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

In the Matter of	)	
	)	
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	)	IB Docket No. 02-10

SECOND ORDER ON RECONSIDERATION

Adopted: July 17, 2012 **Released: July 19, 2012**

By the Commission:

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I. INTRODUCTION

1. In this Second Order on Reconsideration for Earth Stations on Board Vessels (*ESV Second Reconsideration Order*), we adopt changes to the ESV rules in order to promote the deployment of broadband service, to ensure the flexible use of spectrum, and to protect incumbent operators from harmful interference. In particular, we revise our ESV rules by adding technical requirements for variable power ESV systems that use co-frequency transmitters operating simultaneously at varying data rates. ESVs are mobile transmitters that facilitate communications services, including broadband service, to cruise ships, merchant ships, yachts, U.S. Navy vessels, and other maritime vessels that are capable of carrying a stabilized satellite antenna. Our actions in this Order stem from two petitions filed by The Boeing Company (Boeing) and ViaSat, Inc. (ViaSat)[1] requesting changes to our existing ESV rules.[2] The

[1] *See* Petition for Reconsideration of The Boeing Company, filed October 15, 2009 (Boeing Petition); Petition for Clarification or Reconsideration of ViaSat, Inc., filed October 15, 2009 (ViaSat Petition). Appendix A contains the complete list of filings.

[2] *See* 47 C.F.R. §§ 25.221, 25.222 (ESV rules for operating in the C- and Ku-bands, respectively).

requirements we adopt provide variable power ESV systems with operational flexibility and ensure that incumbent fixed-satellite service (FSS) operators are protected from harmful interference in the C-band[3] and Ku-band.[4]

II. BACKGROUND

2. In 2005, the Commission established licensing and service rules for ESVs to operate in the C-band and Ku-band frequencies.[5] The ESV rules include technical requirements for preventing ESVs from causing harmful interference to other radio services in these bands, including the FSS and Fixed Service (FS). To protect the FSS operators, the Commission adopted off-axis effective isotropically radiated power (EIRP)-density limits[6] that restrict the power emitted from the ESV antenna towards the satellites adjacent to the target satellite. The Commission also adopted an antenna pointing error requirement that allows ESV antennas to mispoint only within 0.2 degrees when communicating with the target satellite.[7]

3. To protect the FS operators in the C-band, the Commission required ESV operators to coordinate with affected FS operations; placed limits on the amount of spectrum that ESV operators are permitted to coordinate; limited the EIRP towards the radio horizon and the EIRP-density towards the radio horizon; and limited the installation of ESVs to vessels weighing 300 gross tons or more.[8] The Commission also established rules for licensing ESV systems, including licensing of ESV hub stations and/or blanket licensing for ESV earth stations.[9] Finally, to protect U.S. satellite and terrestrial licensees from harmful interference, the Commission established requirements for U.S.-registered vessels operating ESVs within and outside of U.S. waters and created a regulatory framework for foreign-registered vessels operating ESVs in U.S. waters.[10]

4. In the 2009 Order on Reconsideration (*ESV Reconsideration Order*), the Commission revised certain ESV rules to provide ESV operators with greater flexibility in operating their systems in order to meet the needs of their customers and to be competitive in the global marketplace[11] and to

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[3] The C-band uplink and downlink are allocated to the terrestrial fixed service (FS) and the fixed-satellite service (FSS) on a co-primary basis. The 5925-6425 MHz band also is known as the conventional C-band uplink or 6 GHz band; the 3700-4200 MHz band also is known as the conventional C-band downlink or 4 GHz band. The 5925-6425 MHz band is densely used by the fixed point-to-point microwave service.

[4] The Ku-band uplink and downlink are allocated to the FSS on a primary basis. The 14.0-14.5 GHz band also is known as the conventional Ku-band uplink or 14 GHz band; the 11.7-12.2 GHz band also is known as the conventional Ku-band downlink or 12 GHz band. ESVs may also operate in a portion of the extended Ku-band (10.95-11.2 GHz and 11.45-11.7 GHz).

[5] *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*, IB Docket No. 02-10, Report and Order, FCC 04-286, 20 FCC Rcd 674 (2005) (*ESV Order*). The other services located in the Ku-band include radio astronomy service and space research service. *See ESV Order*, 20 FCC Rcd at 712-713, 715, ¶¶ 89-90, 96.

[6] The phrase "off-axis EIRP-density" is used synonymously with "off-axis power-density."

[7] *ESV Order*, 20 FCC Rcd at 698-699, 716-717, 718-719, ¶¶ 55-58, 98-101, 103-106.

[8] *Id*. at 691-695, 700, ¶¶ 39-45, 61-62.

[9] *Id*. at 722-723, ¶¶ 114-117.

[10] *Id*. at 724-727, ¶¶ 120-128.

