelope. This would enable the Commission to decrease the minimum routine earth station size. Therefore, in the *Further Notice*, the Commission invited comment on several issues related to revising the earth station antenna gain pattern envelope.⁵⁴ The Commission decided to increase the starting point for the antenna gain pattern envelope in the *Sixth Report and Order*, from 1.0° in the C-band and 1.25° in the Ku-band to 1.5° in both bands.⁵⁵ The Commission stayed the effectiveness of its antenna

⁴⁶ *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), citing *Notice*, 15 FCC Rcd at 25136-37 (paras. 20-24).

⁴⁷ *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), citing *Notice*, 15 FCC Rcd at 25140-41 (paras. 31-33).

⁴⁸ *Fifth Report and Order*, 20 FCC Rcd at 5676 (para. 20), citing *Notice*, 15 FCC Rcd at 25187-88 (App. B).

⁴⁹ Specifically, 13 comments were filed on March 26, 2001, and 11 replies were filed on May 7, 2001. See *Fifth Report and Order*, 20 FCC Rcd at 5731 (App. A).

⁵⁰ See, e.g., Letter from Dori K. Bailey of Latham and Watkins, to Magalie Roman Salas, Secretary, FCC (dated Dec. 11, 2001) (SIA December 10 *Ex Parte* Statement) (While the *ex parte* meeting was held on December 10, 2001, the letter summarizing that meeting was filed on December 11, 2001).

⁵¹ 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Further Notice of Proposed Rulemaking*, IB Docket No. 00-248, 17 FCC Rcd 18585, 18631-33 (paras. 127-32) (2002) (*Further Notice*).

⁵² *Fifth Report and Order*, 20 FCC Rcd at 5680-82 (paras. 30-34).

⁵³ *Fifth Report and Order*, 20 FCC Rcd at 5699 (para. 84). In this Order below, we make minor modifications to the procedure for non-routine earth stations based on proposals in a petition for reconsideration of the *Fifth Report and Order*. See Section V. below.

⁵⁴ *Further Notice*, 17 FCC Rcd at 18599-18613 (paras. 29-73).

⁵⁵ *Sixth Report and Order*, 20 FCC Rcd at 5604-06 (paras. 22-25).
(continued . . .)

gain pattern revisions, however, while it considered a proposal for an off-axis EIRP approach for FSS earth stations, set forth in the *Third Further Notice* which was adopted together with the *Sixth Report and Order*.⁵⁶ We discuss this further below.

D. Off-Axis EIRP Approach

15. In response to the *Notice*, some commenters recommended adopting a new envelope establishing off-axis EIRP spectral density limits.⁵⁷ Commenters argued that an off-axis EIRP envelope would combine power density and antenna gain pattern requirements into one rule, and would give earth station license applicants more flexibility because they would be able to adjust their power to compensate for their antenna gain pattern, and vice versa.⁵⁸ The Commission adopted the *Third Further Notice* in part to invite comment on adopting an off-axis EIRP density envelope for FSS earth stations.⁵⁹ The Commission agreed that earth station license applicants should have the flexibility to reduce their power levels to compensate for a higher antenna gain pattern.⁶⁰ The Commission also reasoned that an off-axis EIRP envelope might enable it to act on earth station applications more quickly than would be possible under the substantially similar procedure adopted in the *Fifth Report and Order*. Under that previous procedure, earth station applicants proposing to use antennas with non-routine antenna gain patterns were required to reduce their transmit power levels dB for dB to compensate for the amount that its antenna gain pattern exceeds the envelope in Section 25.209.⁶¹ Moreover, the Commission noted that an off-axis EIRP approach for conventional C-band and Ku-band FSS earth stations would be consistent with our treatment of Ka-band FSS earth stations, and earth stations on vessels (ESVs).⁶²

16. Eight parties filed comments in response to the *Third Further Notice*, and six filed replies.⁶³ In addition, AVL filed an *ex parte* statement on February 13, 2006, to clarify and in some cases to revise the proposals in its applications.⁶⁴ SIA and ViaSat also filed *ex parte*

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⁵⁶ *Sixth Report and Order*, 20 FCC Rcd at 5614 (para. 50).

⁵⁷ *Third Further Notice*, 20 FCC Rcd at 5621 (para. 72).

⁵⁸ *Third Further Notice*, 20 FCC Rcd at 5621 (para. 72).

⁵⁹ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

⁶⁰ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

⁶¹ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74), citing *Fifth Report and Order*, 20 FCC Rcd at 5684-85 (paras. 41-42), 47 C.F.R. § 25.209(a).

⁶² *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74), citing 47 C.F.R. § 25.138 (Ka-band earth stations); Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/ 3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands, *Report and Order*, IB Docket No. 02-10, 20 FCC Rcd 674, 699 (para. 55) (2005) (*ESV Order*).

⁶³ These parties are listed in Appendix A.

⁶⁴ Letter from James L. Oliver, President, AvL Technologies, to Marlene H. Dortch, Secretary, FCC (dated Feb. 13, 2006) (AVL *Ex Parte* Statement).

statements.⁶⁵ Based on that record, and for the reasons discussed below, we adopt the Commission's off-axis EIRP proposal, but not as the only means of reviewing earth station applications as was originally proposed. Instead, the Commission will continue to treat as routine applications for earth stations that fall within the traditional routine earth station processing parameters. In Section III. of this Order below, we address these issues in more detail.

17. In addition, in the *Third Further Notice*, the Commission invited additional comment on two issues for which it needed to supplement the record. For the first issue, regarding use of contention protocols in Very Small Aperture Terminal (VSAT) networks, we adopt a requirement that requires such contention protocol usage to be "reasonable." The second issue involved coordination requirements for VSAT networks with remote terminals located in the "Quiet Zone," a 13,000 square mile area in Virginia, West Virginia, and Maryland in which the National Radio Astronomy Observatory (NRAO) conducts radioastronomy.⁶⁶ We find that no further revisions to the Quiet Zone coordination procedures are needed at this time. We discuss these two issues in Section IV. below. Finally, we address petitions for reconsideration of the *Fifth Report and Order* and *Sixth Report and Order* in Section V.⁶⁷ We grant in part and deny in part the petitions for reconsideration.

III. OFF-AXIS EIRP

A. Review of Earth Station Applications Based on Off-Axis EIRP Envelope

18. *Background.* In the *Third Further Notice*, the Commission invited comment on reviewing FSS earth station applications in the C-band and Ku-band solely on the basis of an off-axis EIRP envelope.⁶⁸ The Commission noted that this approach would give earth station license applicants the flexibility to reduce their power levels to compensate for a higher antenna gain pattern, and might also allow the Commission to act on certain earth station applications faster than would be possible under a substantially similar procedure adopted in the *Fifth Report and Order*.⁶⁹ Moreover, the Commission noted that an off-axis EIRP approach for conventional C-band and Ku-band FSS earth stations would be consistent with its treatment of Ka-band FSS earth stations, and earth stations on vessels (ESVs).⁷⁰ In the event that the Commission decided not to adopt off-axis EIRP envelopes for FSS earth stations, it requested proposals for new minimum

⁶⁵ Letter from Carolyn Tatum Roddy, Director of Regulatory Affairs, SIA, to Marlene H. Dortch, Secretary, FCC (dated Oct. 27, 2006) (SIA *Ex Parte* Statement); Letter from Elizabeth R. Park, Counsel for ViaSat, Inc., to Marlene H. Dortch, Secretary, FCC (dated Dec. 14, 2006) (ViaSat *Ex Parte* Statement).

⁶⁶ See 47 C.F.R. § 25.203(f).

⁶⁷ In this Order, we also dismiss three petitions for reconsideration of the *1996 Streamlining Order*, 11 FCC Rcd 21581, as moot or outside the scope of that proceeding.

⁶⁸ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 75). In the *Third Further Notice*, the Commission also explained why it decided to exclude Ka-band FSS earth stations and mobile satellite service (MSS) earth stations from the off-axis EIRP envelopes it proposed for FSS earth stations in the C-band and Ku-band. *Third Further Notice*, 20 FCC Rcd at 5625-26 (paras. 89-90). No one commented on that decision.

⁶⁹ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

⁷⁰ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

routine antenna sizes based on the revised antenna gain pattern requirements adopted in the *Sixth Report and Order*.⁷¹

19. *Discussion.* SIA and Spacenet generally support adoption of an off-axis EIRP envelope approach for FSS earth stations,⁷² and none of the commenters opposed this proposal. Accordingly, for the reasons set forth in the *Third Further Notice* and summarized above, we adopt such off-axis EIRP envelopes. However, we will not review earth station applications *solely* on the basis of off-axis EIRP envelopes, as proposed in the *Third Further Notice*. This is in part because, as explained further below, an off-axis EIRP approach is not well-suited for analog video earth station applications.⁷³ In addition, by continuing to give earth station applicants the option of having their applications reviewed on the basis of antenna size and power levels as the Commission has done in the past, we can continue to take advantage of our experience with 4.5 meter antennas in the C-band, and 1.2 meter antennas in the Ku-band.

20. In the *Sixth Report and Order*, the Commission adopted a number of revisions to its antenna gain pattern rules. Specifically, the Commission decided to begin the antenna gain pattern envelope at 1.5° off-axis within the GSO orbital arc for C-band and Ku-band earth stations, and 3.0° off-axis outside the GSO orbital arc for Ku-band earth stations.⁷⁴ The Commission also increased its backlobe requirements for Ku-band earth stations to 0 dBi for off-axis angles greater than 85°.⁷⁵ The Commission stayed the effectiveness of these rule revisions, however, pending its decision on whether to adopt an off-axis EIRP envelope methodology for reviewing FSS earth station applications.⁷⁶ Here, we have decided to adopt an off-axis EIRP envelope methodology as one option for earth station applicants. Accordingly, the antenna gain pattern rule revisions adopted in the *Sixth Report and Order* will take effect concurrently with the other rule revisions we adopt in this Order.

B. Development of Off-Axis EIRP Envelope for FSS Earth Stations

1. Circular C-band and Ku-band Earth Stations

21. *Background.* Generally, an off-axis EIRP envelope is determined by the applicable earth station antenna gain pattern envelope and the allowed EIRP density into the antenna.⁷⁷ The allowed EIRP density from the antenna decreases as the off-axis angle increases. In the *Third Further Notice*, the Commission invited comment on basing the off-axis EIRP envelopes for C-band and Ku-band earth stations on the antenna gain pattern envelopes and

⁷¹ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 75).

⁷² SIA Comments at 6-7; Spacenet Comments at 1-3. *See also* AVL *Ex Parte* Statement at 3.

⁷³ *See* Section III.B.4. below.

⁷⁴ *Sixth Report and Order*, 20 FCC Rcd at 5614 (para. 49).

⁷⁵ *Sixth Report and Order*, 20 FCC Rcd at 5614 (para. 49).

⁷⁶ *Sixth Report and Order*, 20 FCC Rcd at 5614 (para. 50).

⁷⁷ *Third Further Notice*, 20 FCC Rcd at 5623 (para. 77), *citing* *ESV Order*, 20 FCC Rcd at 699 (para. 55).

power requirements in Part 25 that were revised to begin at the angles established in the *Sixth Report and Order*.⁷⁸ Those off-axis EIRP envelopes were set forth in the *Third Further Notice*,⁷⁹ and are reprinted in Appendix C to this Order.

22. SIA supports the Commission's proposed off-axis EIRP envelopes for C-band earth station antennas greater than or equal to 2.4 meters in diameter, and for Ku-band earth station antennas greater than or equal to 0.7 meters in diameter.⁸⁰ SIA, however, asserts that the Commission's proposal to start the off-axis EIRP envelope at 1.5° does not adequately protect against mispointing of an antenna by 0.5° or less, as the Commission found in the *Sixth Report and Order*.⁸¹ SIA further recommends that, for C-band earth station antennas less than 2.4 meters in diameter, and for Ku-band earth station antennas less than 0.7 meters in diameter, the Commission adopt off-axis EIRP envelopes that limit off-axis EIRP in the sidelobes greater than 6° slightly more than as proposed in Appendix C. Specifically, SIA recommends that those off-axis EIRP limits be applied at off-axis angles 0.5° less than they would be under the Commission's proposals.⁸² Examples of SIA's proposed off-axis EIRP envelopes are set forth below. Global VSAT Forum supports SIA's proposal to establish a different set of off-axis EIRP envelopes for smaller earth station antennas.⁸³ AVL questions whether SIA's proposal is too regulatory.⁸⁴ ViaSat argues that a separate mask for small earth station antennas might discourage technological developments involving such antennas.⁸⁵

Table 1
Off-Axis EIRP Envelope Proposed for
C-Band Digital Earth Station Applications in
the *Third Further Notice*, Appendix C,
Table II(1), with SIA's Proposed Revisions for
Earth Stations Less Than 2.4 Meters in Diameter

$26.3 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$1.5^\circ \leq \theta \leq 6.5^\circ$
$5.3 - 10\log_{10}(N)$	dBW/4 kHz	For	$6.5^\circ < \theta \leq 8.7^\circ$
$29.3 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$8.7^\circ < \theta \leq 47.5^\circ$
$- 12.7 - 10\log_{10}(N)$	dBW/4 kHz	For	$47.5^\circ < \theta \leq 180^\circ$

⁷⁸ *Third Further Notice*, 20 FCC Rcd at 5623 (para. 77).

⁷⁹ *Third Further Notice*, 20 FCC Rcd at 5653-56 (App. C).

⁸⁰ SIA Comments at 16.

⁸¹ SIA Comments at 12-15.

⁸² SIA Comments at 17-18. *See also* SIA *Ex Parte* Statement at 4.

⁸³ Global VSAT Forum Reply at 1-2.

⁸⁴ AVL Reply at 1.

⁸⁵ ViaSat *Ex Parte* Statement at 4-8.

Table 2
Off-Axis EIRP Envelope Proposed for
Ku-Band Digital Earth Station Applications in
the *Third Further Notice*, Appendix C,
Table IV(1), with SIA's Proposed Revisions for
Earth Stations Less than 0.7 Meters in Diameter

15 - $10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$1.5^\circ \leq \theta \leq 6.5^\circ$
-6 - $10\log_{10}(N)$	dBW/4 kHz	For	$6.5^\circ < \theta \leq 8.7^\circ$
18 - $10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$8.7^\circ < \theta \leq 47.5^\circ$
- 24 - $10\log_{10}(N)$	dBW/4 kHz	For	$47.5^\circ < \theta \leq 84.5^\circ$
- 14 - $10\log_{10}(N)$	dBW/4 kHz	For	$84.5^\circ < \theta \leq 180^\circ$

23. *Discussion.* We decide against adopting SIA's proposal. First, we disagree with SIA's contention that the antenna gain pattern requirements adopted in the *Sixth Report and Order* do not adequately account for the potential for pointing error. In the *Sixth Report and Order*, the Commission explained why it decided to start the antenna gain pattern envelope at 1.5° off-axis. That decision was based on comments in the record from several parties, including SIA, that the main beams of a number of sub-meter Ku-band antennas could meet this requirement.⁸⁶ Furthermore, the Commission observed that, in the United States, the difference between the geocentric angle and the topocentric angle is 0.1° to 0.2°, depending on the elevation angle of the earth station.⁸⁷ The difference between these two angles provides an additional safeguard against adjacent satellite interference.⁸⁸

24. Furthermore, even assuming that SIA is correct that starting the antenna gain pattern envelope at 1.5° off-axis does not adequately protect against adjacent satellite interference, we disagree that SIA's proposal before us now would remedy the issue it raised. Other than changing the starting point for the antenna gain pattern, the antenna gain pattern envelope was unchanged in the *Sixth Report and Order*. In other words, the *Sixth Report and Order* revised the earth station antenna gain requirements only for the main beam of the antenna. The limits on side lobe gain were not affected by the *Sixth Report and Order*. In effect, SIA claims that the *Sixth Report and Order* allows the main lobe to be too wide. However, SIA's recommendation would result in only slight revisions to the Commission's side lobe requirements.⁸⁹ Adopting SIA's recommendation would not have any effect on the width of the main lobe.⁹⁰

⁸⁶ *Sixth Report and Order*, 20 FCC Rcd at 5604 (para. 22).

⁸⁷ *Sixth Report and Order*, 20 FCC Rcd at 5604 (para. 22). The geocentric angle is the angle measured from the center of the earth, and the topocentric angle is the angle measured from the surface of the earth. See *Further Notice*, 17 FCC Rcd at 18640-41 (App. B).

⁸⁸ *Sixth Report and Order*, 20 FCC Rcd at 5604 (para. 22), citing *Further Notice*, 17 FCC Rcd at 18640-41 (App. B).

⁸⁹ Specifically, SIA's proposal would revise the earth station antenna gain pattern envelope from 6.5° to 7°, 8.7° to 9.2°, or 47.5° to 48° off-axis.

⁹⁰ Although we disagree with SIA's contention that the antenna gain pattern requirements adopted in the *Sixth Report and Order* do not adequately account for the potential for pointing error, we find that a relatively minor adjustment to those antenna gain pattern requirements would further reduce the potential for harmful interference resulting from pointing error. Specifically, in the *Third Further Notice*, the (continued . . .)