[11] *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*, IB Docket No. 02-10, Order on Reconsideration, FCC 09-63, 24 FCC Rcd 10369 (2009) (*ESV Reconsideration Order*).

protect the FSS and FS operators in the C- and Ku-bands. The Commission modified the ESV rules for protecting FSS operators by: (1) allowing ESVs to operate at higher off-axis EIRP-density levels as long as they comply with the certification and cessation of emission requirements specified in that Order;[12] (2) allowing certain ESV systems[13] to declare their own maximum antenna pointing error and to cease transmissions within 100 milliseconds if they exceed the declared antenna pointing error;[14] and (3) increasing the starting angle of the off-axis EIRP-density envelope to 1.5 degrees.[15] The Commission reasoned that these changes should promote greater operational flexibility for ESVs while continuing to ensure that the FSS will be protected from harmful interference.[16]

5. In addition, the Commission clarified the requirements for ESVs to: (1) protect offshore FS operators; and (2) cease transmissions when an FS operator objects to continuation of the ESV operating, in response to a public notice that announces the completed frequency coordination between the ESV operator and FS operators.[17] Further, the Commission revised its decision from the *ESV Order* for ESVs on foreign-registered vessels communicating with foreign-based hubs in the Ku-band. In the *ESV Order*, the Commission allowed those ESVs to operate within 300 kilometers from the U.S. coastline only if: (1) there was a bilateral agreement between the United States and the administration of the foreign-based hub; or (2) the vessels' registering administration had approved the operation of the ESV on the foreign vessel pursuant to ITU[18] Radio Regulation Article 4.4 (ITU RR Art. 4.4).[19] In the *ESV Reconsideration Order*, the Commission reduced the distance in which those conditions apply from 300 kilometers to 150 kilometers from the U.S. coastline.[20] Finally, the Commission adopted various procedural changes to

[12] *Id*. at 10373-10376, ¶¶ 10-16.

[13] Only ESVs with fixed power systems using low power techniques or ESV systems with the ability to control power dynamically may deviate from the 0.2 degree antenna pointing error requirement. *See id*. at 10379-10380, ¶¶ 23-27.

[14] *Id*. at 10379-10380, ¶¶ 23-27.

[15] *Id*. at 10381-10382, ¶¶ 30-31.

[16] *Id*. at 10370, ¶ 1.

[17] *Id*. at 10384-10386, ¶¶ 37-38, 42. In the C-band, ESV operators must coordinate with FS operators. Once the parties complete the coordination, the ESV operator must submit a notification to the Commission that identifies certain details of the completed coordination. Following the receipt of this notification, the Commission releases the public notice announcing the details of the completed coordination, which provides the FS operators 30 days to object on the grounds that they have been excluded from the completed coordination. If an FS operator objects, then the ESV operator must cease transmitting on those frequencies used by that FS operator. *See id.* at ¶¶ 39, 42. *See also International Bureau Provides Guidance Concerning the Notice Requirement for C-Band Coordination by Earth Stations on Vessel*, Public Notice, DA 05-1671 (2005) (outlining the details of the coordination that must be submitted as part of the notification). An ESV system may not commence operation until after the release of the public notice announcing the completed coordination. *ESV Reconsideration Order*, 20 FCC Rcd at 10385, ¶ 39.

[18] ITU stands for International Telecommunication Union. The ITU is a United Nations agency that "allocate[s] global radio spectrum and satellite orbits, develop[s] the technical standards that ensure networks and technologies seamlessly interconnect, and strive[s] to improve access to [information and communication technologies] to underserved communities worldwide." *See* http://www.itu.int/en/about/Pages/default.aspx (last visited July 17, 2012).

[19] *ESV Order*, 20 FCC Rcd at 726-727, ¶ 128. ITU RR Art. 4.4 allows administrations of Member States to assign frequencies to services that do not conform to the Radio Regulations as long as those services do not cause interference to, or claim protection from interference by, other services licensed in compliance with the Radio Regulations.

[20] *ESV Reconsideration Order*, 24 FCC Rcd at 10395, ¶ 63.

Sections 25.132, 25.221, 25.222 and 25.271 of its rules in order to clarify and facilitate the operation of ESVs as well as the ESV license application process.[21]

6. On October 15, 2009, Boeing filed a Petition for Reconsideration of the *ESV Reconsideration Order* in which it asked the Commission to allow ESVs with multiple co-frequency earth stations transmitting simultaneously using variable power control to operate on an ALSAT[22] basis and, in the aggregate, at the same power levels as other FSS operators.[23] On the same day, ViaSat filed a Petition for Clarification or Reconsideration to modify and/or clarify the antenna pointing error requirements.[24] The Commission published the public notice of these Petitions in the Federal Register on April 15, 2010.[25] On April 29, 2010, Maritime Telecommunications Network, Inc. (MTN) filed a consolidated response to the Petitions filed by Boeing and ViaSat.[26]

7. Subsequently, in a Public Notice released on January 26, 2011, the International Bureau (Bureau) modified the ESV coordination notification filing procedures by requiring all coordination notifications to be filed electronically via the International Bureau Filing System (IBFS) (http://licensing.fcc.gov/myibfs/).[27] The Bureau stated that notifications must be filed in the form of a statement referencing the relevant call signs and file numbers.