2. Elliptical C-band Earth Stations

25. *Background.* When viewed from any point on the earth's surface, satellites near each other in the geostationary satellite orbit (GSO) appear to lie approximately in one plane.⁹¹ In the *Sixth Report and Order*, the Commission decided to begin the Ku-band antenna gain pattern envelope outside the GSO orbital plane at 3.0° off-axis, in order to facilitate development of more advanced elliptical antennas.⁹² The Commission also tentatively concluded that it would start the Ku-band off-axis EIRP envelope outside the GSO orbital plane at 3.0° off-axis.⁹³

26. With respect to the C-band, however, the Commission specifically invited comment in the *Third Further Notice* on whether it should start the C-band antenna gain pattern envelope outside the GSO orbital plane, and the comparable C-band off-axis EIRP envelope, at 3.0° off-axis, rather than 1.5° off-axis.⁹⁴ The Commission noted that adopting this proposal would facilitate routine processing standards for elliptical C-band earth station antennas.⁹⁵ The Commission also invited comment on whether the existing coordination procedure in Section 25.203(c) of the Commission's rules is adequate for coordinating elliptical C-band earth stations with terrestrial wireless operations.⁹⁶ Finally, the Commission inquired whether it should increase the minimum angle of elevation for elliptical C-band earth stations above the 5° minimum currently in the rules, to further reduce the possibility of harmful interference to terrestrial wireless operations, in the event that the Commission adopts the rule proposed here.⁹⁷

27. *Discussion.* None of the commenters in this proceeding directly address the Commission's proposal to start the C-band and Ku-band off-axis EIRP envelopes outside the GSO orbital plane at 3° off-axis. Accordingly, we adopt the Commission's proposal, to facilitate

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Commission proposed defining the off-axis EIRP envelope for C-band and Ku-band FSS earth stations on the basis of degrees away from the axis of the main lobe. *Third Further Notice*, 20 FCC Rcd at 5653-56 (App. C). Instead of that approach, we could define the off-axis EIRP envelope on the basis of a line from the focal point of the antenna to the target satellite, within the plane 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. This approach would cause VSAT network operators with excessively mispointed antennas to violate the antenna gain pattern rules. Accordingly, as a logical outgrowth of the off-axis EIRP envelopes proposed in the *Third Further Notice*, and in response to SIA's concerns regarding pointing error expressed in the record, we define the off-axis EIRP envelopes for C-band and Ku-band FSS earth stations consistently with the off-axis EIRP envelopes for ESVs.

⁹¹ *Sixth Report and Order*, 20 FCC Rcd at 5599 n.25.

⁹² *Sixth Report and Order*, 20 FCC Rcd at 5610 (para. 38).

⁹³ *Third Further Notice*, 20 FCC Rcd at 5623 (para. 78).

⁹⁴ *Third Further Notice*, 20 FCC Rcd at 5624 (para. 82).

⁹⁵ *Third Further Notice*, 20 FCC Rcd at 5624 (para. 82).

⁹⁶ *Third Further Notice*, 20 FCC Rcd at 5624 (para. 82).

⁹⁷ *Third Further Notice*, 20 FCC Rcd at 5624 (para. 82), citing 47 C.F.R. § 25.205.

elliptical earth station antennas. We also conclude that, since no one advocated new coordination procedures for elliptical C-band earth stations, none are needed at this time.

28. SIA opposes increasing the minimum elevation angle for elliptical C-band earth stations because it might unreasonably limit the use of such earth stations in northern latitudes.⁹⁸ No one argues in favor of this restriction. On the basis of the record on this issue, we find that SIA is persuasive, and no revision to the current minimum elevation angle rules is needed at this time.

29. AVL recommends requiring that the major axis of elliptical antennas be aligned with the GSO plane.⁹⁹ We conclude that starting the off-axis EIRP envelope at 1.5° off-axis within the GSO orbital plane, and at 3.0° outside that plane, has the same effect as requiring elliptical antennas to be aligned with the GSO plane in most cases. Thus, AVL's recommendation would simply state explicitly a requirement that is now implicit in the Commission's rules. Therefore, we adopt AVL's suggestion.

3. Analog Video

30. *Background.* As noted above, the Commission proposed replacing the current routine earth station licensing standards, based on antenna size and power levels, with procedures based exclusively on off-axis EIRP envelopes.¹⁰⁰ In addition, the Commission based its proposed off-axis EIRP envelopes on the antenna gain pattern envelopes and EIRP density limits in Part 25, revised to begin at the angles established in the *Sixth Report and Order*.¹⁰¹ Analog video services present unique issues under this approach, because Part 25 has historically provided EIRP limits rather than EIRP density limits on analog video transmissions.¹⁰² In the *Third Further Notice*, the Commission requested comment on three options for addressing these analog video transmission issues: (1) applying the off-axis EIRP envelopes for other narrowband analog transmissions to analog video transmissions; (2) developing new off-axis EIRP envelopes for analog video transmissions; or (3) prohibiting analog video transmissions, after a one-year transition period.¹⁰³ The Commission assumed that eliminating analog video might be reasonable because the use of analog generally in satellite transmissions is declining.¹⁰⁴ The Commission also explained that analog video transmissions are more susceptible to harmful interference from other transmissions and more likely to cause harmful interference to other transmissions.¹⁰⁵

⁹⁸ SIA Comments at 7.

⁹⁹ AVL Comments at 4; AVL *Ex Parte* Statement at 2.

¹⁰⁰ Section III.A. above, citing *Third Further Notice*, 20 FCC Rcd at 5622 (paras. 74-75).

¹⁰¹ Section III.B.1. above, citing *Third Further Notice*, 20 FCC Rcd at 5623 (para. 77).

¹⁰² See *Third Further Notice*, 20 FCC Rcd at 5624 (para. 84).

¹⁰³ *Third Further Notice*, 20 FCC Rcd at 5624-25 (paras. 85-88).

¹⁰⁴ *Third Further Notice*, 20 FCC Rcd at 5625 (para. 87).

¹⁰⁵ *Third Further Notice*, 20 FCC Rcd at 5625 (para. 87), citing *Fifth Report and Order*, 20 FCC Rcd at 5706 (para. 106); Amendment of Part 25 of the Commission's Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at Reduced Orbital Spacings and to Revise Application (continued . . .)

31. *Discussion.* SIA claims that it is not possible to develop an off-axis EIRP envelope for analog video signals because the power spectral density of such signals fluctuates.¹⁰⁶ SES Americom opposes new analog video regulations because the current rules are working well.¹⁰⁷ In addition, a number of commenters oppose eliminating analog video transmissions, because a substantial number of customers are still using analog video.¹⁰⁸ Several maintain that neither a prohibition nor a transition requirement is necessary because analog video users are in the process of converting to digital video already.¹⁰⁹ Many parties assert that a one-year transition period would not be adequate.¹¹⁰ Commenters also maintain that a premature transition to digital would be prohibitively expensive.¹¹¹ Several commenters argue that the relative susceptibility to harmful interference of analog video signals is not relevant, because satellite operators have been accommodating those signals for years.¹¹² NPS claims that digital transmissions are more likely to be perceived as a potential root cause of harmful interference.¹¹³

32. We adopt SES Americom's and SIA's proposal to retain the current regulatory framework for analog video services at this time.¹¹⁴ The record in this proceeding has shown convincingly that requiring the transition from analog to digital video transmissions proposed in the *Third Further Notice* would be unreasonably expensive and burdensome.

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Processing Procedures for Satellite Communications Services, *Second Report and Order and Further Notice of Proposed Rulemaking*, CC Docket No. 86-496, 8 FCC Rcd 1316, 1320 (para. 24) (1993) (*Ku-band Antenna Gain Pattern Revision Order*).

¹⁰⁶ SIA Comments at 21-22. *See also* EchoStar Reply at 4; NPS Reply at 4; SIA *Ex Parte* Statement at 5.

¹⁰⁷ SES Americom Comments at 7.

¹⁰⁸ SES Americom Comments at 6-7; NCTA Comments at 1-4; Time Warner Comments at 3-4; NPS Comments at 2-3; Joint Commenters Comments at 3-6. *See also* EchoStar Reply at 5.

¹⁰⁹ SES Americom Comments at 7; Time Warner Comments at 5-6; SIA Comments at 26; NPS Comments at 6; Joint Commenters Comments at 6; EchoStar Reply at 4; NPS Reply at 5; SIA Reply at 5. *See also* SIA *Ex Parte* Statement at 6.

¹¹⁰ NCTA Comments at 3-4; Time Warner Comments at 3-4; SIA Comments at 27-29; NPS Comments at 7-8; NPS Reply at 5.

¹¹¹ NCTA Comments at 1-4; Time Warner Comments at 3-5; SIA Comments at 27-29; Joint Commenters Comments at 6-7; EchoStar Reply at 2-3; NPS Reply at 4; SIA Reply at 6-8. *See also* SIA *Ex Parte* Statement at 6.

¹¹² SIA Comments at 23-26; SES Americom Comments at 4-6; Time Warner Comments at 6; NPS Comments at 5; Joint Commenters Comments at 2-3; EchoStar Reply at 3-4; SIA Reply at 5. *See also* SIA *Ex Parte* Statement at 6.

¹¹³ NPS Comments at 3-6.

¹¹⁴ SES Americom Comments at 3-4; SIA Reply at 4.

4. Other Issues

33. The Commission included a " $10\log(N)$ " term in its proposed off-axis EIRP envelopes to account for the use of frequency division multiple access (FDMA), time division multiple access (TDMA), or code division multiple access (CDMA) technique for digital earth stations in VSAT networks.¹¹⁵ The effect of these terms is to regulate off-axis EIRP on a per-earth station basis rather than an aggregate basis. SIA supports the per earth station approach.¹¹⁶ SIA asserts, however, that this approach might not be best for the Aeronautical Mobile Satellite Service (AMSS) operating in the Ku-band.¹¹⁷ We are considering AMSS in another proceeding and will determine how best to treat AMSS on the basis of the record in that proceeding.¹¹⁸ Similarly, we have considered separately various approaches to regulating off-axis EIRP for ESVs in the C- and Ku-bands,¹¹⁹ and are considering vehicle-mounted earth stations in the Ku- and extended Ku-bands.¹²⁰

34. Finally, SIA asserts that it has found some mathematical errors in the Commission's proposed off-axis EIRP envelopes in Appendix C of the *Third Further Notice*.¹²¹ We agree with SIA in some cases, and disagree in others. These issues are discussed in more detail in Appendix D to this Order.¹²²

¹¹⁵ See *Third Further Notice*, 20 FCC Rcd at 5653-56 (App. C). Specifically, the Commission included a " $10\log(N)$ " term for the EIRP limits of digital earth stations, where N is set equal to 1 for TDMA and FDMA networks, and N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam for CDMA networks.

¹¹⁶ SIA Comments at 11.

¹¹⁷ SIA Comments at 11; SIA Reply at 8-9.

¹¹⁸ See Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service, *Notice of Proposed Rulemaking*, IB Docket No. 05-20, 20 FCC Rcd 2906 (2005) (*AMSS NPRM*).

¹¹⁹ See Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands, *Report and Order*, IB Docket No. 02-10, 20 FCC Rcd 674 (2005) (*ESV Order*) (*petitions for reconsideration pending*).

¹²⁰ See Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service, *Notice of Proposed Rulemaking*, IB Docket No. 07-101, 22 FCC Rcd 9649 (2007).

¹²¹ SIA Comments at 11 and 16 n.25; *Third Further Notice*, 20 FCC Rcd at 5653-56 (App. C).

¹²² In particular, we disagree with SIA's implicit assumption that the Commission overstated the off-axis EIRP limit between 7° and 9.2° off-axis by 0.1 dB/4 kHz. We explain this conclusion in Appendix D. When we discuss SIA's alternative proposal in Section III.E. below, we adjust its proposal by 0.1 dB/4 kHz to correct for SIA's assumption.

C. Protection from Interference

35. *Background.* In the *Third Further Notice*, the Commission noted that its rules protect earth stations from interference to the extent that the antenna conforms to the antenna gain reference patterns specified in its rules.¹²³ Accordingly, the Commission invited comment on whether to adopt a standard comparable to Section 25.209(c) to protect earth stations from harmful interference, in the event that it decided to replace the current antenna gain reference pattern requirements in Section 25.209 with an off-axis EIRP envelope for earth stations in the fixed satellite service.¹²⁴ The Commission also asked whether its decision to start the antenna gain reference pattern at 1.5° from the main lobe affect an earth station operator's ability to claim protection from harmful interference.¹²⁵

36. *Discussion.* SIA supports the Commission's proposal to provide protection from interference starting at 1.5° off-axis, to be consistent with the off-axis EIRP envelope starting point.¹²⁶ None of the other commenters opposed this approach. We find that it would be reasonable to adopt the Commission's proposal to require earth stations licensed under the off-axis EIRP procedure we adopt here to be protected from interference starting at 1.5° off-axis. This is consistent with the Commission's historical practice of protecting earth stations from interference to the extent that a routine earth station would be expected to receive interference.

D. Resolution of Harmful Interference Complaints

37. The Commission concluded that its existing procedures for resolving complaints of harmful interference has been generally effective, and proposed continuing to apply those procedures under an off-axis EIRP envelope approach for earth station licensing.¹²⁷ SIA supports retaining the current resolution procedure,¹²⁸ and no one else commented on this issue. Accordingly, we find that there is no reason to depart from our current procedures for resolving complaints of harmful interference.

E. Alternative Pointing Error Proposals

1. SIA Alternative Proposal

38. *Background.* As an alternative, SIA proposes that the Commission allow small antenna earth station applicants to show that they can maintain a pointing error of less than 0.5° off-axis, and meet off-axis EIRP envelopes that are slightly less restrictive than those proposed by SIA and set forth in Tables 1 and 2 above.¹²⁹ Specifically, for small Ku-band digital earth station

¹²³ *Third Further Notice*, 20 FCC Rcd at 5626 (para. 91), citing 47 C.F.R. § 25.209(c).

¹²⁴ *Third Further Notice*, 20 FCC Rcd at 5626 (para. 91).

¹²⁵ *Third Further Notice*, 20 FCC Rcd at 5626 (para. 91).

¹²⁶ SIA Comments at 8.

¹²⁷ *Third Further Notice*, 20 FCC Rcd at 5627 (para. 92), citing 47 C.F.R. § 25.274.

¹²⁸ SIA Comments at 9.

¹²⁹ SIA Comments at 19-20.
(continued . . .)

applications, and for any pointing error "p" less than 0.5°, SIA would use the off-axis EIRP envelope set forth below. SIA maintains that this would give earth station operators an incentive to improve their pointing accuracy.¹³⁰

Table 3
Off-Axis EIRP Envelope Proposed for
Ku-Band Digital Earth Station Applications in
the *Third Further Notice*, Appendix C,
Table IV(1), with SIA's Proposed Pointing Error Adjustment

15 - 10log ₁₀ (N) - 25log ₁₀ (θ-p)	dBW/4 kHz	For	1.5° ≤ θ ≤ (7-p)°
-6 -10log ₁₀ (N)	dBW/4 kHz	For	(7-p)° < θ ≤ (9.2-p)°
18 -10log ₁₀ (N) - 25log ₁₀ (θ-p)	dBW/4 kHz	For	(9.2-p)° < θ ≤ (48-p)°
- 24 -10log ₁₀ (N)	dBW/4 kHz	For	(48-p)° < θ ≤ (85-p)°
- 14 -10log ₁₀ (N)	dBW/4 kHz	For	(85-p)° < θ ≤ 180°

39. *Discussion.* We do not adopt SIA's alternative proposal. First, as the Commission has explained before, the purpose of distinguishing between routine and non-routine earth stations is to identify classes of earth stations that can be authorized without a detailed, case-by-case engineering review.¹³¹ Under SIA's alternative proposal, earth station applicants would be required to provide some kind of technical showing to demonstrate their pointing accuracy, and this requirement is inconsistent with the Commission's goal of establishing new routine earth station standards. Second, in the *Sixth Report and Order*, the Commission found that starting the antenna gain pattern envelope for FSS earth stations at 1.5° off-axis adequately accounts for the potential for pointing error.¹³² Accordingly, we conclude here that we do not need any rules other than those adopted in this Order to account for the potential for pointing error in FSS earth station antennas.

2. AVL Proposals

40. *Background.* AVL recommends routine processing for applications for earth stations that can be pointed very accurately. Specifically, AVL notes that it manufactures an earth station antenna with a computerized pointing mechanism. AVL also asserts that this mechanism by itself should be adequate to process the earth station routinely, regardless of whether the antenna gain pattern intersects the antenna gain pattern envelope at an off-axis angle greater than 1.5°. ¹³³ AVL maintains that any FSS antenna could become mispointed due to wind, refers to the effects of wind as "backlash," and suggests adopting standards for limiting backlash. ¹³⁴ AVL contends that the risk from harmful interference to adjacent satellites resulting from a mispointed main beam is greater than the risk resulting from larger side lobes, and

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¹³⁰ SIA Comments at 19.

¹³¹ See *Fifth Report and Order*, 20 FCC Rcd at 5680 (para. 30).

¹³² *Sixth Report and Order*, 20 FCC Rcd at 5604 (para. 22).

¹³³ AVL Comments at 1-4.

¹³⁴ AVL Comments at 4.

suggests that the Commission should focus its attention on preventing the edge of the main beam of antennas from being pointed at an adjacent satellite.¹³⁵ SIA and Global VSAT Forum support AVL's goal of establishing incentives for better pointing accuracy, but only if it can be done in a technologically neutral manner.¹³⁶ In addition, SIA points out that AVL's proposal appears to assume, incorrectly, that pointing accuracy is the only factor that might cause adjacent satellite interference, and contends that an off-axis EIRP approach is a more effective method for addressing adjacent satellite interference.¹³⁷

41. AVL also proposes requiring all non-routine temporary-fixed earth station applicants to demonstrate the pointing accuracy of their antennas.¹³⁸ SIA replies that such detailed increases in regulation are not necessary.¹³⁹ SIA further contends that AVL has not explained why there should be additional regulations for temporary-fixed earth stations, nor provided sufficient detail for its proposal.¹⁴⁰

42. *Discussion.* We decline adopting AVL's proposals. First, we agree with SIA that AVL appears to assume, incorrectly, that antenna pointing accuracy is the only factor that might cause adjacent satellite interference. Clearly, sidelobe transmissions are another factor, and SIA is correct in asserting that an off-axis EIRP envelope would address sidelobe issues more effectively than AVL's proposal would. Although we agree with AVL that the width of the main beam of an antenna is also an important factor, AVL does not explain how its suggested pointing accuracy requirements by themselves, without antenna gain pattern rules or off-axis EIRP rules that result in limiting the width of the main beam, would be effective in preventing harmful interference. Second, AVL's proposal appears to require a case-by-case review of pointing accuracy showings, and therefore would not be well-suited for a routine licensing approach. Third, we share SIA's and Global VSAT Forum's concerns regarding whether AVL's proposal is technologically neutral.

43. In addition, we conclude that AVL has not shown that the new requirements it recommends for non-routine temporary-fixed earth stations are warranted at this time. Generally, the Commission has received few, if any, complaints of harmful interference resulting from temporary-fixed earth stations.¹⁴¹ Thus, we have no basis for concluding that the procedures for non-routine earth stations adopted in the *Fifth Report and Order* might be inadequate for non-routine temporary-fixed earth stations. Moreover, we agree with SIA that, if there were some basis for additional regulations for non-routine temporary-fixed earth stations, AVL does not describe its proposal in sufficient detail to adopt it here.

¹³⁵ AVL *Ex Parte* Statement at 2; AVL Reply at 1.

¹³⁶ SIA Reply at 9-10; Global VSAT Forum Reply at 2.

¹³⁷ SIA Reply at 11.

¹³⁸ AVL Comments at 4.

¹³⁹ SIA Reply at 13-14.

¹⁴⁰ SIA Reply at 14.

¹⁴¹ See *Fifth Report and Order*, 20 FCC Rcd at 5709 (para. 113) (no complaints of harmful interference resulting from Ku-band earth stations from 1993 to the time the Order was adopted in 2005).

F. Exceeding Off-Axis EIRP Envelope

1. Certification Procedure

44. *Background.* As the Commission explained in the *Fifth Report and Order*, among other places, the Commission has historically distinguished between routine and non-routine earth station applications.¹⁴² Earth station operators have been allowed to exceed the Commission's earth station technical requirements, provided that they can show that they will not cause harmful interference to other licensed operations.¹⁴³ In the *Third Further Notice*, the Commission solicited comment on whether earth station operators should continue to be allowed to exceed the applicable off-axis EIRP envelope, in the event it adopted such envelopes.¹⁴⁴ Alternatively, the Commission invited comment on allowing only earth stations operating in bands that are not shared with other services to exceed the applicable off-axis EIRP envelope.¹⁴⁵

45. The Commission requested comment on issues that would be raised if earth station applicants were allowed to exceed the applicable off-axis EIRP envelope. In particular, the Commission proposed requiring such earth station applicants to follow one of the streamlined procedures adopted in the *Fifth Report and Order* for considering non-routine earth station applications.¹⁴⁶ Under that procedure, an applicant must obtain certifications from the operators of satellites with which the earth station operator plans to communicate, showing that those satellite operators have coordinated with the operators of satellites located within six degrees of the target satellite.¹⁴⁷ The Commission also invited parties to propose alternative procedures.¹⁴⁸

46. Finally, the Commission requested comment on whether it can continue to expect satellite operators to coordinate their operations in good faith.¹⁴⁹ If not, the Commission invited comment on whether it would be necessary to impose some kind of penalty for failing to coordinate in good faith, and if so, a number of options for such a penalty.¹⁵⁰

47. *Discussion.* None of the commenters address the proposal to prohibit all or some earth station operators from exceeding the off-axis EIRP envelope. Instead, the parties focus on the showing that should be required of such earth station applicants. Spacenet recommends

¹⁴² See *Fifth Report and Order*, 20 FCC Rcd at 5674-75 (paras. 17-18).

¹⁴³ See *Fifth Report and Order*, 20 FCC Rcd at 5675 (para. 18).

¹⁴⁴ *Third Further Notice*, 20 FCC Rcd at 5627 (para. 94).

¹⁴⁵ *Third Further Notice*, 20 FCC Rcd at 5627 (para. 94).

¹⁴⁶ *Third Further Notice*, 20 FCC Rcd at 5627-28 (paras. 94-95). See also *Fifth Report and Order*, 20 FCC Rcd at 5685-88 (paras. 44-52).

¹⁴⁷ *Fifth Report and Order*, 20 FCC Rcd at 5688-89 (para. 52), 5699 (para. 84).

¹⁴⁸ *Third Further Notice*, 20 FCC Rcd at 5627-28 (para. 95).

¹⁴⁹ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 96).

¹⁵⁰ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 96).

retaining the coordination procedure adopted in the *Fifth Report and Order* for earth station applications that exceed the off-axis EIRP envelope.¹⁵¹ SIA asserts that affidavits should be signed by both the target and adjacent satellite operators.¹⁵² SIA opposes any punitive measures to enforce coordination agreements as unnecessary, however.¹⁵³

48. As an initial matter, we will allow earth station applicants to exceed the off-axis EIRP envelope upon an appropriate showing that such operations will not cause harmful interference to other licensees. This is consistent with the Commission's past practice, as explained in the *Fifth Report and Order*.¹⁵⁴ Furthermore, nothing in the record suggests that we should change our practice as a result of our adoption of an off-axis EIRP envelope approach for FSS earth stations.

49. We also find that the certification procedure adopted in the *Fifth Report and Order* provides a good basis for determining whether any particular earth station operator should be allowed to exceed the off-axis EIRP envelope.¹⁵⁵ The Commission found in that Order that this certification procedure is a reasonable method for expediting review of non-routine earth stations without increasing the risk of harmful interference to other licensed operations.¹⁵⁶ Spacenet supports this approach.¹⁵⁷ SIA, the only other commenter on this issue, recommends requiring both target satellite operators and adjacent satellite operators to certify that coordination has been completed,¹⁵⁸ but does not sufficiently justify its recommendation. SIA also suggested that both target satellite operators and adjacent satellite operators submit certifications as part of its 2001 alternative to the Commission's proposed non-routine earth station procedure.¹⁵⁹ At the time, the Commission tentatively concluded that requiring additional certifications from adjacent satellite operators would create unnecessary additional administrative burdens on non-routine earth station applicants,¹⁶⁰ and specifically asked parties to address that tentative conclusion.¹⁶¹ SIA did not address that issue at that time.¹⁶²

¹⁵¹ Spacenet Comments at 2-3.

¹⁵² SIA Comments at 9.

¹⁵³ SIA Comments at 10.

¹⁵⁴ *Fifth Report and Order*, 20 FCC Rcd at 5674-75 (paras. 17-18).

¹⁵⁵ *Fifth Report and Order*, 20 FCC Rcd at 5685-89 (paras. 44-52).

¹⁵⁶ *Fifth Report and Order*, 20 FCC Rcd at 5688-89 (para. 52).

¹⁵⁷ Spacenet Comments at 2-3.

¹⁵⁸ *Fifth Report and Order*, 20 FCC Rcd at 5674-75 (paras. 17-18).

¹⁵⁹ *See Further Notice*, 17 FCC Rcd at 18632 (para. 129).

¹⁶⁰ *See Further Notice*, 17 FCC Rcd at 18632 (para. 129).

¹⁶¹ *See Further Notice*, 17 FCC Rcd at 18633 (para. 132).

¹⁶² *Fifth Report and Order*, 20 FCC Rcd at 5681 (para. 31) ("In addition, other than clarifying and explaining its proposal to treat an earth station's transmit operations differently from its receive operations, SIA has not addressed many of the concerns the Commission raised in the *Further Notice*.")
(continued . . .)

50. In the *Third Further Notice*, the Commission again noted that it has historically relied on satellite operators to work together cooperatively to reach coordination agreements,¹⁶³ and "request[ed] comment on whether our expectation of good-faith coordination among satellite system operators is well-founded and is self-policing."¹⁶⁴ Neither SIA nor any other commenter has provided a basis to question the Commission's expectation of good-faith coordination. Moreover, even if a target satellite operator neglected to coordinate with an affected adjacent satellite operator, the Commission's procedure includes an additional opportunity for those satellite operators to comment.¹⁶⁵ Accordingly, we find again that requiring certifications from adjacent satellite operators would be unnecessarily burdensome for non-routine earth station operators, and we have decided not to adopt this proposal.

51. Finally, we agree with SIA that punitive measures to enforce coordination agreements are not necessary. We base this conclusion on our discussion above that we have always relied on satellite operators to work together to coordinate their operations, and we expect that cooperation to continue.

2. Alternative Procedure

52. *Background.* Spacenet would also give earth station operators an opportunity to submit technical demonstrations of harmful interference potential, so that satellite operators are not given too much influence over the earth station licensing process.¹⁶⁶ SIA responds that allowing earth station operators to exceed the off-axis EIRP envelope without coordination could result in harmful interference, because adjacent satellite operators might not be aware of the earth station operations at issue.¹⁶⁷

53. AVL also recommends an alternative to the streamlined procedure adopted in the *Fifth Report and Order*. AVL would focus on the actual earth station antenna gain pattern in reviewing non-routine earth station applications, rather than simply whether the earth station's antenna gain pattern falls within the envelope specified in Section 25.209.¹⁶⁸ AVL further suggests that the Commission consider whether the earth station will use an electronic pointing mechanism.¹⁶⁹ Alternatively, AVL recommends requiring that non-routine earth station applications include only a certification from a professional engineer.¹⁷⁰

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¹⁶³ *Third Further Notice*, 20 FCC Rcd at 5627 (para. 93).

¹⁶⁴ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 96).

¹⁶⁵ *See Fifth Report and Order*, 20 FCC Rcd at 5694-97 (paras. 70-79).

¹⁶⁶ Spacenet Comments at 2-3.

¹⁶⁷ SIA Reply at 12-13.

¹⁶⁸ AVL *Ex Parte* Statement at 2.

¹⁶⁹ AVL *Ex Parte* Statement at 1-3.

¹⁷⁰ AVL Reply at 2. *See also* AVL *Ex Parte* Statement at 3.
(continued . . .)

54. *Discussion.* In the *Fifth Report and Order*, the Commission recognized that, in rare instances, a target satellite operator might be unable to complete coordination, even though it might be possible for a non-routine earth station to operate interference-free in a two-degree-spacing environment without reducing its power. In those cases, the Commission stated that it would entertain requests for waiver of the streamlined non-routine earth station procedures.¹⁷¹ The Commission also stated that parties requesting such waivers were permitted but not required to submit an ASIA.¹⁷² We will continue to allow this. As the Commission discussed briefly in the *Fifth Report and Order*, the burden would lie with the earth station applicant to show that its proposed operations would not cause harmful interference.¹⁷³ In response to AVL, non-routine earth station applicants are free to attempt to support their applications with any demonstration that they think the Commission will find persuasive. We also agree with AVL that such a showing may include a statement that the earth station antenna has an electronic pointing mechanism. However, we reach no conclusion here regarding whether any specific showing would or would not be sufficient in any particular instance, except that the earth station applicants in these cases bear the burden of proof of showing that their proposed operations will not cause harmful adjacent satellite interference. We disagree with SIA that adjacent satellite operators might not be aware of the earth station operations at issue, because any such waiver request would be placed on public notice to give all interested parties an opportunity to comment.

55. Finally, we will not adopt AVL's proposal of requiring non-routine earth station applicants to provide only a professional engineer's certification. Non-routine earth stations by definition create some increased risk of harmful interference, and so a more extensive showing is required to enable the Commission to determine that the proposed earth station operations will not cause harmful interference before any license is issued.

G. Information Requirements

56. *Background.* In the *Third Further Notice*, the Commission observed that there are two options for revising its information requirements to collect off-axis EIRP data for earth stations. Under one option, the Commission could require earth station applicants to submit a graph showing that their proposed earth station will meet the applicable off-axis EIRP envelope. Under the other option, earth station applicants would be required to provide a table showing the EIRP of the antenna at various specific off-axis angles.¹⁷⁴ The Commission proposed requiring a table, because it would be easier to develop a computer program to automate the review of tabular information than it would to develop a program for reviewing graphs.¹⁷⁵ The Commission also

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¹⁷¹ *Fifth Report and Order*, 20 FCC Rcd at 5700 (para. 87).

¹⁷² *Fifth Report and Order*, 20 FCC Rcd at 5700 (para. 87).

¹⁷³ *Fifth Report and Order*, 20 FCC Rcd at 5700 (para. 87), *citing* 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969); *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

¹⁷⁴ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 97).

¹⁷⁵ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 98).

explained that it would need a computer program to act on earth station applications under off-axis EIRP requirements as quickly as it acts on routine earth station applications under the current rules.¹⁷⁶

57. The Commission also proposed delegating authority to the International Bureau (Bureau) to develop and implement revisions to the electronic application forms and the International Bureau Filing System (IBFS) necessitated by an off-axis EIRP requirement for earth stations.¹⁷⁷ This delegation would include determining when the revised IBFS program should be initiated, establishing any procedures needed to assure security, and addressing any other issues that may arise regarding the electronic filing of earth station applications under an off-axis EIRP approach.¹⁷⁸ In addition, the Commission proposed directing the Bureau to consult with industry and potential users informally, to share plans for its proposed implementation, and to make any necessary adjustments in light of industry and user views, as appropriate.¹⁷⁹ Finally, the Commission proposed directing the Bureau to implement this program in coordination with other electronic filing initiatives within the agency, as appropriate.¹⁸⁰ The Commission pointed out that the proposed delegation of authority is comparable to delegations the Commission has adopted in the past to implement electronic filing requirements.¹⁸¹

58. *Discussion.* SIA supports the Commission's proposal to establish a table for showing compliance with the off-axis EIRP envelope. SIA recommends a table showing the EIRP level for each 0.1° up to 10°, and for every 5° for angles greater than 10°.¹⁸² No one else commented on this issue. We find this proposal to be reasonable, and we adopt it. Furthermore, we adopt the Commission's proposal to delegate authority to the International Bureau to modify IBFS and the FCC Form 312, Schedule B, to reflect this decision. Until such time that this revision is available, we will require parties filing earth station applications pursuant to the off-axis EIRP envelope procedure we adopt herein to include tables in the format recommended by SIA as attachments to their applications.

59. We emphasize that the off-axis EIRP rules we adopted in this Order above are based in part on the revisions to the antenna gain pattern envelope rules adopted in the *Sixth Report and Order*. Those rule revisions, in turn, were based on evidence in the record at that time that showed that earth station operators can limit their pointing error to 0.5° or less.¹⁸³ As a result, there is no basis for concluding that an earth station operator who does not maintain that

¹⁷⁶ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 98).

¹⁷⁷ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 99).

¹⁷⁸ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 99).

¹⁷⁹ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 99).

¹⁸⁰ *Third Further Notice*, 20 FCC Rcd at 5628 (para. 99).

¹⁸¹ Implementation of Section 402(b)(1)(A) of the Telecommunications Act of 1996, *Report and Order*, CC Docket No. 96-187, 12 FCC Rcd 2170, 2195 (para. 48) (1997).

¹⁸² SIA Comments at 10.

¹⁸³ See *Sixth Report and Order*, 20 FCC Rcd at 5604 (para. 22).

level of pointing accuracy could comply with the off-axis EIRP envelopes adopted above, unless the operator lowers its input power sufficiently. Therefore, in cases in which an earth station applicant using the off-axis EIRP procedure will not limit its pointing error to 0.5°, we will expect that applicant to demonstrate in an attachment to its application that it will comply with the applicable off-axis EIRP envelope when the antenna is mispointed at its maximum pointing error. Alternatively, we would expect such an applicant to apply for its license pursuant to the certification of coordination procedure adopted for non-routine earth stations in the *Fifth Report and Order* and discussed briefly above.¹⁸⁴

IV. OTHER ISSUES

A. Contention Protocols

1. Background

60. The Commission's rules permit parties to obtain a license for networks comprised of a number of technically identical small aperture antenna earth stations. These networks are referred to as very small aperture terminal (VSAT) networks. VSATs are generally comprised of a hub station transmitting to a satellite, which then transmits the signal to multiple technically identical remote small aperture antennas.¹⁸⁵ The remote antennas can also transmit to the satellite, which then retransmits the signal to the hub station.¹⁸⁶

61. In the *Notice* and the *Further Notice*, the Commission explained that VSAT networks employ a number of techniques to prevent or limit interference among the multiple remote earth stations, and to prevent them from interfering with other adjacent satellite networks.¹⁸⁷ The original VSAT systems used a Single Channel Per Carrier (SCPC) channelization approach, in which each remote earth station was assigned its own block of spectrum. Subsequently, VSAT system operators developed techniques that enabled some remote earth stations to share frequencies. One sharing technique is known as time division

¹⁸⁴ See *Fifth Report and Order*, 20 FCC Rcd at 5687-89 (paras. 49-52); Section III.F.1. above. See also 47 C.F.R. § 25.220.

¹⁸⁵ *Notice*, 15 FCC Rcd at 25145 (para. 50), citing Routine Licensing of Large Networks of Small Antenna Earth Stations Operating in the 12/14 GHz Frequency Bands, 51 Fed. Reg. 15067 (Apr. 22, 1986) (*1986 VSAT Order*); 47 C.F.R. § 25.134(a).

¹⁸⁶ VSAT networks were originally permitted only in the Ku-band. See *Notice*, 15 FCC Rcd at 25145 (para. 50). Subsequently, VSAT networks have been allowed in the C-band and Ka-band under certain conditions. See FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum, *First Report and Order*, IB Docket No. 00-203, 16 FCC Rcd 11511 (2001) (*FWCC/Onsat First Report and Order*). Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use, *Report and Order*, IB Docket No. 98-172, 15 FCC Rcd 13430 (2000). Nevertheless, the Commission in the *Third Further Notice* invited comment on contention protocol requirements only for Ku-band VSAT networks. See *Third Further Notice*, 20 FCC Rcd at 5639-40 (paras. 130-31). Accordingly, the contention protocol requirements we adopt in this Order below are applicable only to Ku-band VSAT networks.