III. DISCUSSION

8. In this *ESV Second Reconsideration Order*, we grant in part and deny in part the Petition filed by Boeing and deny the Petition filed by ViaSat. In particular, we adopt an aggregate power-density rule that will allow ESVs with variable power, co-frequency systems to operate their individual transmitters simultaneously while using varying off-axis EIRP-density levels instead of requiring each transmitter within the system to use the same EIRP-density. We also require variable power ESV systems to operate 1 dB below the off-axis EIRP-density limits[28] in order to protect FSS from harmful interference. In addition, we require ESV applicants seeking a waiver of the 1 dB requirement to file a report regarding their system operations. Further, we require variable power ESV systems to cease transmissions if those ESVs exceed the applicable power-density limits. We decline to clarify the antenna pointing error provisions for ESVs because we find that the current rule provisions effectively explain the requirements for operating an ESV antenna. Finally, we adopt useful, but non-substantive rule changes such as renumbering the rules to incorporate the variable power ESV provisions (in order to

[21] *Id*. at 10395-10397, ¶ 65.

[22] ALSAT authority allows an earth station providing FSS in the Ku-band to access any U.S. satellite or foreign satellite on the Permitted Space Station List as long as its communications are in accordance with the technical parameters and conditions set forth in the earth station's license. *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*, IB Docket No. 96-111, First Reconsideration Order, FCC 99-325, 15 FCC Rcd 7207, 7210-11, ¶ 6, 7215-16, ¶ 19 (1999).

[23] *See generally* Boeing Petition.

[24] *See generally* ViaSat Petition.

[25] *See Petition for Reconsideration of Action in Rulemaking Proceeding*, Federal Register, 75 FR 19401 (2010).

[26] Consolidated Response of Maritime Telecommunications Network, Inc., filed April 29, 2010 (MTN Reply).

[27] *See The International Bureau Announces a Change in the Procedure for Filing Coordination Notifications for Earth Stations on Vessels Operating in the C-band*, Public Notice, DA 11-132, 26 FCC Rcd 564 (2011). *See also* Section 25.221(a)(12) in Appendix B.

[28] Specifically, 1 dB below the off-axis EIRP-density limits. *See* 47 C.F.R. §§ 25.221(a)(1)(i), 25.222(a)(1(i).

be consistent with the rules for Vehicle-Mounted Earth Stations (VMES)) and incorporating the new requirement to file coordination notifications electronically on IBFS. The revisions we adopt today for variable power ESVs will provide greater operational flexibility for those ESVs while continuing to ensure that the FSS operators are protected from harmful interference in the C- and Ku-bands.

A. Off-Axis EIRP-Density Limits and Aggregate Power

9. *Background.* In the *ESV Order*, the Commission adopted off-axis EIRP-density limits to protect the FSS satellite or space station operations from harmful interference in the C- and Ku-bands.[29] The off-axis EIRP-density is the power emitted from the ESV antenna in directions other than towards the target satellite. ESV operators may exceed the off-axis EIRP-density limits if they comply with certification and cessation of emission requirements.[30]

10. The ESV off-axis EIRP-density limits restrict the power-density that is emitted from ESV systems using: (1) a single earth station terminal in a single channel (*i.e.*, single channel per carrier or SCPC system); or (2) a modulation technique such as code division multiple access (CDMA), in which multiple co-frequency earth station terminals transmit simultaneously in the same satellite beam (*i.e.*, aggregate power system). To determine if the off-axis EIRP-density limits are exceeded, the power-density from an SCPC system is measured from the individual terminal, whereas the power-density from an aggregate power system is measured from all of the simultaneously operating co-frequency terminals. The off-axis EIRP-density limits adopted in the *ESV Order* were based on the power-density emitted from an individual terminal in an SCPC ESV system, and did not account for aggregate power systems. Therefore, the Commission, in the *Part 25 Streamlining Sixth Report and Order (Part 25 Streamlining 6th R&O)* incorporated the 10*log(N) term into the off-axis EIRP-density limits to measure the power-density from individual terminals in aggregate power systems. Specifically, the power-density of each individual co-frequency transmitter is reduced by a factor of 10*log(N), with "N" representing the maximum number of co-frequency ESV transmitters expected to operate simultaneously in the same satellite receiving beam.[31] However, the 10*log(N) term, with "N" defined as set forth above, assumes that aggregate power systems will operate their terminals so that each terminal emits the same level of power-density (*i.e.*, fixed power systems) and does not take into account another type of aggregate power system – a system with terminals that may operate at different levels of power (*i.e.*, variable power or dynamic power systems).

11. In the *VMES Order*, released after the *Part 25 Streamlining 6th R&O*, the Commission adopted licensing and service rules, largely based on the ESV rules, for VMES networks, a land-based mobile application with characteristics similar to ESVs that operates in the FSS-based Ku-band.[32] However, in the *VMES Order*, the Commission went a step further than the ESV rules by adopting an

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[29] *See ESV Order*, 20 FCC Rcd at 698, 716, ¶¶ 55, 99. The off-axis EIRP-density is the power emitted from the ESV antenna in directions other than towards the target satellite. The off-axis EIRP-density limits define the level of power-density that can be emitted from an ESV antenna.

[30] *See ESV Reconsideration Order*, 24 FCC Rcd at 10373-10376, ¶¶ 10-16.

[31] *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*, IB Docket No. 00-248, Sixth Report and Order and Third Further Notice of Proposed Rulemaking, FCC 05-62, 20 FCC Rcd 5593 (2005) (*Part 25 Streamlining 6th R&O*). *See also ESV Order*, 20 FCC Rcd at 698, 716 nn. 154, 256.

[32] *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*, IB Docket No. 07-101, Report and Order, FCC 09-64, 24 FCC Rcd 10414 (2009) (*VMES Order*).

aggregate power-density rule for VMES that use variable power systems.[33] In particular, the Commission required VMES applicants using variable power systems to demonstrate that their systems could operate 1 dB below the off-axis EIRP-density limits.[34] The Commission also required VMES licensees to file a report one year following the license issuance demonstrating that the system had complied with the power-density requirements.[35] However, in the *VMES Order*, the Commission did not provide variable power VMES systems with ALSAT authority and did not define the value of "N" in the 10*log(N) term for these systems.[36]

12. In adopting the aggregate power-density rule for VMES systems, the Commission reasoned that individual co-frequency transmitters in variable power networks are capable of operating at different EIRP-density levels in the same satellite receiving beam under control of a central control and monitoring station. The Commission explained that, in a variable power system, the central control and monitoring station dynamically allocates a different EIRP-density to individual transmitters based on the amount of data that needs to be transmitted from a particular transmitter[37] with the control paths passing through GSO satellites. Thus, operating variable power VMES systems involves greater operational complexity than systems with fixed power.

13. *Boeing Petition.* In its petition, Boeing requests that the Commission allow CDMA-based ESVs to operate on an ALSAT basis using variable power control and without the 1 dB reduction in power-density required for variable power VMES operators. Boeing claims that the restrictions imposed on variable power ESV systems (requiring that all co-frequency terminals use the same power-density levels) and VMES systems (prohibiting ALSAT licensing and requiring coordination or a 1 dB power-density reduction) "unnecessarily limit the commercial flexibility and broadband throughput of such networks and inhibit their ability to provide broadband services to consumers on ships, trains, trucks and aircraft in the most efficient manner possible."[38]

14. In addition, if the Commission declines Boeing's request, Boeing proposes as an alternative that the Commission modify Section 25.222(a) of the ESV rules to be consistent with Section 25.226(a)(3), which sets forth the requirements for variable power VMES systems.[39] Boeing also notes that neither the ESV nor VMES rules define N for CDMA variable power systems.[40] Thus, Boeing recommends that Section 26.226(a)(3)(i) and the corresponding ESV rule state that "the effective aggregate EIRP-density from all terminals should be at least 1 dB below the off-axis EIRP-density limits defined in (a)(1)(i)(A)-(C), assuming N equals one."[41]

15. ViaSat supports Boeing's proposal to revise the ESV rules to address variable power systems, including certain CDMA systems.[42] ViaSat indicates that these constraints – the lack of ALSAT

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[33] *See VMES Order*, 24 FCC Rcd at 10447, ¶ 102.

[34] *Id*. at 10447, 10450, ¶¶ 102, 115-117.

[35] *Id*. at 10451, ¶ 117.

[36] *Id*.

[37] *Id*. at 10448, ¶ 110-111.

[38] Boeing Petition at 3-4.

[39] *Id*. at 8-11.

[40] *Id*. at 10.

[41] *Id*.