¹⁸⁷ *Notice*, 15 FCC Rcd at 25145 (para. 50).

multiple access (TDMA). The TDMA technique assigns each remote earth station a different time to transmit and receive information. Another technique is frequency division multiple access (FDMA). The FDMA technique assigns different frequencies or frequency band segments to different remote earth stations. The SCPC described above is an example of the FDMA technique. A third approach, code division multiple access (CDMA), prevents interference between remote earth stations by assigning a different digital code to different earth stations.¹⁸⁸ We refer to TDMA, FDMA, and CDMA as "reservation" protocols, because these techniques "reserve" a time, frequency, or different digital code for each transmission in a VSAT network.¹⁸⁹

62. Reservation protocols are distinguished from contention protocols. In contention protocols, transmissions from different VSAT remote earth stations compete or "contend" for the same resource, which could be a frequency, a time slot, or a hub earth station receiver. One example of a contention protocol is the slotted Aloha protocol.¹⁹⁰ In this technique, the hub earth station synchronizes all remote VSAT stations so that they transmit only in discrete time slots, like TDMA, typically tens of milliseconds in duration.¹⁹¹ Unlike TDMA, however, two or more remote earth stations are permitted to transmit in the same time slot in slotted Aloha. Slotted Aloha relies on the statistical characteristics of unrelated transmissions from different earth stations to limit the number and duration of transmissions that occur from more than one VSAT remote earth station in the same time slot. When two or more remote earth stations using a contention protocol transmit simultaneously using the maximum allowed EIRP density per carrier, those transmissions can "collide." The resulting power level caused by these collisions at a received satellite exceeds the level specified in the Commission's rules during the time period of simultaneous transmission, although for no more than tens of milliseconds.¹⁹²

2. Procedural History

63. Before the Commission adopted the *Notice*, Spacenet, Inc. (Spacenet) filed a petition for declaratory ruling that the Commission allow VSAT networks to use the slotted Aloha contention protocol. According to Spacenet, because the collisions in its VSAT network

¹⁸⁸ For a more detailed discussion of each of these techniques, see *Notice*, 15 FCC Rcd at 25206-10 (App. E).

¹⁸⁹ *Third Further Notice*, 20 FCC Rcd at 5615 (para. 52).

¹⁹⁰ Petition of Spacenet, Inc. for a Declaratory Ruling that Section 25.134 of the Commission's Rules Permits VSAT Remote Stations in the Fixed Satellite Service to Use Network Access Schemes that Allow Statistically Infrequent Overlapping Transmissions of Short Duration, or, in the Alternative, For Rulemaking to Amend that Section, *Order*, 15 FCC Rcd 23712 (Int'l Bur., 2000) (*Spacenet Order*). With the "unslotted Aloha" technique, remote earth stations in the VSAT network can transmit randomly at any time, meaning that the transmissions are not synchronized in time or duration. The "unslotted Aloha" technique is distinguishable from the "slotted Aloha" technique, in which remote earth stations transmit in specific time slots, which means that the transmissions are synchronized but not coordinated. In other words, the remote earth stations transmitting in a given time slot can transmit regardless of whether there are other earth stations transmitting in the same time slot. G. Maral, *VSAT Networks* at 144-45 (John Wiley and Sons, ed. 1995); *Spacenet Order*, 15 FCC Rcd at 23713 (para. 3).

¹⁹¹ *Spacenet Order*, 15 FCC Rcd at 23713 (para. 3).

¹⁹² Spacenet maintained that the duration of an inbound transmission is typically between 15 and 50 milliseconds. *Spacenet Order*, 15 FCC Rcd at 23713 (para. 3), citing Spacenet Petition at 8.

are infrequent and of short duration, they do not cause unacceptable interference to adjacent satellite systems.¹⁹³ In its petition for declaratory ruling, Spacenet requested that the Bureau conclude that the Commission's rules allow the slotted Aloha technique as a general matter, provided that the VSAT network operator limits the amount of traffic on its network sufficiently to reduce the probability of a collision to an acceptable level.¹⁹⁴

64. The Bureau denied Spacenet's petition for declaratory ruling because the power level resulting from transmission signal collisions could exceed the routine processing limits specified in Section 25.134(a) of the Commission's rules.¹⁹⁵ The Bureau concluded, however, that Spacenet had shown that use of the slotted Aloha method is not currently causing unacceptable interference to other satellite systems. Accordingly, the Bureau granted Spacenet and other VSAT operators that employ various multiple access techniques a waiver of Section 25.134 for purposes of continuing to use existing multiple access methods while this rulemaking is pending.¹⁹⁶ The Bureau noted that its waiver does not prejudice our actions in this rulemaking proceeding.¹⁹⁷

65. In the *Notice*, the Commission developed its own set of proposed rules for reservation protocols and contention protocols. The Commission did not consider the statistical equation that Spacenet recommended in its petition for declaratory ruling, because the Commission believed that a more general and simplified approach addressing both reservation protocols and contention protocols would better facilitate the licensing of earth stations than a rule limited to a single contention protocol.¹⁹⁸

66. The Commission ultimately adopted parts of its proposal, dealing with reservation protocols, in the *Sixth Report and Order*.¹⁹⁹ Specifically, the Commission did not require any power adjustment for TDMA and FDMA systems, but required earth stations in CDMA systems to reduce their power by $10\log(N)$, where N is the maximum number of earth stations transmitting simultaneously in the same frequency band segment in the same satellite beam.²⁰⁰

67. With respect to other contention protocols, such as Aloha, however, the Commission found in the *Further Notice* that the rules proposed in the *Notice* were too restrictive.²⁰¹ Therefore, the Commission revised its proposals for rules applicable to contention

¹⁹³ See *Spacenet Order*, 15 FCC Rcd at 23713 (para. 3).

¹⁹⁴ See *Spacenet Order*, 15 FCC Rcd at 23714-15 (para. 7).

¹⁹⁵ 47 C.F.R. § 25.134(a). See also *Spacenet Order*, 15 FCC Rcd at 23715 (para. 9).

¹⁹⁶ *Spacenet Order*, 15 FCC Rcd at 23716 (para.12).

¹⁹⁷ *Spacenet Order*, 15 FCC Rcd at 23716 (para.12).

¹⁹⁸ *Notice*, 15 FCC Rcd at 25146-47 (para. 54).

¹⁹⁹ *Sixth Report and Order*, 20 FCC Rcd at 5620-21 (para. 70).

²⁰⁰ *Sixth Report and Order*, 20 FCC Rcd at 5618 (para. 63).

²⁰¹ *Further Notice*, 17 FCC Rcd at 18618 (para. 85).

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protocols, and invited further comment.²⁰² Similarly, in the *Third Further Notice*, the Commission determined that the record did not adequately support adoption of the contention protocol rules proposed in the *Further Notice*. Accordingly, the Commission further refined its proposals for contention protocols, and invited additional comment.²⁰³

3. Current Commission Proposal

68. In the *Third Further Notice*, the Commission observed that all the new contention protocol rule proposals suggested by commenters in response to the *Further Notice* had four elements: (i) a power density limit on individual earth stations in the VSAT network; (ii) a limit on the power generated during collisions, (iii) a limit on the probability of collisions, and (iv) a limit on the duration of any collision.²⁰⁴ The Commission also found that the record at that time provided an adequate basis to adopt some of these contention protocol elements, but needed further development on other elements.²⁰⁵

69. First, the Commission questioned whether any of the proposals in the *Third Further Notice* record would be consistent with the off-axis EIRP envelope approach adopted above.²⁰⁶ This was because all the parties' recommendations in the *Third Further Notice* included a power density limit on individual earth stations, which is inconsistent with an off-axis EIRP approach which gives earth station operators flexibility to increase or decrease power density levels of individual earth stations depending on antenna size.²⁰⁷ Therefore, the Commission invited comment on adopting aggregate off-axis EIRP limits for VSAT systems using a contention protocol, instead of EIRP limits for individual earth stations.²⁰⁸

70. Second, the Commission found that, generally, the commenters' proposed rules would allow power during collisions to increase as the probability of collision decreases. However, there were a number of competing proposals regarding how much the power level should be allowed to increase as the probability of collision decreases.²⁰⁹ Therefore, the Commission invited comment on a variation of one of the commenters' proposal in the record.²¹⁰

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²⁰² *Further Notice*, 17 FCC Rcd at 18620-21 (paras. 92-95). In the *Further Notice*, the Commission found some support for its reservation protocol proposals, but invited comment on whether any such rule revisions would be necessary in the event that it adopted the contention protocol rule proposed in the *Further Notice*. *Further Notice*, 17 FCC Rcd at 18622 (paras. 98-99). This issue became moot when the Commission rejected the contention protocol rule proposed in the *Further Notice*. See *Sixth Report and Order*, 20 FCC Rcd 5618 (para. 60).

²⁰³ *Third Further Notice*, 20 FCC Rcd at 5629-41 (paras. 100-37).

²⁰⁴ *Third Further Notice*, 20 FCC Rcd at 5634 (para. 113).

²⁰⁵ *Third Further Notice*, 20 FCC Rcd at 5634 (para. 113).

²⁰⁶ *Third Further Notice*, 20 FCC Rcd at 5635 (para. 119).

²⁰⁷ *Third Further Notice*, 20 FCC Rcd at 5634 (para. 114).

²⁰⁸ *Third Further Notice*, 20 FCC Rcd at 5635-36 (para. 119).

²⁰⁹ *Third Further Notice*, 20 FCC Rcd at 5634-35 (paras. 115-17).

(continued . . .)

71. In summary, the Commission requested comment on the following proposal:

- (i) For VSAT networks using a contention protocol, the aggregate off-axis EIRP shall not exceed the applicable off-axis EIRP envelope by more than the amounts set forth in Table 5 below;
- (ii) The maximum duration of any single collision is less than 100 milliseconds.

Table 4 is the off-axis EIRP envelope adopted in this Order for digital transmissions from a single earth station in the Ku-band in the plane of the geostationary satellite orbit as it appears at the particular earth station location:

Table 4
Off-Axis EIRP Envelope for
Ku-Band Digital Earth Station Applications
for an Individual Earth Station

15 - $25\log_{10}\theta$	dBW/4 kHz	For	$1.5^\circ \leq \theta \leq 7^\circ$
-6	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$
18 - $25\log_{10}\theta$	dBW/4 kHz	For	$9.2^\circ < \theta \leq 48^\circ$
-24	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$
-14	dBW/4 kHz	For	$85^\circ < \theta \leq 180^\circ$

where θ is the angle in degrees from the line connecting the focal point of the antenna to the target satellite, within the plane 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. Table 5 below allows VSAT network operators to exceed the aggregate off-axis EIRP envelope by 2 dB for each decrease in order of magnitude in percentage of time.²¹¹ This was based on proposals from SIA and Spacenet. However, SIA and Spacenet recommended allowing VSAT network operators to exceed the off-axis EIRP envelope for as much as 10 percent of the time. Therefore, the Commission modified the proposal to allow VSAT network operators to exceed the envelope for no more than 1 percent of the time, as set forth in Table 5 below.²¹²

(Continued from previous page)

²¹⁰ *Third Further Notice*, 20 FCC Rcd at 5636-37 (para. 119).

²¹¹ *Third Further Notice*, 20 FCC Rcd at 5636 (para. 119).

²¹² *Third Further Notice*, 20 FCC Rcd at 5636 (para. 119).

Table 5
EIRP Limits For VSAT
Networks Using Contention Protocols
Proposed By the Commission
in the *Third Further Notice*²¹³

Percentage of Time	Increase in Aggregate EIRP Allowed
10% (10^{-1})	0 dB
1% (10^{-2})	2 dB
0.1% (10^{-3})	4 dB
0.01% (10^{-4})	6 dB
0.001% (10^{-5})	8 dB
0.0001% (10^{-6})	10 dB
0.00001% (10^{-7})	12 dB
0.000001% (10^{-8})	14 dB
0.0000001% (10^{-9})	16 dB

72. In the *Third Further Notice*, the Commission suggested that this approach would strike a reasonable balance between protecting adjacent satellites from harmful interference and allowing VSAT network operators to make efficient use of their facilities.²¹⁴ The Commission also stated that parties opposing this proposal must provide an alternative proposal, and must explain in sufficient detail why they believe that their proposal strikes a better balance than the Commission's proposal between these policy goals.²¹⁵

73. The Commission also provided some guidance on what kinds of demonstrations it might find useful if filed in support of various kinds of alternative contention protocol proposals.²¹⁶ For example, the Commission recommended that parties arguing that no power limit is required for collisions limited to 100 milliseconds should provide more extensive justification for their recommendations.²¹⁷ The Commission also observed that it was originally concerned that an earth station's transmission data would be significantly degraded, possibly beyond recovery, in cases where the earth station experiencing interference is operating in a narrower bandwidth or approximately the same bandwidth as the interfering earth station.²¹⁸ Therefore, the Commission recommended that parties advocating no power limit should provide

²¹³ The baseline for the power increase shown in Table 5 is power received in an FSS receiver from a single VSAT transmitter meeting the antenna gain requirements of Section 25.209 with a power density at the input to the antenna of -14 dBW/4 kHz.

²¹⁴ *Third Further Notice*, 20 FCC Rcd at 5637 (para. 120).

²¹⁵ *Third Further Notice*, 20 FCC Rcd at 5637 (para. 121).

²¹⁶ *Third Further Notice*, 20 FCC Rcd at 5637-38 (paras. 122-24).

²¹⁷ *Third Further Notice*, 20 FCC Rcd at 5637 (para. 122).

²¹⁸ *Third Further Notice*, 20 FCC Rcd at 5637 (para. 122), *citing Notice*, 15 FCC Rcd at 25146-47 (para. 54), *Spacenet Order*, 15 FCC Rcd at 23716 (para. 10).

an adequate basis in the record for concluding that concerns regarding narrow-bandwidth transmissions do not warrant some limit on power levels during collisions.²¹⁹

4. Alternative Proposals

74. SIA and Global VSAT Forum assert that there is no need for contention protocol rules because there have not been any instances of harmful interference resulting from use of contention protocols in the past.²²⁰ SIA further maintains that only Aloha Networks has suggested that there is a need for contention protocol rules, and that Aloha Networks may have designed its proposals to make its proprietary technology more competitive.²²¹ SIA also emphasizes that use of contention protocols makes VSAT networks much more efficient, and it would be very costly to stop using them.²²² On the other hand, ViaSat supports the development of some kind of off-axis EIRP envelope for contention protocol use, to provide regulatory certainty for contention protocol users.²²³

75. According to SIA, its technical analysis demonstrates that a VSAT network using a contention protocol is less likely to cause harmful interference than it would be if it did not use a contention protocol.²²⁴ The SIA analysis compares the outage percentage that would accrue given an interferer which continuously operates at the uplink power limit for VSATs, -14 dBW per 4 kHz as required by Section 25.134 of our rules,²²⁵ with the outage that would result if the interferer operates a contention protocol which transmits at the same power limit when a single burst is transmitted without contention.²²⁶ SIA conducted this analysis for Washington, D.C., Miami, and Los Angeles, representing, respectively, typical, wet, and dry climates in the United States. According to SIA, the results show that, for the loading of 70 percent on the contention system, typical of the Aloha type of system implicit in the SIA-proposed mask, the outage time resulting from the contention protocol interferer is less than that caused by the continuous interferer for typical modulation techniques presently in use.²²⁷

²¹⁹ *Third Further Notice*, 20 FCC Rcd at 5637 (para. 122).

²²⁰ SIA Comments at 29-30; SIA Reply at 3-4; Global VSAT Forum Reply at 3. *See also* SIA *Ex Parte* Statement at 9.

²²¹ SIA Comments at 30-31; SIA Reply at 4. *See also* Spacenet Comments at 3.

²²² SIA Comments at 38-40.

²²³ ViaSat *Ex Parte* Statement at 9-13.

²²⁴ SIA Comments at 32.

²²⁵ 47 C.F.R. § 25.134.

²²⁶ *See* SIA Comments, Att. 1.

²²⁷ According to SIA, the difference ranges from about 1.25 to 5.1 percent, depending on the climate, for victim systems using convolutional coding and Viterbi decoding. SIA Comments, Att. 1 at 19. For the case representing a dry climate using turbo coding and operating at the edge of the satellite receive beam (typified by Los Angeles in SIA's study), the contention system would increase a very low unavailability from 0.0114 percent (about 60 minutes per year) to 0.0117 percent (about 61.5 minutes per year), an increase of about 2.9 percent.

76. SIA claims that the proposal in the *Third Further Notice* would require excessive power reductions and result in prohibiting contention protocol operations at their current levels.²²⁸ Therefore, SIA proposes an alternative contention protocol rule, in the event that the Commission decides to adopt a rule. Instead allowing a 2 dB increase in power for each decimal place decrease in the likelihood of collision, as set forth in Table 5 above, SIA proposes slightly different allowed power increases and probabilities, as set forth below. SIA bases these figures on the formula for predicting collisions in a Slotted Aloha network using a 70 percent loading factor.²²⁹

Table 6
EIRP Limits For VSAT
Networks Using Contention Protocols
Proposed By SIA²³⁰

Number of Packets in Slot	Maximum Allowed Increase in Aggregate EIRP	Maximum Percentage of Time for which the Aggregate EIRP Level can be Exceeded
0	(No power transmitted)	50.3414696209 %
1	0	15.5804983555 %
2	3.0	3.4141584126 %
3	4.77	0.5753457592 %
4	6.0	0.0785535449 %
5	7.0	0.0090026349 %
6	7.78	0.0008883621 %
7	8.5	0.0000769348 %
8	9.0	0.0000059349 %
9	9.54	0.0000004127 %
10	10	0.0000000261 %

5. Discussion

77. The Commission has determined on a number of occasions that Section 25.134 must be revised to allow use of any contention protocol in VSAT networks.²³¹ Section 25.134 of the Commission's rules establishes specific limits for individual earth station antenna input power densities.²³² These power density limits have been put in place to limit the interference power received in the receivers of adjacent FSS satellites. Use of contention protocols results in

²²⁸ SIA Comments at 39. See also SIA *Ex Parte* Statement at 9-11.