[42] Reply of ViaSat, Inc., filed May 12, 2010 (ViaSat Reply), at 3.

authority and 1 dB power-density reduction – are inconsistent with the National Broadband Plan which recommended the elimination of unnecessary technical restrictions on the use of spectrum.[43] ViaSat argues that eliminating the unnecessary restrictions highlighted by Boeing would serve the public interest because: (1) there is no record evidence that variable power systems pose a risk of harmful interference or that such systems are unable to comply with the same power-density levels as other types of earth stations; (2) variable power systems are less likely to cause harmful interference than fixed power systems; (3) the Commission could require such applicants to demonstrate compliance with the applicable power-density limit instead of having a hard, inflexible rule for such systems; and (4) the Commission acknowledges that the restrictions adversely affect the capacity and robustness of these systems.[44]

16. MTN would not object if the Commission modified Section 25.222 to clarify that the value of N is one for variable-power CDMA systems.[45] However, MTN opposes Boeing's proposal to remove the 1 dB restriction because, in MTN's opinion, the risk of harmful interference should be assessed on a case by case basis and, if the requirements for exceeding the off-axis EIRP-density limits in Section 25.226(a)(3)(ii) is applied to ESVs, then ESVs would be able to exceed the off-axis EIRP-density levels in Section 25.226(a)(3)(i).[46]

17. *Discussion.* We grant, in part, Boeing's alternative request to adopt an aggregate power-density rule for variable power ESV systems, similar to what we did for VMES in Section 25.226(a)(3)(i). However, as explained below, we decline to grant Boeing's proposal to adopt the requirements for exceeding the off-axis EIRP-density limits and the reporting requirements set forth in Sections 25.226(a)(3)(ii) and 25.226(a)(3)(iii), respectively, of the VMES rules. As part of the aggregate power-density rule, we require variable power ESVs to operate at least 1 dB below the off-axis EIRP-density limits. A reduction in power of 1 dB means that the maximum power-density permitted would be equivalent to 80 percent of the power emitted by other ESV systems. We also grant Boeing's request to give variable power ESV systems ALSAT authority and, as Boeing proposes,[47] we define, for 10*log(N), N equal to one for aggregate variable power-density, co-frequency systems. We decline Boeing's proposal to remove the requirement for variable power ESV systems to operate terminals at least 1 dB below the off-axis EIRP-density limits on an aggregate basis. As explained below, ESV applicants have the option to pursue a waiver of the 1 dB requirement. We will require ESV applicants intending to seek a waiver of the 1 dB requirement to file a report detailing the operations of the system along with their request. Finally, we adopt a cessation of emission rule for variable power systems. The changes we implement today should provide greater operational flexibility for variable power ESV systems while ensuring that the FSS satellite or space station operations are protected from harmful interference. These changes also provide variable power ESV systems regulatory parity with variable power VMES systems.

18. The aggregate power-density rule allows variable power ESV systems to operate with greater flexibility. We recognize that the current off-axis EIRP density limits allow the operation of ESV systems that utilize multiple, co-frequency transmitters operating simultaneously, which are some of the characteristics of variable power systems. However, the current limits require each of those transmitters to operate at the same level of power-density, pursuant to 10*log(N), and do not take into account the dynamic component of the variable power system. The variable power system's dynamic component

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[43] *Id*.

[44] *Id*. at 4-5.

[45] MTN Reply at 2-3.

[46] *Id*. at 3.

[47] Boeing Petition at 10.

allocates different levels of power-density to different terminals, depending on the data needs in the areas covered by each of those terminals. The aggregate power-density rule that we adopt today recognizes and promotes the dynamic component of the variable power ESV system, thereby creating greater operational flexibility for those systems.

19. As noted above, we decline to grant Boeing's proposal to eliminate the 1 dB restriction, a requirement for variable power VMES operators. Although operating 1 dB below the EIRP-density envelope will result in a reduction of capacity, we disagree with Boeing and ViaSat that the 1 dB power-density reduction is unnecessary for this type of system. As we explained in the *VMES Order*, a dynamic or variable power system is complex – the system's network control and monitoring center must manage a large number of factors and, as a result of operating commands through FSS satellites, there are inherent time delays in relaying commands and monitoring the co-frequency terminals.[48] This complexity, combined with the fact that these are mobile applications operating in a fixed satellite frequency band, necessitates adoption of more cautionary measures, such as requiring the ESV system to reduce power-density by 1 dB. Moreover, because variable power ESV systems have technology that is similar to VMES variable power systems, we are not compelled to eliminate the 1 dB requirement for ESV systems.

20. However, we agree with Boeing and ViaSat that certain variable power ESV systems may be capable of operating without the 1 dB requirement while preventing interference and, therefore, these systems may regain the 20 percent system capacity that is lost due to the 1 dB reduction. As Boeing states, variable power networks have operated in the United States on an experimental basis for several years without complaints of harmful interference.[49] Further, MTN asserts that the potential for harmful interference from these systems should be assessed on a case-by-case basis and we agree.[50] We conclude, therefore, that the waiver process described in detail below is an appropriate approach to permit qualified variable power ESV systems to operate without the 1 dB requirement.[51]

21. Pursuant to Section 1.3 of the Commission's rules, the ESV operator may file a request to waive the 1 dB requirement. We require the waiver request to be accompanied by a report[52] that demonstrates that the system has operated without providing unacceptable interference to adjacent satellites.[53] In order to help ensure that the report includes sufficient technical information, we encourage the ESV applicant to refrain from filing a waiver request until its system is operating at or

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[48] *See VMES Order*, 24 FCC Rcd at 10450, ¶ 115.

[49] Boeing Petition at 4.

[50] MTN Reply at 3.

[51] We highlight the waiver as an option here in order to emphasize that ESV operators do not need to request a change to the aggregate power rule in order to operate without the 1 dB restriction.

[52] At a minimum, the report should evaluate, through the use of operational statistics, actual measurements or a combination thereof, the aggregate power-density at the geostationary satellite orbit (GSO) from all simultaneously active co-frequency transmitters. The report should include information on the average and maximum number of simultaneous co-frequency transmitters, an analysis of the EIRP-spectral density at the GSO, and a discussion of the factors taken into account at the network control center required to manage the aggregate power-density of the system.

[53] We note that, in the *VMES Order*, the Commission required variable power systems to file a report one year following approval for the VMES license detailing that the system has met the power-density requirements. *See VMES Order*, 24 FCC Rcd at 10451, ¶ 117. We do not adopt that requirement here. Instead, we require a report only for those applicants seeking a waiver of the 1 dB requirement.

above 50 percent of its capacity.[54] This report will provide us with the data we need to make a determination on the waiver request. We will place the waiver request and report on public notice seeking comment from the FSS satellite operators and other interested parties. As a result, variable power ESVs may demonstrate through the waiver process, as explained above, that they are capable of operating at the same power-density level as other ESV systems without causing harmful interference to the FSS.

22. We also adopt a cessation of emission requirement for variable power ESV systems that differs depending upon whether one of two scenarios occurs. Under the first scenario, if the power-density from an individual transmitter exceeds the applicable[55] power-density limit, then that transmitter must cease or reduce emissions automatically within 100 milliseconds of detecting this violation. Under this scenario, the individual transmitter must be self-monitoring and capable of shutting itself off. Under the second scenario, if the power-density of one or more transmitters causes the aggregate off-axis EIRP-densities to exceed the applicable power-density limit, then the transmitter or transmitters must cease or reduce emissions within 100 milliseconds of receiving the appropriate command from the system's central control and monitoring station. As part of the application, the ESV operator should describe how the system will respond when the power-density in excess of the applicable off-axis EIRP-density limits is detected. Finally, this cessation of emission requirement also applies to variable power ESV systems operating at higher power levels under Sections 25.221(a)(2) and 25.222(a)(2), except that that variable power system must cease emissions when it exceeds the power levels provided to the target satellite operator.[56]

23. Boeing observes that the Commission did not explain in either the *ESV Reconsideration Order* or the *VMES Order* why it adopted operating requirements for variable power systems in the VMES rules but not in the ESV rules.[57] We did not discuss variable power ESV systems in the above-referenced Orders because Boeing, which had raised that issue, withdrew it from the record of the ESV docket prior to the release of these orders.[58] However, Boeing has raised the issue in its current Petition, so we address it here. We agree with Boeing that ESV systems are technically identical to VMES systems in relevant respects, and that there is no reason to treat ESV variable power systems any

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[54] We note that the 1 dB reduction in EIRP-density is equivalent in a capacity reduction of about 20% over operations at the maximum permitted EIRP-density. If the system is designed to operate at the maximum EIRP-density, then notifying the Commission when it has reached 50% of peak capacity allows for a further 30% growth during the year following notification without exceeding the minus 1 dB limit. Further, we note that to show that the system will not cause harmful interference while operating at full power, the report should demonstrate a correspondence between the current capacity and the current aggregate EIRP-density at the GSO.

[55] By "applicable," we mean that, for variable power ESV systems that do not request, or request, but do not obtain a waiver of the 1 dB requirement, the applicable power-density limits would be the off-axis EIRP-density limits minus 1 dB. For variable power ESV systems that obtain Commission approval to waive the 1 dB requirement, the applicable power-density limit would be the off-axis EIRP-density limit set forth in Sections 25.221(a)(1)(i), 25.222(a)(1)(i).

[56] *See* Sections 25.221(a)(2)(iii), 25.221(b)(2)(iv), 25.222(a)(2)(iii) and 25.222(b)(2)(iv) in Appendix B.

[57] Boeing Petition at 9.