²²⁹ SIA Comments at 34-36 and App. 1.

²³⁰ The baseline for the power increase shown in Table 6 is power received in an FSS receiver from a single VSAT transmitter meeting the antenna gain requirements of Section 25.209 with a power density at the input to the antenna of -14 dBW/4 kHz.

²³¹ *Third Further Notice*, 20 FCC Rcd at 5630 (para. 103); *Further Notice*, 17 FCC Rcd at 18618-19 (para. 86). See also *Spacenet Order*, 15 FCC Rcd at 23715 (para. 9).

²³² 47 C.F.R. § 25.134(a), (b).

aggregate power densities in the adjacent satellite receivers that exceed the limits that would be produced by a single VSAT operating with the power density specified in Section 25.134. The Commission observed in the *Further Notice* that use of contention protocols can increase the efficiency of VSAT networks.²³³ We agree with SIA that VSAT network operators should be allowed to take advantage of those efficiencies. Accordingly, we revise Section 25.134 as set forth below to allow use of contention protocols.

78. We will not adopt SIA's alternative EIRP envelope because it is substantially similar to a proposal Spacenet made in a petition for rulemaking it filed in 2000.²³⁴ As noted above, the Commission declined to seek comment on Spacenet's proposal in the *Notice* in this proceeding, concluding that a more general and simplified approach would better facilitate the licensing of earth stations that use contention protocols.²³⁵

79. However, we agree with SIA that use of contention protocols tends to *decrease* the likelihood of harmful interference in almost all cases. This result stems from the fact that, with any contention system with randomly-timed requests for access, there will be a portion of the time when there is no demand for access. For a satellite network, this means that there will be no transmission to the satellite for part of the time. For a system with 70 percent loading,²³⁶ there will be no transmission to the satellite, and therefore no interference to the neighboring satellites, for about 50 percent of the time. This serves to reduce the outages caused to neighboring victim satellites by the system with the contention protocol. For the conditions assumed in the SIA study, this reduction mostly offsets the outages that may be caused by the multiple simultaneous transmissions which occur when multiple earth stations simultaneously seek access.²³⁷ Specifically, there was a decrease in unavailability in five of the six case studies examined in the SIA study, ranging from 1.3 percent to 5.1 percent.²³⁸ In the one case of an increase in unavailability, SIA's study shows that increase to be *de minimis*.²³⁹ The SIA study also shows that a system meeting the mask proposed by the Commission in the *Third Further Notice*²⁴⁰

²³³ *Further Notice*, 17 FCC Rcd at 18618 (para. 85).

²³⁴ *See Spacenet Order*, 15 FCC Rcd 23712.

²³⁵ *Notice*, 15 FCC Rcd at 25146 (para. 54).

²³⁶ The loading factor represents the ratio of the total number of packets transmitted to the total number of time slots available irrespective of whether the packets experience contention or not.

²³⁷ In Aloha-type networks with a loading factor of 70 percent, transmissions occur only about 50.3 percent of the time and collisions occur about 15.6 percent of the time. If the loading increases to 100 percent, transmissions occur about 63.2 percent of the time and collisions occur about 26.4 percent of the time.

²³⁸ The case studies were based in Miami, Washington, D.C., and Los Angeles, to represent different rain attenuation conditions. SIA assumed Viterbi coding and Turbo coding at each of these three locations. SIA Comments, App. 1 at 19.

²³⁹ In the case of a slotted Aloha VSAT network using turbo coding in Los Angeles, there was an increase in unavailability over the static case of 2.9 percent. This is equivalent to a decrease in availability from 99.9886 percent to 99.9883 percent. SIA Comments, App. 1 at 19.

²⁴⁰ *Third Further Notice*, 20 FCC Rcd at 5635 (para. 119).

would increase the unavailability of a "static system,"²⁴¹ a VSAT system that does not employ a contention protocol, from about 0.13 percent to about 0.43 percent.²⁴² This would generally be more interfering than the mask proposed by SIA.

80. We conclude that there is no requirement at this time to develop detailed regulations to govern the use of contention protocols in VSAT networks in the FSS whose demand statistics normally allow for significant percentages of time during which no transmissions occur.²⁴³ Our conclusion is based primarily on the results of the SIA study that: 1) the contention protocol system operating at reasonable loading factors produces less outage to the neighboring satellites than a static system; and 2) the envelope proposed in the *Third Further Notice* would allow more outage than a static system. In reaching our conclusion, we also considered the long history of no identified harmful interference associated with contention protocols.

81. Accordingly, we adopt an exception to Section 25.134 that allows VSAT system operators to exceed the -14 dBW/4 kHz power limit, in the aggregate when multiple earth stations simultaneously transmit, for purposes of "reasonable use" of a contention protocol. In this Order, we do not define "reasonable use" in terms of specific limits for probability of collision, length of collision, or increase in power during collisions, as the Commission has proposed in the past. Instead, we allow licensees flexibility in their contention protocol usage. We anticipate that we will resolve any issues regarding "reasonableness" of contention protocol usage in the complaint process. If a Commission licensee believes that its operations are experiencing harmful interference as the result of another licensee's unreasonable contention protocol usage, that licensee will have the burden of showing that it is experiencing harmful interference, and that the other licensee is the cause of that interference. If the complainant can meet this burden of proof, the burden will then shift to the defendant to show that its use of contention protocols is reasonable. By requiring reasonable contention protocol use rather than specifying limits for length of collision and increase in power allowed during a collision, we expect that our contention protocol rule will not interfere with technological developments in the area of contention protocols. We also expect that requiring contention protocol usage to be reasonable will provide sufficient regulatory certainty to address the concern raised by ViaSat.²⁴⁴

²⁴¹ By "static system," we mean a VSAT system operating continuously at the power limit of our current rules.

²⁴² SIA suggests that contention protocol services should be allowed to increase the outage of transmissions over neighboring satellites by 10 percent relative to continuous interferers based on *recommends* 3.1 of ITU Recommendation S.1323-2 for aggregate interference from all entries from all other satellite networks operating in the same frequency band that can potentially cause interference of a time-varying nature. SIA Comments at 33. SIA characterizes the Commission-proposed mask as overly protective because it would not allow the increase in outage of 10 percent. SIA Comments at 36-37. We do not consider this to be an appropriate application of Recommendation S.1323-2. First, Note 1 in the recommendation specifically excludes application of *recommends* 3 to interference between GSO FSS networks. Second, if the recommendation did apply, the 10 percent should be the aggregate of all the interference entries (particularly including NGSO entries). Third, we do not consider that the use of a different modulation technique or protocol within the same GSO FSS service should justify a 10 percent increase in the outage that its use may impart to other GSO FSS transmissions using other techniques and access protocols.

²⁴³ As we noted above, we are considering issues related to off-axis EIRP envelopes for AMSS earth stations in another proceeding. See Section III.B.4. above, *citing* AMSS NPRM, 20 FCC Rcd 2906.

²⁴⁴ ViaSat *Ex Parte* Statement at 9-13.
(continued . . .)

82. We do not prescribe any particular method for demonstrating that a licensee's contention protocol usage is reasonable. One possible method would be to show that the licensee was using a contention protocol in a manner that does not result in an increase in unavailability relative to a static system throughout most of its service area, that any increases in unavailability occur only in limited areas, and such increases are no greater than the increase found in SIA's study. If the defending licensee chooses not to make this kind of showing, it would be free to make any other demonstrations that it believes the Commission would find persuasive, in the event that we receive a contention protocol-related complaint in the future.

6. Contention Protocol Information Requirements

83. In the *Third Further Notice*, the Commission invited comment on requiring applicants to certify that they will comply with any contention protocol requirements that it adopts, rather than requiring a detailed mathematical showing.²⁴⁵ This proposal was based on recommendations from commenters in response to prior comments.²⁴⁶ In addition, the Commission reasoned that a detailed showing in this case did not appear to be necessary to prevent harmful interference.²⁴⁷ No one commented on this issue in response to the *Third Further Notice*. Therefore, for the reasons discussed in the *Third Further Notice* and summarized here, we adopt the proposal to require earth station licensees planning to use a contention protocol to certify that their contention protocol usage will be reasonable.

7. Grandfathering

84. *Background.* In the *Third Further Notice*, the Commission requested comment on applying the contention protocol requirements it proposed in the *Third Further Notice* only to VSAT networks licensed after those rules take effect, in the event that it were to adopt its proposal.²⁴⁸ SIA asserts that, at minimum, a 15-year transition period for all VSAT networks is needed to allow VSAT operators a reasonable opportunity to revise their VSAT networks.²⁴⁹

85. *Discussion.* As noted above, we did not adopt the proposal in the *Third Further Notice*, but rather, we require VSAT network operators using contention protocols to be reasonable in their use. Based on comments in the record in this proceeding that there have been no reported cases of harmful interference resulting from contention protocol usage,²⁵⁰ we conclude that current VSAT network operators using contention protocols are meeting this standard already. We also find that this is consistent with SIA's recommendation, in that we do

(Continued from previous page)

²⁴⁵ *Third Further Notice*, 20 FCC Rcd at 5640 (para. 133).

²⁴⁶ *See Third Further Notice*, 20 FCC Rcd at 5640 (para. 133).

²⁴⁷ *Third Further Notice*, 20 FCC Rcd at 5640 (para. 133).

²⁴⁸ *Third Further Notice*, 20 FCC Rcd at 5641 (para. 135).

²⁴⁹ SIA Comments at 41-42.

²⁵⁰ SIA Comments at 29-30; SIA Reply at 3-4; Global VSAT Forum Reply at 3.

not anticipate that any current VSAT network operators will be required to revise their networks to comply with the new contention protocol rule. Accordingly, we require all Ku-band VSAT network operators using contention protocols to use reasonable parameters in conjunction with their contention protocols.²⁵¹ We will also revise Form 312 to provide a streamlined method for earth station applicants planning to use a contention protocol to make this certification.

8. Other Contention Protocol Issues

86. In the *Third Further Notice*, the Commission tentatively concluded that it was not necessary to develop specific rules to govern VSAT networks that use a combination of reservation and contention protocols.²⁵² No one commented on this proposal. We find that the requirement that we adopted above, that use of a contention protocol is allowed provided that it is reasonable, should also be applicable to VSAT networks that use a combination of reservation and contention protocols. Therefore, we will require such new license applicants to certify that their contention protocol usage will be reasonable.

B. Quiet Zone for Radio Astronomy

87. *Background.* Section 25.203(f) of the Commission's rules establishes a "Quiet Zone" for radio astronomy in a 13,000 square mile area in Virginia, West Virginia, and Maryland.²⁵³ Under Section 25.203(f), anyone seeking a license in that area must notify the National Radio Astronomy Observatory (NRAO).²⁵⁴ NRAO is given 20 days to file an objection to the proposed operations with the Commission. If NRAO files an objection, Section 25.203(f) states that the Commission may take whatever action it deems appropriate.²⁵⁵

88. In its 2001 reply in this proceeding, NRAO proposed a revision to Section 25.203(f) that was outside the scope of the original 2000 *Notice*.²⁵⁶ Specifically, NRAO proposed adding the following language to the end of Section 25.203(f).²⁵⁷

²⁵¹ Current VSAT network operators that meet this requirement will not be required to submit anything to show that they comply with this requirement. However, operators that do not meet this requirement will be required to file a request for waiver of this requirement within 60 days of the effective date of this rule revision. VSAT operators using a contention protocol that does not meet this standard, that do not file a request for waiver within this deadline, may become subject to forfeiture liability.

²⁵² *Third Further Notice*, 20 FCC Rcd at 5639 (paras. 127-29).

²⁵³ The Quiet Zone is an area bounded by 39° 15' N.L., 78° 30' W.L., 37° 30' N.L., and 80° W.L. See 47 C.F.R. § 25.203(f).

²⁵⁴ NRAO Reply at 1-2, citing 47 C.F.R. § 25.203(f); Amendment of Part 2 of the Commission's Rules and Regulations to Give Interference Protection to Frequencies Utilized for Radio Astronomy, Amendment of Part 3, 4, 5, 6, 7, 9, 10, 11, 16, 20, and 21 of the Commission's Rules and Regulations to Give Interference Protection to Frequencies Utilized for Radio Astronomy, *Report and Order*, Docket No. 11745, FCC 58-1111, 17 Rad. Reg. 1738 (1958) (*Quiet Zone Order*).

²⁵⁵ 47 C.F.R. § 25.203(f).

²⁵⁶ See *Notice*, 15 FCC Rcd at 25131.

²⁵⁷ *Third Further Notice*, 20 FCC Rcd at 5642 (para. 139), citing NRAO Reply of May 7, 2001, at 2-3.

Licensees or permittees of systems serving geographic areas which are authorized to add transmission facilities without further application to, or approval by, the Commission, and which additional transmission facilities are located within the coordinates specified above, shall, prior to allowing such additional transmission facilities to operate, notify the National Radio Astronomy Observatory (NRAO) and coordinate the construction and operation to minimize possible harmful interference to the NRAO. A certificate of coordination signed by an authorized representative of the NRAO shall be made available to the Commission upon request. Comments or objections by the NRAO in response to such coordination, or non-coordination if appropriate, will be considered by the Commission in the same manner as comments or objections to applications as stated above.

89. Accordingly, the Commission requested comment on NRAO's proposed coordination requirements for remote terminals within the Quiet Zone. Specifically, the Commission invited interested parties to discuss whether VSAT network operators should be required to complete coordination with NRAO prior to placing any remote earth stations in the Quiet Zone, rather than simply notifying NRAO as they have been required to do since 1958.²⁵⁸ The Commission further observed that its Quiet Zone rules were designed to create a balance between protecting NRAO's radio astronomy operations,²⁵⁹ and allowing the development of radio services in the Quiet Zone.²⁶⁰ Finally, the Commission noted that the Commission currently has only a notification requirement, rather than a coordination requirement, for terrestrial wireless operations in the Quiet Zone.²⁶¹

90. *Discussion.* Several parties contend that NRAO's proposal is unnecessary, and that NRAO has not shown that new coordination procedures are needed to prevent any current or reasonably anticipated interference.²⁶² SIA and WildBlue note that NRAO's proposed

²⁵⁸ *Third Further Notice*, 20 FCC Rcd at 5643 (para. 142). See also *Quiet Zone Order*, 17 Rad. Reg. 1738.

²⁵⁹ *Third Further Notice*, 20 FCC Rcd at 5642 (para. 141), citing *Quiet Zone Order*, 17 Rad. Reg. at 1741 (para. 7); Amendment of the General Mobile Radio Service (Part 95) and Amateur Mobile Radio Service (Part 97) Rules to Establish Procedures to Minimize Potential Interference to Radio Astronomy Operations, *Report and Order*, SS Docket No. 78-352, 85 FCC 2d 738, 742 (para. 17) (1981), *aff'd*, 88 FCC 2d 78 (1981) (extending Quiet Zone protection to Amateur radio and General Mobile radio station licenses); Review of Quiet Zones Application Procedures, *Report and Order*, WT Docket No. 01-319, 19 FCC Rcd 3267 (2004) (Streamlining procedures for terrestrial wireless applications requiring Quiet Zone coordination without reducing or eliminating Quiet Zone protection).

²⁶⁰ *Third Further Notice*, 20 FCC Rcd at 5642 (para. 141), citing *Quiet Zone Order*, 17 Rad. Reg. at 1741 (para. 10). See also Amendment of Section 22.949 of the Commission's Rules to Provide for a Moratorium on Acceptance of Unserved Area Cellular Applications Within the National Radio Quiet Zone, *Order*, RM-8647, 15 FCC Rcd 2728 (Wireless Bur., 2000) (granting waivers to two cellular licensees to allow them to expand their networks into Quiet Zone).

²⁶¹ *Third Further Notice*, 20 FCC Rcd at 5642 (para. 141), citing 47 C.F.R. § 1.924.

²⁶² SIA Comments at 42; WildBlue Reply at 3-5; Global VSAT Forum Reply at 3-4. (continued . . .)

coordination procedure would be very burdensome to VSAT operators, and result in substantial delay of service to end users.²⁶³ SIA further argues that the Commission's current procedures give NRAO a full and fair opportunity to voice its interference concerns.²⁶⁴ SIA also maintains that NRAO's proposal would result in usurping the Commission's jurisdiction over interference disputes in the Quiet Zone.²⁶⁵ Finally, SIA asserts that NRAO's proposal is beyond the scope of this proceeding to the extent that NRAO intends it to apply to anything other than VSAT systems.²⁶⁶ None of the commenters support NRAO's proposal. NRAO did not respond to the *Third Further Notice*.

91. We will not adopt NRAO's proposal. The current notification requirement has been in place since 1958, and neither NRAO nor any other commenter has suggested that any of NRAO's operations have suffered harmful interference as a result of the current requirement. Furthermore, there is no reason to assume that NRAO might begin to receive harmful interference as a result of the decision in the *Fifth Report and Order* to allow multiple hub earth stations in VSAT networks.²⁶⁷ This is because licensees are not permitted to place hubs in the Quiet Zone without filing a modification application specifying the location and operating parameters of those hubs.²⁶⁸ In addition, in 2004, the Commission completed a review of its Quiet Zone rules applicable to terrestrial wireless operators. In that proceeding, the Commission decided to permit, but not require, terrestrial wireless operators to coordinate their planned operations within the Quiet Zone before filing a license application with the Commission.²⁶⁹ In fact, in that proceeding, NRAO advocated an informal, non-mandatory coordination rather than codifying a specific time frame for those coordination discussions.²⁷⁰ There is no basis in the record in this proceeding to place a more restrictive requirement on VSAT operators than the Commission has placed on terrestrial wireless operators.

C. Downlink EIRP Density Limits for Ku-band Earth Stations

(Continued from previous page)

²⁶³ SIA Comments at 43-44; WildBlue Reply at 5-6. *See also* WildBlue Reply at 2 (NRAO's proposal could cause delays in broadband deployment in the Quiet Zone).