[58] We note that Boeing raised this issue in the context of its petition for reconsideration of the *ESV Order* but later submitted a letter withdrawing its petition in part. Because the Commission at that time considered the partial withdrawal to cover operational requirements for variable power ESV systems, it did not address this matter. *See ESV Reconsideration Order*, 24 FCC Rcd at 10370 n.4, *citing* Letter from Carlos M. Nalda, Counsel for Boeing, to Marlene H. Dortch, Secretary, FCC (dated Mar. 23, 2007). As Boeing did not intend to withdraw its petition in this regard, we agree that the matter should be considered pending, and, consequently, we resolve it here.

differently than variable power VMES systems. Accordingly, we adopt rules that permit the variable power ESV systems to operate as described above.

24. We disagree, however, with Boeing's claim that, in the *ESV Reconsideration Order*, the Commission changed the off-axis EIRP-density limits by specifically removing a reference to variable power CDMA networks.[59] The Commission modified the definition of the term "N" in three ways, none of which had the effect of changing the off-axis EIRP density limits: (1) the term "CDMA" was dropped to make the rule clearer for those systems that may employ alternative ways of operating simultaneous co-frequency transmitters than by "code-division multiple access;" (2) the term "maximum" was replaced by "expected maximum" to better describe what was expected in the application; and (3) the phrase "that have the same EIRP" was added to better describe the mathematical expression "10*log(N)" in the rule.

25. Finally, as noted above, we decline Boeing's proposal that we adopt the requirements for exceeding the off-axis EIRP-density limits and the reporting requirement set forth in Section 25.226(a)(3)(ii) and 25.226(a)(3)(iii), respectively, of the VMES rules.[60] We find that incorporating the requirements exceeding the off-axis EIRP-density limits into Sections 25.221(a)(3) and 25.222(a)(3) is redundant with those same requirements set forth in Sections 25.221(a)(2) and 25.222(a)(2) of the ESV rules. We also find that the reporting requirement, which requires variable power VMES systems to file a report one year following license issuance that details the aggregate EIRP-density levels as a result of operations, is unnecessary, especially since variable power systems must operate 1 dB below the off-axis EIRP-density limits. As explained above in the discussion of the waiver process, we find that filing a report regarding system operations should only be required for variable power ESV operators requesting a waiver of the 1 dB requirement.[61]

B. Antenna Pointing Error Requirement

26. *Background.* In the *ESV Order*, the Commission adopted an antenna pointing error requirement in order to protect adjacent satellites from harmful interference.[62] Specifically, the Commission required each ESV operator to maintain an antenna pointing error within 0.2 degrees between the target satellite and the axis of the ESV antenna's main lobe.[63] The Commission also required the ESV system to cease emissions automatically within 100 milliseconds if the antenna pointing error exceeded 0.5 degrees.[64]

27. In the *ESV Reconsideration Order*, however, the Commission relaxed the antenna pointing error requirement in order to allow more operational flexibility for certain ESV systems described below.[65] The Commission recognized that certain ESV operators may be capable of maintaining a pointing error that is greater than 0.2 degrees without exceeding the off-axis EIRP-density limits that protect FSS satellites adjacent to the target satellite.[66] Thus, ESVs that operate with a constant level of power could lower the earth station EIRP-density and could deviate from the antenna pointing error

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[59] Boeing Petition at 5.

[60] *See id.* at 9-10.

[61] *See supra*, ¶ 21.

[62] *ESV Order*, 20 FCC Rcd at 699, ¶ 58.

[63] 47 C.F.R. §§ 25.221(a)(1)(ii)(A), 25.222(a)(1)(ii)(A).

[64] *Id*. §§ 25.221(a)(1)(iii)(A), 25.222(a)(1)(iii)(A).

[65] *ESV Reconsideration Order*, 24 FCC Rcd at 10379-10380, ¶¶ 23-27.

[66] *Id*. at 10379, ¶ 24.

requirement if they declare a maximum antenna pointing error that exceeded 0.2 degrees.[67] In addition, ESV operators capable of controlling power dynamically[68] may exceed the antenna pointing error requirement if those operators simultaneously reduce their power by a proportionate amount.[69]

28. *ViaSat Petition.* ViaSat requests that the Commission modify and/or clarify four areas of the antenna pointing error rules in order to provide the certainty needed to ensure further development of ESV services and technologies.[70] First, ViaSat proposes that the Commission add the term "peak" to the 0.2 antenna pointing error requirement in Section 25.222(a)(1)(ii)(A).[71] ViaSat argues that the Commission intended for the 0.2 degree pointing error to be a "peak" level and not a "maximum" limit. In particular, according to ViaSat, the Commission expressed its intent to be consistent with ITU Resolution 902's (Res. 902) technical parameters, "which requires operators to maintain a pointing accuracy within 0.2 degrees peak."[72] According to ViaSat, the term "peak" in this context is generally understood to be the value three standard deviations above the mean value in a normal distribution.[73] ViaSat further asserts that, unlike the antenna pointing error, the higher 0.5 degree shut-down limit could be described as a maximum limit.[74] ViaSat also argues that the new language in Section 25.222(a)(1)(ii)(B) allowing ESV operators to declare a "maximum" antenna pointing error implies that the 0.2 degree antenna pointing error is a maximum limit instead of a peak level. ViaSat therefore requests that the Commission modify that rule to remove such an implication.[75]