²⁶⁴ SIA Comments at 44.

²⁶⁵ SIA Comments at 44.

²⁶⁶ SIA Comments at 45.

²⁶⁷ In the *Notice*, the Commission proposed revising Section 25.134 to explicitly permit multiple hub stations under a single VSAT network license. *Notice*, 15 FCC Rcd at 25148 (paras. 58-59). The Commission adopted its proposed revisions to Section 25.134 in the *Fifth Report and Order*. *Fifth Report and Order*, 20 FCC Rcd at 5713 (para. 125).

²⁶⁸ *Fifth Report and Order*, 20 FCC Rcd at 5714 (para. 127).

²⁶⁹ Review of Quiet Zone Procedures, *Report and Order*, WT Docket No. 01-319, 19 FCC Rcd 3267, 3271-72 (para. 8) (2004) (*Quiet Zone Streamlining Order*). *See also* 47 C.F.R. § 1.924(a)(4).

²⁷⁰ *See Quiet Zone Streamlining Order*, 19 FCC Rcd at 3272 (para. 9).

92. Here, we revise Section 25.212(c) to correct a previous oversight regarding EIRP density limits for Ku-band earth stations. The *Fifth Report and Order* increased the downlink EIRP density limits applicable to Ku-band VSAT networks, from 6 dBW/4 kHz to 10 dBW/4 kHz.²⁷¹ In adopting this increase, the Commission determined that the types of systems likely to be adversely affected by increasing the downlink EIRP density limit were analog narrowband hub-type systems.²⁷² To compensate for the potential inference that these systems might otherwise experience from the VSAT downlink EIRP density increase, the Commission allowed analog narrow band hub-type systems to increase their power by 4 dB, from 13 dBW/4 kHz to 17 dBW/4 kHz.²⁷³ The Commission found that this increase would not significantly increase the potential for harmful or unacceptable interference among adjacent satellite networks because there are few narrowband analog hub systems currently in operation.²⁷⁴

93. At that time, the Commission also decided to increase the routine EIRP density levels for other types of Ku-band downlink transmissions.²⁷⁵ Although the Commission concluded it could increase the Ku-band downlink EIRP density limit, this change was inadvertently excluded from the rules. Consequently, we make the downlink EIRP density limits for other Ku-band earth stations in Section 25.212(c) consistent with the power levels adopted in Section 25.134. The correct power levels are set forth in Appendix B.

V. RECONSIDERATION ISSUES

A. Background

94. On July 5, 2005, SIA filed a petition for reconsideration of the *Fifth Report and Order*, raising concerns regarding a number of details of the new earth station procedures. No comments or replies were filed in response to SIA's petition. For the reasons set forth below, we grant SIA's petition in part, and deny it in part.²⁷⁶ In addition, as noted briefly above, this is the latest in a series of rulemakings in which the Commission has streamlined its satellite and earth station procedures. We take this opportunity to resolve several issues raised in three petitions for reconsideration of another streamlining proceeding, the *1996 Streamlining Order*.²⁷⁷

²⁷¹ *Fifth Report and Order*, 20 FCC Rcd at 5702 (para. 93). See also Section 25.134 of the Commission's Rules, 47 C.F.R. § 25.134.

²⁷² *Fifth Report and Order*, 20 FCC Rcd at 5702-03 (para. 94).

²⁷³ *Fifth Report and Order*, 20 FCC Rcd at 5702-03 (para. 94).

²⁷⁴ *Fifth Report and Order*, 20 FCC Rcd at 5702-03 (para. 94).

²⁷⁵ *Fifth Report and Order*, 20 FCC Rcd at 5704 (para. 99).

²⁷⁶ On July 8, 2005, SIA and Boeing filed petitions for reconsideration of the *Sixth Report and Order*. SIA requested only that the Commission consider its comments filed in response to the *Third Further Notice*. We considered SIA's comments together with all other comments filed in response to the *Third Further Notice* in this Order above. Accordingly, we grant SIA's petition for reconsideration of the *Sixth Report and Order*. Boeing later withdrew its petition for reconsideration. See Letter from Carlos M. Nalda, Counsel for The Boeing Company, to Marlene H. Dortch, Secretary, FCC (dated Apr. 5, 2007) (Boeing *Ex Parte* Statement). We therefore dismiss Boeing's petition as moot.

²⁷⁷ *1996 Streamlining Order*, 11 FCC Rcd 21581. These petitioners, EDS Corporation (EDS), GE American Communications, Inc. (GE Americom), and Telquest Ventures, Inc. (Telquest), are listed in (continued . . .)

B. Rule References to Smaller-than-Routine Earth Stations

95. *Background.* At the time SIA filed its petition for reconsideration, Sections 25.209(a) and (b) of the Commission's rules specified antenna gain limits at each off-axis angle starting at 1° off-axis.²⁷⁸ Section 25.209(g) relaxed the antenna gain pattern requirements for Ku-band earth stations, by starting the Ku-band antenna gain pattern at 1.25° off-axis instead of 1° off-axis.²⁷⁹ SIA notes that Section 25.220, the new rule specifying the procedures for smaller-than-routine diameter earth station applications, refers to only Sections 25.209(a) and (b). SIA argues that the rule should refer to Section 25.209(g) as well.²⁸⁰ According to SIA, it is necessary to start the Ku-band antenna gain pattern at 1.25° off-axis to include 1.2-meter Ku-band earth stations in the "routine" classification.²⁸¹

96. *Discussion.* SIA is correct. By neglecting to refer to Section 25.209(g) in the streamlined non-routine earth station procedures set forth in Sections 25.132(b)(3) and 25.220 as revised in the *Fifth Report and Order*, the Commission had inadvertently made some routine Ku-band earth station applications subject to the non-routine earth station procedures. However, those rule revisions are superseded by the revisions to the antenna gain pattern envelope requirements adopted in the *Eighth Report and Order* above.²⁸²

C. Protection from Interference for Non-Routine Earth Stations

97. *Background.* Under Section 25.209(c) of the Commission's Rules, receive-only earth stations and the receive operations of transmit-receive earth stations are protected from harmful interference to the extent that an earth station that meets the antenna gain pattern envelope specified in Sections 25.209(a) and (b).²⁸³ SIA claims that, under the new procedures for non-routine earth station applications, non-routine receive antennas would not be entitled to any protection from harmful interference unless those non-routine receive operations were coordinated.²⁸⁴

98. *Discussion.* When the Commission adopted Section 25.220, it intended that the receive operations of uncoordinated non-routine earth stations would be protected from harmful

(Continued from previous page)

Appendix A. In 2002, Telquest withdrew a petition for stay that it filed concurrently with its petition for reconsideration, but did not withdraw its petition for reconsideration. Letter from Patricia Paoletta, Counsel for Telquest, to Secretary, FCC (dated Nov. 6, 2002).

²⁷⁸ 47 C.F.R. §§ 25.209(a), (b).

²⁷⁹ 47 C.F.R. § 25.209(g).

²⁸⁰ SIA Petition at 2-3.

²⁸¹ SIA Petition at 3.

²⁸² See Section III.A. above, citing *Sixth Report and Order*, 20 FCC Rcd at 5614 (paras. 49-50).

²⁸³ 47 C.F.R. § 25.209(c).

²⁸⁴ SIA Petition at 3-4.

interference to the extent to which the parties agreed in their coordination.²⁸⁵ In the absence of such an agreement, the Commission intended that the earth station would be protected from interference only to the extent that a routine earth station would.²⁸⁶

99. We agree with SIA to the extent that it argues that non-routine receive-only earth stations should be given the same level of protection from interference as a routine earth station, or in other words, the same protection level it would enjoy if it met the antenna gain pattern requirements of Sections 25.209(a) and (b), in the absence of a coordination agreement. We also agree with SIA that parts of Section 25.220 could be interpreted as inconsistent with this intent.²⁸⁷ We disagree, however, that the Commission's rules should mandate a particular level of interference protection rather than allowing parties to negotiate a different level of protection, as SIA appears to suggest.²⁸⁸ Accordingly, we will revise Section 25.220 to make clear that, in the absence of a coordination agreement, non-routine earth stations will be protected from interference to the same extent as routine earth stations, but we will not adopt SIA's apparent suggestion to preclude parties from negotiating a different level of protection.

D. Signing of Certifications

100. *Background.* In its petition for reconsideration, SIA again proposes revising the certification procedure to require adjacent satellite operators to sign certifications showing that the proposed non-routine earth station operations have been coordinated, in cases where both the target satellite and the adjacent satellites are U.S.-licensed. SIA states that this procedure will prevent any misunderstanding with respect to the coordination agreement, and ensure that adjacent satellite operators have current information regarding the interference environment in which they operate.²⁸⁹ SIA also asserts that obtaining these signatures would not be burdensome for either satellite operator because they are generally in regular contact.²⁹⁰ Alternatively, SIA contends that the benefits of adjacent satellite operator signatures would be outweighed by the potential for delay in cases where the adjacent satellite is not U.S.-licensed.²⁹¹

101. *Discussion.* We find that SIA has not adequately justified its proposal. SIA suggests that adjacent satellite operator signatures are needed to prevent misunderstandings of coordination agreements, and ensure that they have current information regarding their interference environment.²⁹² However, SIA's concerns about current information are inconsistent with its assertion that U.S.-licensed satellite operators are in regular contact with each other.²⁹³

²⁸⁵ 47 C.F.R. § 25.220(d)(1).

²⁸⁶ 47 C.F.R. § 25.220(d)(2).

²⁸⁷ See 47 C.F.R. § 25.220(c)(3), cited in SIA Petition at 3.

²⁸⁸ SIA Petition at 3-4.

²⁸⁹ SIA Petition at 4.

²⁹⁰ SIA Petition at 4-5.

²⁹¹ SIA Petition at 5.

²⁹² SIA Petition at 4.

²⁹³ SIA Petition at 4-5.

(continued . . .)

Furthermore, in the Order above, the Commission considered and declined another SIA proposal to require signatures from both the target satellite operator and adjacent satellite operators on certifications, because it was unnecessary in light of the Commission's historical reliance on satellite operators to work together cooperatively to reach coordination agreements.²⁹⁴ Moreover, even if a target satellite operator neglected to coordinate with an affected adjacent satellite operator, the Commission's procedure includes an additional opportunity for those satellite operators to comment.²⁹⁵ There is nothing in the record to justify a different result here.

E. Determination of Need for Coordination

102. In the *Fifth Report and Order*, the Commission concluded that the target satellite operator should not be required to coordinate with an adjacent satellite operator in cases where the non-routine earth station in question will not generate a side lobe in the direction of the adjacent satellite that will be large enough to cause harmful interference.²⁹⁶ SIA recommends stating this exception in more precise terms. SIA would require coordination with all adjacent satellites within 6° of the target satellite unless the earth station is routine, or the earth station operator plans to reduce its input power or power density into the antenna by a sufficient amount to meet the antenna gain pattern envelope in Section 25.209 within $\pm 1^\circ$ of the nominal location of the adjacent satellite.²⁹⁷ We agree that a more precise statement of the coordination requirement would reduce confusion on this issue. Accordingly, we will revise Section 25.220 of the Commission's rules based on SIA proposal.

F. Other Reconsideration Issues

103. In the context of its pleadings filed in response to the *Third Further Notice*, AVL raises a number of issues regarding decisions made in the *Fifth Report and Order* and *Sixth Report and Order*. First, AVL recommends that the Commission not require any certifications or power reductions for routine earth stations.²⁹⁸ SIA replies that nothing in the *Fifth Report and Order* suggests that the procedures adopted in that Order were intended for routine earth stations.²⁹⁹ SIA is correct. The procedures adopted in the *Fifth Report and Order* are intended to streamline the review of non-routine earth station applications.³⁰⁰ We do not plan to apply those procedures to routine earth station applications.

(Continued from previous page)

²⁹⁴ Section III.F.1. above, citing *Third Further Notice*, 20 FCC Rcd at 5627 (para. 93).

²⁹⁵ Section III.F.1. above, citing *Fifth Report and Order*, 20 FCC Rcd at 5694-97 (paras. 70-79).

²⁹⁶ *Fifth Report and Order*, 20 FCC Rcd at 5686 (para. 47).

²⁹⁷ SIA Petition at 5-6.

²⁹⁸ AVL Comments at 3.

²⁹⁹ SIA Reply at 11.

³⁰⁰ See *Fifth Report and Order*, 20 FCC Rcd at 5669 (para. 3) ("We adopt streamlined procedures for considering non-routine earth station applications"). See also 47 C.F.R. § 25.220(a)(1).

104. AVL also assumes that the certification procedure adopted by the Commission in the *Fifth Report and Order* requires non-routine earth station operators to obtain certifications from adjacent satellite operators, and complains that such a procedure would be unreasonably burdensome.³⁰¹ AVL is mistaken. The Commission in the *Fifth Report and Order* explicitly stated that earth station applicants must submit certifications from their target satellite operators, not all the adjacent satellite operators.³⁰²

105. In addition, AVL claims that the Commission has eliminated a provision that allows earth station operators to exceed the antenna gain pattern in the sidelobes by up to three dB in this proceeding.³⁰³ SIA counters that allowing such "excursions" would result in an unacceptable increase in the potential for interference environment.³⁰⁴ AVL misunderstands the Commission's actions. In the *Sixth Report and Order*, the Commission made only one change to the antenna gain pattern envelope: it increased the starting point to 1.5° off-axis, up from 1.0° off-axis for C-band antennas and 1.25° off-axis for Ku-band antennas. The Commission did not eliminate any provision with respect to "excursions." Furthermore, these excursions are reflected in the off-axis EIRP envelopes proposed in the *Third Further Notice*.³⁰⁵ In response to SIA's argument, we note that Section 25.209 has allowed earth station operators the flexibility allowed to exceed that envelope by up to three dB for several years. SIA does not provide any reason to depart from this practice. Accordingly, we conclude that no further revisions to Section 25.209 are warranted.

106. Finally, we take this opportunity to address some petitions for reconsideration of another Part 25 streamlining proceeding.³⁰⁶ EDS asserts that Form 312, adopted in the *1996 Streamlining Order*, required disclosure of foreign ownership that is in excess of the disclosure required by the Communications Act.³⁰⁷ When the Form 312 filing requirement took effect, the Form included instructions that made clear that the foreign ownership reporting requirements are limited to broadcast, common carrier, aeronautical en route or aeronautical fixed earth stations. We conclude that the instructions adequately address EDS's concern, and no further action is needed. GE observes that there was a typographical error in Section 25.212(c) of the Commission's rules,³⁰⁸ but that error was later corrected.³⁰⁹ Accordingly, we dismiss this petition as moot. Finally, Telquest does not raise issues related to any rule adopted in the *1996 Streamlining Order*, but rather criticizes the dismissal of its Direct Broadcast Satellite (DBS)

³⁰¹ AVL Comments at 4.

³⁰² See *Fifth Report and Order*, 20 FCC Rcd at 5688 (para. 52). See also 47 C.F.R. § 25.220(d)(1).

³⁰³ AVL Comments at 4-5; AVL Reply at 1-2. See also AVL *Ex Parte* Statement at 2-3.

³⁰⁴ SIA Reply at 12.

³⁰⁵ See *Third Further Notice*, 20 FCC Rcd at 5653-56 (App. C).

³⁰⁶ See *1996 Streamlining Order*.

³⁰⁷ EDS Petition at 2-9.

³⁰⁸ GE Americom Petition at 2-3.

³⁰⁹ See *Satellite Application and Licensing Procedures, Correction to Final Rule*, 62 FR 51378 (Oct. 1, 2001).

application about nine months before the *1996 Streamlining Order* was released.³¹⁰ We therefore dismiss Telquest's petition as outside the scope of this proceeding.³¹¹

VI. SUMMARY AND CONCLUSIONS

107. In this Order, we continue the process we began in 2000 to streamline the Commission's non-routine earth station processing rules. Throughout this proceeding, the Commission has provided multiple opportunities for interested parties to recommend rule revisions,³¹² and based the streamlining measures adopted in this *Eighth Report and Order* on recommendations from satellite industry commenters in an earlier phase in this proceeding.³¹³ As a result of this Order, we now have three procedures for earth station applications. First, applications for earth stations with antennas of routine diameter or greater,³¹⁴ to be operated at routine power levels or lower,³¹⁵ will be processed routinely. This is consistent with the procedure for routine earth station applications in place now.

108. Second, earth station applications that do not meet these standards, but fall within the applicable off-axis EIRP envelope, will be processed routinely and placed on 30 days' public notice. The Commission will develop a form for these earth station applications. In the meantime, applicants choosing to use this procedure must file their information in the form of a table as set forth in this Order above and include the table as an attachment to their applications.³¹⁶ As the Commission noted in the *Third Further Notice*, this procedure is substantially similar to the power reduction procedure adopted in the *Fifth Report and Order*.³¹⁷ Accordingly, we replace the power reduction procedure adopted in the *Fifth Report and Order* with the off-axis EIRP procedure we adopt here, as proposed in the *Third Further Notice*.³¹⁸ In

³¹⁰ TelQuest Ventures, L.L.C., Western Tele-Communications, Inc., *Report and Order*, 11 FCC Rcd 8151 (Int'l Bur., 1996) (*Telquest Dismissal Order*).

³¹¹ Telquest also filed an application for review of the *Telquest Dismissal Order*, raising arguments substantially similar to those in its petition for reconsideration of the *1996 Streamlining Order*. The Commission dismissed that petition in 2001. Application of Telquest Ventures, L.L.C. For a License for a Fixed-Satellite Transmit/Receive Earth Station to Communicate with a Canadian DBS Satellite to be located at 91 Degrees W.L. and for Blanket License Authority to Construct and Operate One Million Receive-Only Earth Stations for use with a Canadian DBS Satellite to be Located at 91 Degrees W.L., *Memorandum Opinion and Order*, 16 FCC Rcd 15026 (2001).

³¹² See *Fifth Report and Order*, 20 FCC Rcd at 5672 (para. 13).

³¹³ See *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

³¹⁴ By "routine diameter," we mean 1.2 meters for Ku-band earth stations, and 4.5 meters for C-band earth stations.

³¹⁵ By "routine power level," we mean the power levels specified in Sections 25.134, 25.211, or 25.212 of the Commission's rules.

³¹⁶ See Section V.

³¹⁷ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 74).

³¹⁸ *Third Further Notice*, 20 FCC Rcd at 5622 (para. 75).

addition, licenses granted pursuant to this procedure will be eligible for ALSAT treatment, consistent with the power reduction procedure adopted in the *Fifth Report and Order*.³¹⁹

109. Third, license applications for earth stations that will exceed the off-axis EIRP envelope will be considered pursuant to the certification procedure adopted in the *Fifth Report and Order*. In other words, applicants will need to provide a certification from the operator of each space station with which the applicant plans to communicate, showing that the space station operator has coordinated the non-routine earth station operations with its neighboring satellite operators.³²⁰ We emphasize that earth station operators are not required to coordinate directly with the neighboring satellite operators.³²¹ If for any reason the applicant is unwilling or unable to obtain such certifications, it is free to attempt to show that its proposed earth station operations would not cause harmful adjacent satellite interference in the context of a waiver of the certification requirement. Such applicants are also free to include any information they believe will support their arguments, including but not limited to an ASIA analysis, as discussed in the *Fifth Report and Order*,³²² or a statement that the earth station antenna has an electronic pointing mechanism, as suggested by AVL. However, we reach no conclusion here regarding whether any specific showing would or would not be sufficient in any particular instance. Instead, we repeat that the earth station applicant in these cases bear the burden of proof of showing that their proposed operations will not cause harmful interference to adjacent satellites.

110. Applicants for Ku-band VSAT network licenses planning to use a contention protocol, and filing their applications after the rules in this Order take effect, will be required to certify in their applications that their use of that contention protocol will be reasonable. We also considered NRAO's proposal to require VSAT network operators to coordinate with NRAO prior to filing their applications with the Commission, and decided not to depart from the current procedures requiring NRAO notification, which appear to have been working adequately since 1958. Finally, we act on several petitions for reconsideration as indicated above.

111. All the rule revisions adopted in this Order are set forth in Appendix B of this Order. In addition, we incorporate into Appendix B the rule revisions adopted in the *Sixth Report and Order* and stayed pending consideration of the issues in the *Third Further Notice*, to the

³¹⁹ *Fifth Report and Order*, 20 FCC Rcd at 5684-85 (paras. 41-42). "ALSAT" means "all U.S.-licensed space stations." Originally, under an ALSAT earth station license, an earth station operator providing fixed-satellite service in the conventional C- and Ku-bands could access any U.S. satellite without additional Commission action, provided that those communications are in accordance with the same technical parameters and conditions established in the earth stations' licenses. See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States, *Report and Order*, IB Docket No. 96-111, 15 FCC Rcd 7207, 7210-11 (para. 6) (1999) (*DISCO II First Reconsideration Order*). The *DISCO II First Reconsideration Order* expanded ALSAT earth station licenses to allow access to any satellite on the Permitted List. *DISCO II First Reconsideration Order*, 15 FCC Rcd at 7215-16 (para. 19).

³²⁰ *Fifth Report and Order*, 20 FCC Rcd at 5687-88 (para. 50).

³²¹ See *Fifth Report and Order*, 20 FCC Rcd at 5683-84 n.99.

³²² *Fifth Report and Order*, 20 FCC Rcd at 5700 (para. 87).

extent necessary.³²³ The Commission will publish a summary of this Order in the Federal Register, in which it will announce the effective date of all these rule revisions.

VII. PROCEDURAL MATTERS

112. *Final Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act (RFA),³²⁴ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated into the *Third Further Notice*.³²⁵ The Commission sought written public comments on the possible significant economic impact of the proposed policies and rules on small entities in the *Third Further Notice*, including comments on the IRFA. No one commented specifically on the IRFA. Pursuant to the RFA,³²⁶ a Final Regulatory Flexibility Analysis is contained in Appendix D.

113. *Paperwork Reduction Act.* This Order contains new and modified information collections subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies are invited to comment on the new or modified information collection(s) contained in this proceeding. Implementation of these new or modified reporting and/or recordkeeping requirements will be subject to approval by the OMB, as prescribed by the Act, and will go into effect upon announcement in the Federal Register of OMB approval.

114. *Privacy Impact Assessment.* The Commission has performed a Privacy Impact Assessment as required by the Privacy Act, as amended by the E-Government Act of 2002.³²⁷ The Commission has determined that this information collection does not affect individuals or household; thus, there are no impacts under the Privacy Act.

VIII. ORDERING CLAUSES

³²³ See *Sixth Report and Order*, 20 FCC Rcd at 5614 (para. 50). Among other stayed rule revisions adopted in the *Sixth Report and Order*, the Commission increased the backlobe gain limits to 0 dBi in portions of the Ka-band that are not shared by the FSS and MSS or other services, as proposed by SIA. See *Sixth Report and Order*, 20 FCC Rcd at 5611 (paras. 40-41); *Further Notice*, 17 FCC Rcd at 18612 (para. 69), citing Letter from Richard DalBello, Executive Director, Satellite Industry Association, to Magalie Roman Salas, Secretary, FCC (dated Nov. 5, 2001) (SIA November 5 *Ex Parte* Statement) at 12. However, a backlobe gain limit of 0 dBi was incorporated into the off-axis EIRP envelope adopted for Ka-band earth stations in another proceeding, based in part on recommendations from a Ka-band Blanket Licensing Working Group. See Section 25.138 of the Commission's rules, 47 C.F.R. § 25.138; Letter from John P. Stern, Associate General Counsel, to Magalie Roman Salas, Secretary, FCC, IB Docket No. 98-172 (dated Sept. 27, 1999); Letter from Carlos M. Nalda, Dow, Lohnes, and Albertson, to Magalie Roman Salas, Secretary, FCC, IB Docket No. 98-172 (dated Oct. 28, 1999). Accordingly, the Ka-band antenna gain pattern rule revision adopted in the *Sixth Report and Order* is no longer necessary.

³²⁴ See 5 U.S.C. § 603.

³²⁵ *Third Further Notice*, 20 FCC Rcd at 5662-65 (App. E).

³²⁶ See 5 U.S.C. § 604.

³²⁷ 5 U.S.C. § 552a.

115. Accordingly, IT IS ORDERED, pursuant to Sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 157(a), 303(c), 303(f), 303(g), 303(r), that this *Eighth Report and Order* in IB Docket No. 00-248 is hereby ADOPTED.

116. IT IS FURTHER ORDERED that Part 25 of the Commission's rules IS AMENDED as set forth in Appendix B. An announcement of the effective date of these rule revisions will be published in the Federal Register.

117. IT IS FURTHER ORDERED that the Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Order, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

118. IT IS FURTHER ORDERED, pursuant to Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, that the Petition for Reconsideration of the *Fifth Report and Order* filed by SIA is GRANTED IN PART and DENIED IN PART, as indicated above.

119. IT IS FURTHER ORDERED, pursuant to Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, that the Petition for Reconsideration of the *Sixth Report and Order* filed by SIA is GRANTED.

120. IT IS FURTHER ORDERED, pursuant to Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, that the Petition for Reconsideration of the *Sixth Report and Order* filed by Boeing is DISMISSED AS MOOT.

121. IT IS FURTHER ORDERED, pursuant to Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, that the Petitions for Reconsideration of the *1996 Streamlining Order* filed by EDS and GE Americom are DISMISSED AS MOOT.

122. IT IS FURTHER ORDERED, pursuant to Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, that the Petition for Reconsideration of the *1996 Streamlining Order* filed by Telquest IS DENIED.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A**List of Commenters****I. Comments filed September 6, 2005**

1. AvL Technologies, Inc. (AVL)
2. CBS Broadcasting, Inc., Fox Broadcasting Company, Microspace Communications Corporation, MTV Networks, Showtime Networks Inc., Twentieth Television, and the Walt Disney Company (together, Joint Commenters)
3. National Cable and Telecommunications Association (NCTA)
4. National Programming Service, Inc. (NPS)
5. Satellite Industry Association (SIA)
6. SES Americom, Inc. (SES Americom)
7. Spacenet Inc. and Starband Communications Inc. (Spacenet)
8. Time Warner, Inc. (Time Warner)

II. Replies filed October 6, 2005

1. AVL
2. EchoStar
3. Global VSAT Forum
4. NPS
5. SIA
6. WildBlue Communications, Inc. (WildBlue)

III. *Ex Parte* Statements

1. Letter from James L. Oliver, President, AvL Technologies, to Marlene H. Dortch, Secretary, FCC (dated Feb. 13, 2006) (AVL *Ex Parte* Statement).
2. Letter from Carolyn Tatum Roddy, Director of Regulatory Affairs, SIA, to Marlene H. Dortch, Secretary, FCC (dated Oct. 27, 2006) (SIA *Ex Parte* Statement).
3. Letter from Elizabeth R. Park, Counsel for ViaSat, Inc., to Marlene H. Dortch, Secretary, FCC (dated Dec. 14, 2006) (ViaSat *Ex Parte* Statement).
4. Letter from Carlos M. Nalda, Counsel for The Boeing Company, to Marlene H. Dortch, Secretary, FCC (dated Apr. 5, 2007) (Boeing *Ex Parte* Statement).

IV. Petitions for Reconsideration, Comments, and Replies**A. *Fifth Report and Order***

1. SIA

B. *Sixth Report and Order*

1. Boeing
2. SIA
3. Intelsat (Comments)
4. Boeing (Reply)

C. 1996 Streamlining Order, IB Docket No. 95-117, Filed March 12, 1997

1. EDS Corporation (EDS)
2. GE American Communications, Inc. (GE Americom)
3. Telquest Ventures, Inc. (Telquest)

APPENDIX B**Rule Changes**

For the reasons discussed above, the Federal Communications Commission amends title 47 of the Code of Federal Regulations, part 25, as follows:

PART 25 -- SATELLITE COMMUNICATIONS

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

Authority: 47 U.S.C. 701-744. Interprets or applies Sections 4, 301, 302, 303, 307, 309, and 332 of the Communications Act, as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309, 332, unless otherwise noted.

2. In Section 25.115, add paragraphs (h) and (i) to read as follows:

§ 25.115 Application for earth station authorizations.

* * * * *

(h) Any earth station applicant filing an application pursuant to § 25.218 of this chapter must file three tables showing the off-axis EIRP level of the proposed earth station antenna of the plane of the geostationary orbit, the elevation plane, and towards the horizon. In each table, the EIRP level must be provided at increments of 0.1° for angles between 0° and 10° off-axis, and at increments of 5° for angles between 10° and 180° off-axis.

(1) For purposes of the off-axis EIRP table in the plane of the geostationary orbit, the off-axis angle is the angle in degrees from the line connecting the focal point of the antenna to the target satellite, within the plane 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.

(2) For purposes of the off-axis EIRP table in the elevation plane, the off-axis angle is the angle in degrees from the line connecting the focal point of the antenna to the target satellite, within the plane perpendicular to the plane 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.

(3) For purposes of the off-axis EIRP table towards the horizon, the off-axis angle is the angle in degrees from the line determined by the intersection of the horizontal plane and the elevation plane described in paragraph (h)(2) of this Section, in the horizontal plane. The horizontal plane is the plane determined by the focal point of the antenna and the horizon.

(4) In addition, in an attachment to its application, the earth station applicant must certify that it will limit its pointing error to 0.5°, or demonstrate that it will comply with the applicable off-axis EIRP envelopes in Section 25.218 of this Part when the antenna is mispointed at its maximum pointing error.

(i) Any earth station applicant filing an application for a VSAT network made up of FSS earth stations and planning to use a contention protocol must include in its application a certification that it will comply with the requirements of § 25.134(g)(4).

3. In Section 25.134, add paragraph (g)(4) to read as follows:

§ 25.134 Licensing provisions of Very Small Aperture Terminal (VSAT) and C-band Small Aperture Terminal (CSAT) networks.

* * * * *

(g) * * *

(4) Any earth station applicant filing an application to operate a VSAT network after **[Insert effective date of rule]** in the Ku-band and planning to use a contention protocol must certify that its contention protocol usage will be reasonable.

* * * * *

4. In Section 25.138, add paragraph (a)(4) to read as follows:

§ 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.

(a) * * *

(4) GSO FSS earth station antenna off-axis EIRP spectral density for cross-polarized signals shall not exceed the following values, in all directions relative to the GSO arc, under clear sky conditions:

8.5-25log(θ)-10log(N)	dBW/40 kHz	for	$2.0^\circ < \theta \leq 7.0^\circ$
-12.63-10log(N)	dBW/40 kHz	for	$7.0^\circ < \theta \leq 9.23^\circ$

Where:

θ is the angle in degrees from the axis of the main lobe;

For systems where more than one earth station is expected to transmit simultaneously in the same bandwidth, e.g., CDMA systems, N is the likely maximum number of simultaneously transmitting co-frequency earth stations in the receive beam of the satellite;

N=1 for TDMA and FDMA systems.

* * * * *

5. In Section 25.209, revise paragraphs (a), (b), and (c)(1), remove and reserve paragraph (d), revise paragraph (f), and remove and reserve paragraph (g), to read as follows:

§ 25.209 Antenna performance standards.

(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 Ka-band or conventional Ku-band:

$29 - 25\log_{10}\theta$	dBi	For	$1.5^\circ \leq \theta \leq 7^\circ$
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	$48^\circ < \theta \leq 180^\circ$

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. 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 Ka-band or conventional Ku-band:

$29 - 25\log_{10}\theta$	dBi	For	$1.5^\circ \leq \theta \leq 7^\circ$
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	$85^\circ < \theta \leq 180^\circ$

(3) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths, for all earth stations not operating in the Ka-band or conventional Ku-band:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

$32 - 25\log_{10}\theta$	dBi	For	$3^\circ < \theta \leq 48^\circ$
-10	dBi	For	$48^\circ < \theta \leq 180^\circ$

where θ and dBi are defined above. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(4) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths, for all earth stations operating in the Ka-band or conventional Ku-band:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

$32 - 25\log_{10}\theta$	dBi	For	$3^\circ < \theta \leq 48^\circ$
-10	dBi	For	$48^\circ < \theta \leq 85^\circ$
0	dBi	For	$85^\circ < \theta \leq 180^\circ$

where θ and dBi are defined above. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(5) Elliptical earth station antennas may be operated only when the major axis of the antenna is aligned with the plane of the geostationary satellite orbit as it appears at the particular earth station location.

(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 domestic 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	$1.8^\circ < \theta \leq 7^\circ$
-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:

$19 - 25\log_{10}\theta$	dBi	For	$3^\circ < \theta \leq 7^\circ$
-2	dBi	For	$7^\circ < \theta \leq 9.2^\circ$

where θ and dBi are defined above.

(c)(1) Earth station antennas licensed for reception of radio transmissions from a space station in the fixed-satellite service are protected from radio interference caused by other space stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the referenced patterns defined in paragraphs (a) and (b) of this section, and protected from radio interference caused by terrestrial radio transmitters identified by the frequency coordination process only to the degree to which harmful interference would not be expected to be caused to an earth station conforming to the reference pattern defined in paragraphs (a)(3) and (a)(4) of this section.

* * * * *

(d) [removed and reserved.]

* * * * *

(f) An earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section will be authorized only if the applicant meets its burden of demonstrating that its antenna will not cause unacceptable interference. For ESVs in the C-band, this demonstration must comply with the procedures set forth in § 25.221. For ESVs in the Ku-band, this demonstration must comply with the procedures set forth in § 25.222. For feeder-link earth stations in the 17/24 GHz BSS, this demonstration must comply with the procedures set forth in §

25.223. For other FSS earth stations, this demonstration must comply with the procedures set forth in §§ 25.218 or 25.220. In any case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations.

(g) [removed and reserved.]

* * * * *

6. In Section 25.212, revise paragraph (c) to read as follows:

§25.212 Narrowband analog transmissions, digital transmissions, and video transmissions in the GSO Fixed-Satellite Service.

* * * * *

(c) In the 14.0-14.5 GHz band, an earth station with an antenna equivalent diameter of 1.2 meters or greater may be routinely licensed for transmission of narrowband analog services with bandwidths up to 200 kHz if the maximum input power spectral density into the antenna does not exceed -8 dBW/4 kHz and the maximum transmitted satellite carrier EIRP density does not exceed 17 dBW/4 kHz. Such earth stations may be routinely licensed for transmission of narrowband and/or wideband digital services, including digital video services, if the maximum input spectral power density into the antenna does not exceed -14 dBW/4 kHz, and the maximum transmitted satellite carrier EIRP density does not exceed +10.0 dBW/4 kHz. Antennas transmitting in the 14.0-14.5 GHz band with a major and/or minor axis smaller than 1.2 meters are subject to the provisions of §25.220, which may include power reduction requirements.

* * * * *

7. Revise Part 25 by adding new § 25.218 to read as follows:

§ 25.218 Off-Axis EIRP Envelopes for FSS earth station operations.

- (a) This section applies to all earth station applications, except for
 - (1) ESV applications,
 - (2) Analog video earth station applications,
 - (3) Applications for feeder-link earth stations in the 17/24 GHz BSS.

(b) Earth station applications subject to this Section are eligible for routine processing if they meet the applicable off-axis EIRP envelope set forth in this Section below. For purposes of this Section, the term "extended Ku-band" is the 10.7-11.7 GHz, 12.75-13.25 GHz, and 13.75-14.0 GHz band. The term "conventional Ku-band" is defined in Section 25.201 of this chapter.

(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 - 25log ₁₀ θ	dBW/4 kHz	For	1.5° ≤ θ ≤ 7°
8.5	dBW/4 kHz	For	7° < θ ≤ 9.2°
32.5 - 25log ₁₀ θ	dBW/4 kHz	For	9.2° < θ ≤ 48°

-9.5	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$
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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 1.5° 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.

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

$32.5 - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
-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, within any plane that includes that line, with the exception of the plane 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 envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the envelope given above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 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	$1.5^\circ \leq \theta \leq 7^\circ$
$5.3 - 10\log_{10}(N)$	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 1.5° 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.

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

$29.3 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
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$-12.7 - 10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$
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where θ is defined in paragraph (c)(2) of this Section, and N is defined in paragraph (d)(1) of this Section. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(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	$1.5^\circ \leq \theta \leq 7^\circ$
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 1.5° 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.

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

$24 - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
-18	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$
- 8	dBW/4 kHz	For	$85^\circ < \theta \leq 180^\circ$

where θ is defined in paragraph (c)(2) of this section. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 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	$1.5^\circ \leq \theta \leq 7^\circ$
$-6 - 10\log_{10}(N)$	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 1.5° 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.

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

$18 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
$-24 - 10\log_{10}(N)$	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 is defined in paragraph (c)(2) of this section, and N is defined in paragraph (f)(1) of this section. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(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	$1.5^\circ \leq \theta \leq 7^\circ$
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 1.5° 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.

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

$24 - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
-18	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ is defined in paragraph (c)(2) of this Section. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 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	$1.5^\circ \leq \theta \leq 7^\circ$
$-6 - 10\log_{10}(N)$	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 1.5° 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.

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

$18 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
$-24 - 10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$

where θ is defined in paragraph (c)(2) of this section and N is defined in paragraph (h)(1) of this section. For the purposes of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

8. Revise § 25.220 by revising paragraphs (a) and (d), and removing and reserving paragraphs (c), (e), and (f), to read as follows:

§ 25.220 Non-conforming transmit/receive earth station operations.

(a)(1) This section applies to earth station applications, other than ESV applications and 17/24 GHz BSS feeder link applications, in which the proposed earth station operations do not fall within the applicable off-axis EIRP envelope specified in Section 25.218 of this Chapter.

(2) The requirements for petitions to deny applications filed pursuant to this section are set forth in § 25.154.

(b) * * *

(c) [removed and reserved.]

(d)(1) The applicant must submit the certifications listed in paragraphs (d)(1)(i) through (d)(1)(iv) of this Section. The applicant will be authorized to transmit only to the satellite systems included in the coordination agreements referred to in the certification required by paragraph (d)(1)(ii) of this section. The applicant will be granted protection from receiving interference only with respect to the satellite systems included in the coordination agreements referred to in the certification required by paragraph (d)(1)(ii) of this section, and only to the extent that protection from receiving interference is afforded by those coordination agreements.

(i) A statement from the satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to receive interference from adjacent satellite networks that may be unacceptable.

(ii) A statement from the satellite operator that it has coordinated the operation of the subject non-conforming earth station accessing its satellite(s), including its required downlink power density based on the information contained in the application, with all adjacent satellite networks within 6° of orbital separation from its satellite(s), and the operations will operate in conformance with existing coordination agreement for its satellite(s) with other satellite systems, except as set forth in paragraph (d)(4) of this paragraph.

(iii) A statement from the satellite operator that it will include the subject non-conforming earth station operations in all future satellite network coordinations, and

(iv) A statement from the earth station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).

(2) A license granted pursuant to paragraph (d)(1) of this section will include, as a condition on that license, that if a good faith agreement cannot be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall accept the power density levels that would accommodate the 2° compliant satellite.

(3) In the event that a coordination agreement discussed in paragraph (d)(1)(ii) of this section is reached, but that coordination agreement does not address protection from interference for the earth station, that earth station will be protected from interference to the same extent that an earth station that meets the requirements of § 25.209 of this title would be protected from interference.

(4) Notwithstanding paragraph (d)(1)(ii) of this section, a party applying for an earth station license pursuant to this section will not be required to certify that its target satellite operator has reached a coordination agreement with another satellite operator whose satellite is within 6° of orbital separation from its satellite in cases where the off-axis EIRP density level of the proposed earth station operations will be less than or equal to the levels specified by the applicable off-axis EIRP envelope set forth in § 25.218 of this Chapter in the direction of the part of the geostationary orbit arc within 1° of the nominal orbit location of the adjacent satellite.

(e) [removed and reserved.]

(f) [removed and reserved.]

(g) * * *

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APPENDIX C

Proposed Off-Axis EIRP Envelopes for FSS Earth Station Applications

In this Appendix, we list several off-axis EIRP envelopes for various types of FSS earth station transmissions, as originally proposed in Appendix C of the *Third Notice of Proposed Rulemaking*.

I. Power Limits for C-band Analog Earth Stations

(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	$1.5^\circ \leq \theta \leq 7^\circ$
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 axis of the main lobe. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 1.5° 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 dBW/4 kHz.

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

$32.5 - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
-9.5	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ is defined above. For the purposes of this section, 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 6 dBW/4 kHz. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dBW/4 kHz.

II. Power Limits for C-band Digital Earth Stations

(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	$1.5^\circ \leq \theta \leq 7^\circ$
$5.3 - 10\log_{10}(N)$	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 is the angle in degrees from the axis of the main lobe, 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 1.5° 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 dBW/4 kHz.

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.

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

$29.3 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
$-12.7 - 10\log_{10}(N)$	dBW/4 kHz	For	$48^\circ < \theta \leq 180^\circ$

where θ and N are defined above. For the purposes of this section, 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 6 dBW/4 kHz. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dBW/4 kHz.

III. Power Limits for Ku-band Analog Earth Stations

(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	$1.5^\circ \leq \theta \leq 7^\circ$
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 is the angle in degrees from the axis of the main lobe. For the purposes of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ between 1.5° 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 dBW/4 kHz.

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

$24 - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
-18	dBW/4 kHz	For	$48^\circ < \theta \leq 85^\circ$
- 8	dBW/4 kHz	For	$85^\circ < \theta \leq 180^\circ$

where θ is defined above. For the purposes of this section, 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 6 dBW/4 kHz. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dBW/4 kHz.

IV. Power Limits for Ku-band Digital Earth Stations

(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	$1.5^\circ \leq \theta \leq 7^\circ$
$-6 - 10\log_{10}(N)$	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 is the angle in degrees from the axis of the main lobe, 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 1.5° 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 dBW/4 kHz.

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.

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

$18 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$3^\circ \leq \theta \leq 48^\circ$
$-24 - 10\log_{10}(N)$	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 N are defined above. For the purposes of this section, 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 6 dBW/4 kHz. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dBW/4 kHz.

APPENDIX D

Technical Arguments

SIA identifies certain minor errors in Appendix C of the *Third Further Notice*. First, throughout Appendix C, in each place that the phrase "No individual sidelobe would exceed 3 dB/4 kHz" appears, SIA recommends replacing "3 dBW/4 kHz" with simply "3 dB".¹ We agree, and we correct this typographical error in the rule revisions we adopt in this Order. Similarly, we replace "6 dBW/4 kHz" with "6 dB" as SIA suggests.²

SIA also claim that the Commission misstated two of the equations in Appendix C of the *Third Further Notice*, in which the Commission proposed an off-axis EIRP envelope for C-band digital transmissions.³ SIA's claims are illustrated below.

Table II(1) in Appendix C of *Third Further Notice*

$27.3 - 10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$1.5^\circ \leq \theta \leq 7^\circ$
$5.3 - 10\log_{10}(N)$	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$

Table II(1) as Proposed by SIA

26.3 - $10\log_{10}(N) - 25\log_{10}\theta$	dBW/4 kHz	For	$1.5^\circ \leq \theta \leq 7^\circ$
5.2 - $10\log_{10}(N)$	dBW/4 kHz	For	$7^\circ < \theta \leq 9.2^\circ$

SIA is correct that the Commission misstated the first line of Table II(1). This figure is derived by combining the antenna gain pattern in Section 25.209 with the C-band power level permitted by Section 25.212. In this case, for angles between 1.5° and 7° , that is $29 - 2.7$, which is 26.3 as SIA points out.

However, we disagree that the second line of Table II(1) is misstated. When the antenna gain pattern in Section 25.209 is combined with the C-band power level permitted by Section 25.212, for angles between 7° and 9.2° , the figure is $8 - 2.7$, which is 5.3, not 5.2 as SIA claims.

¹ SIA Comments at 11.

² SIA Comments at 11.

³ SIA Comments at 11 and 16 n.25.

APPENDIX E

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 *Third Further Notice of Proposed Rulemaking (Third Further Notice)* in IB Docket No. 00-248.¹ The Commission sought written public comment on the proposals in the *Third Further Notice*, including comment on the IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.²

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

The Telecommunications Act of 1996 requires the Commission in every even-numbered year beginning in 1998 to review all regulations that apply to the operations or activities of any provider of telecommunications service and to determine whether any such regulation is no longer necessary in the public interest due to meaningful economic competition. Our objective is to repeal or modify any rules in Part 25 that are no longer necessary in the public interest, as required by Section 11 of the Communications Act of 1934, as amended.

We codify streamlined procedures that allow for routine treatment of applications for earth stations that will comply with an of-axis EIRP envelope.

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

No comments were submitted directly in response to the IRFAs in the *Third Further Notice*.

C. 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.³ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁴ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁵ A small business concern is one which: (1) is independently owned and operated;

¹ 2000 Biennial Regulatory Review -- Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Sixth Report and Order and Third Further Notice of Proposed Rulemaking*, IB Docket No. 00-248, 20 FCC Rcd 5593 (2005) (*Third Further Notice*).

² See 5 U.S.C. § 604.

³ 5 U.S.C. § 604(a)(3).

⁴ 5 U.S.C. § 601(6).

⁵ 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for (continued . . .)

(2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁶

1. Cable Services. The SBA has developed a small business size standard for Cable and Other Program Distribution, which consists of all such firms having \$12.5 million or less in annual receipts.⁷ According to Census Bureau data for 1997, in this category there was a total of 1,311 firms that operated for the entire year.⁸ Of this total, 1,180 firms had annual receipts of under \$10 million, and an additional fifty-two firms had receipts of \$10 million to \$24,999,999.⁹ Thus, under this size standard, the majority of firms can be considered small.

The Commission has developed its own small business size standard for a small cable operator for the purposes of rate regulation. Under the Commission's rules, a "small cable company" is one serving fewer than 400,000 subscribers nationwide.¹⁰ Based on our most recent information, we estimate that there were 1,439 cable operators that qualified as small cable companies at the end of 1995.¹¹ Since then, some of those companies may have grown to serve over 400,000 subscribers, and others may have been involved in transactions that caused them to be combined with other cable operators. Consequently, we estimate that there are fewer than 1,439 small cable companies that may be affected by the proposed rules.

The Communications Act of 1934, as amended, also contains a size standard for a "small cable operator," which is "a cable operator that, directly or through an affiliate, serves in the aggregate fewer than one percent of all subscribers in the United States and is not affiliated with any entity or entities whose gross annual revenues in the aggregate exceed \$250,000,000."¹² The Commission has determined that there are 67,700,000 subscribers in the United States.¹³ Therefore, an operator serving fewer than 677,000 subscribers shall be deemed a small operator,

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public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

⁶ 15 U.S.C. § 632.

⁷ 13 C.F.R. § 121.201, NAICS code 517510.

⁸ U.S. Census Bureau, 1997 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 4, NAICS code 513220 (issued October 2000).

⁹ *Id.*

¹⁰ 47 C.F.R. § 76.901(e). The Commission developed this definition based on its determinations that a small cable company is one with annual revenues of \$100 million or less. See *Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992: Rate Regulation*, MM Doc. Nos. 92-266 and 93-215, Sixth Report and Order and Eleventh Order on Reconsideration, 10 FCC Rcd 7393, 7408-7409 ¶¶ 28-30 (1995).

¹¹ Paul Kagan Assocs., Inc., Cable TV Investor, Feb. 29, 1996 (based on figures for Dec. 30, 1995).

¹² 47 U.S.C. § 543(m)(2).

¹³ See *FCC Announces New Subscriber Count for the Definition of Small Cable Operator*, Public Notice, 16 FCC Rcd 2225 (2001).

if its annual revenues, when combined with the total annual revenues of all of its affiliates, do not exceed \$250 million in the aggregate.¹⁴ Based on available data, we estimate that the number of cable operators serving 677,000 subscribers or less totals approximately 1,450.¹⁵ We do not request or collect information on whether cable operators are affiliated with entities whose gross annual revenues exceed \$250,000,000,¹⁶ and therefore are unable to estimate accurately the number of cable system operators that would qualify as small cable operators under the definition in the Communications Act.

2. Satellite Telecommunications. The rules proposed in this *Further Notice* would affect providers of satellite telecommunications services, if adopted. Satellite telecommunications service providers include satellite operators and earth station operators. The Commission has not developed a definition of small entities applicable to satellite operators. Therefore, the applicable definition of small entity is generally the definition under the SBA rules applicable to Satellite Telecommunications.¹⁷ This definition provides that a small entity is expressed as one with \$12.5 million or less in annual receipts.¹⁸ 1997 Census Bureau data indicate that, for 1997, 273 satellite communication firms had annual receipts of under \$10 million. In addition, 24 firms had receipts for that year of \$10 million to \$24,999,990.¹⁹

3. Auxiliary, Special Broadcast and other program distribution services. This service involves a variety of transmitters, generally used to relay broadcast programming to the public (through translator and booster stations) or within the program distribution chain (from a remote news gathering unit back to the station). The Commission has not developed a definition of small entities applicable to broadcast auxiliary licensees. Therefore, the applicable definition of small entity is the definition under the Small Business Administration (SBA) rules applicable to radio broadcasting stations,²⁰ and television broadcasting stations.²¹ These definitions provide that a small entity is one with either \$6.0 million or less in annual receipts for a radio broadcasting station or \$12.0 million in annual receipts for a TV station.²² There are currently 3,237 FM

¹⁴ 47 C.F.R. § 76.1403(b).

¹⁵ See *FCC Announces New Subscriber Count for the Definition of Small Cable Operator*, Public Notice, 16 FCC Rcd 2225 (2001).

¹⁶ We do receive such information on a case-by-case basis only if a cable operator appeals a local franchise authority's finding that the operator does not qualify as a small cable operator pursuant to section 76.901(f) of the Commission's rules. See 47 C.F.R. § 76.990(b).

¹⁷ "This industry comprises establishments primarily engaged in providing point-to-point 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." Small Business Administration, NAICS code 517310.

¹⁸ 13 C.F.R. § 120.121, NAICS code 517310.

¹⁹ U.S. Census Bureau, 1997 Economic Census, Subject Service: Information, "Establishment and Firm Size," Table 4, NAICS 513340 (Issued Oct. 2000).

²⁰ 13 C.F.R. § 121.201, NAICS code 515112.

²¹ 13 C.F.R. § 121.201, NAICS code 515120.

²² 13 C.F.R. § 121.201.
(continued . . .)

translators and boosters, 4913 TV translators.²³ The FCC does not collect financial information on any broadcast facility and the Department of Commerce does not collect financial information on these auxiliary broadcast facilities. We believe, however, that most, if not all, of these auxiliary facilities could be classified as small businesses by themselves. We also recognize that most translators and boosters are owned by a parent station which, in some cases, would be covered by the revenue definition of small business entity discussed above. These stations would likely have annual revenues that exceed the SBA maximum to be designated as a small business (as noted, either \$6.0 million for a radio station or \$12.0 million for a TV station). Furthermore, they do not meet the Small Business Act's definition of a "small business concern" because they are not independently owned and operated.

4. Microwave Services. Microwave services include common carrier,²⁴ private-operational fixed,²⁵ and broadcast auxiliary radio services.²⁶ At present, there are approximately 22,015 common carrier fixed licensees and 61,670 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services. The Commission has not yet defined a small business with respect to microwave services. For purposes of this FRFA, we will use the SBA's definition applicable to cellular and other wireless communications companies -- *i.e.*, an entity with no more than 1,500 persons.²⁷ We estimate that all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify as small entities under the SBA definition for radiotelephone (wireless) companies.

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

The rules adopted in this *Eighth Report and Order* are not intended to increase the reporting, record keeping and other compliance requirements of any licensee, and we do not anticipate any differential treatment to be received by larger and smaller entities. The reporting requirements associated with the off-axis EIRP envelope method for reviewing earth station applications are the same as the reporting requirements associated with one of the earth station application procedures adopted in the *Fifth Report and Order*. These requirements will not affect small businesses differently from other non-routine earth station applicants.

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²³ FCC News Release, Broadcast Station Totals as of September 30, 1999, No. 71831 (Jan. 21, 1999).

²⁴ See 47 C.F.R. § 101 *et seq.* (formerly, part 21 of the Commission's Rules).

²⁵ Persons eligible under parts 80 and 90 of the Commission's rules can use Private Operational-Fixed Microwave services. See 47 C.F.R. parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

²⁶ Auxiliary Microwave Service is governed by part 74 of Title 47 of the Commission's Rules. See 47 C.F.R. part 74 *et seq.* Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

²⁷ See 13 C.F.R. § 121.201, NAICS code 517212.

E. 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 reaching its proposed approach, which may include the following four alternatives: (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 or reporting requirements under the rule for 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 small entities.²⁸

In this *Eighth Report and Order*, the Commission considers and rejects a proposal to require analog video earth station operators to comply with an off-axis EIRP envelope. Commenters persuasively argued that such a requirement would have been burdensome for all analog video earth station operators, including small business analog video earth station operators.

F. Report to Congress

The Commission will send a copy of the *Eighth Report and Order*, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A). In addition, the Commission will send a copy of the *Eighth Report and Order*, including FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of the *Eighth Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register. *See* 5 U.S.C. § 604(b).

²⁸ 5 U.S.C. §§ 603(c)(1) – (c)(4).