29. Second, ViaSat argues, for the reasons discussed above, that applicants declaring their own antenna pointing error should provide both a "peak" pointing tolerance and the "maximum" mispointing levels. Specifically, ViaSat requests that the Commission modify Section 25.222(a)(1)(ii)(B) so that applicants declare a "peak," instead of a "maximum" antenna pointing error that may be greater than 0.2 degrees.[76] ViaSat also requests that the Commission: (1) modify Section 25.222(a)(1)(iii)(B) to allow applicants to specify a "maximum" mispointing limit in excess of 0.5 degrees as long as they comply with the applicable off-axis EIRP-density limits; and (2) require the applicants to shut down when they exceed that "maximum" mispointing limit.[77]

30. Third, ViaSat requests that the Commission clarify that the antenna pointing error includes both non-deliberate and deliberate mispointing. ViaSat argues that, in the *ESV Reconsideration Order*,

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[67] *Id*. at 10379-10380, ¶¶ 23-25.

[68] Controlling power dynamically means that the ESV system may automatically increase or decrease power depending on the pointing of the antenna.

[69] *ESV Reconsideration Order*, 24 FCC Rcd at 10380, ¶ 27.

[70] ViaSat Petition at 2.

[71] *See* ViaSat Petition, Exh. A, Proposed Revisions to New Rules.

[72] *See* ViaSat Petition at 2-3. Res. 902, entitled "Provisions relating to earth stations located on board vessels which operate in fixed-satellite service networks in the uplink bands 5925-6425 MHz and 14-14.5 GHz," was adopted at the 2003 World Radio Conference (WRC-03) and contains the international technical provisions related to ESV operations.

[73] ViaSat Petition at 3.

[74] *Id*.

[75] *Id*. at 3-4.

[76] *Id*. at 5.

[77] *Id*.

the Commission only identified non-deliberate causes of antenna mispointing, thereby creating an uncertainty as to whether deliberate antenna mispointing would be allowed. ViaSat claims that many ESV terminals use closed-loop tracking systems that deliberately mispoint the antenna in order to determine whether the signal strength from the target satellite can be enhanced.[78] ViaSat reasons that making this clarification would provide the Commission, the satellite industry and the public with more comprehensive information when evaluating ESV applications.[79]

31. Finally, ViaSat requests that the Commission clarify that ESV operators may simultaneously deviate from the antenna pointing error requirement (which, according to ViaSat, should be 0.2 degrees peak and 0.5 degrees maximum) *and* the off-axis EIRP-density limits provided that those technical parameters have been coordinated with satellites adjacent to the target satellite.[80] According to ViaSat, Section 25.222(a)(2) of the ESV rules allows ESV operators to exceed the off-axis EIRP-density limits, but Sections 25.222(a)(1)(ii)(B) and 25.222(a)(1)(iii)(B) require ESV operators to stay within the mask if the ESVs declare their own pointing error.[81] ViaSat argues that making this clarification would be consistent with the intent of the *ESV Reconsideration Order*, which is to maximize operator flexibility to the extent that such flexibility does not cause harmful interference to adjacent satellite operators.[82]

32. Boeing supports ViaSat's proposals, but without explanation.[83] MTN does not oppose ViaSat's proposals, but is not convinced that the changes proposed by ViaSat are needed.[84] MTN also expresses concern that adoption of ViaSat's proposals, without careful implementation, could lead to confusion, an outcome that MTN does not support.[85] Boeing also "agrees with MTN that the Commission should carefully implement the proposals so that no further confusion is caused."[86]

33. *Discussion.* First, we decline to specify that the 0.2 degree antenna pointing error is a "peak" limit in the 0.2 antenna pointing error rule, as requested by ViaSat. We disagree with ViaSat that the term "peak"[87] in this context is understood to be the value three standard deviations above the mean value in a normal distribution.[88] The term "peak" also has other meanings such as "[t]he highest value attained by a varying quantity" and "the most extreme possible amount or value."[89] Further, the ITU did not associate any particular definition with the term "peak" as it was used in Res. 902.[90] By not using the term "peak" and by specifying a shut-off angle in the ESV rules, the Commission provided ESV

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[78] *Id*.

[79] *Id*. at 6.

[80] *Id*. at 6-8; ViaSat Reply at 1-2.

[81] ViaSat Petition at 7.

[82] *Id*. at 8.

[83] *Id*.

[84] MTN Reply at 4.

[85] *Id*.

[86] Reply of The Boeing Company, filed May 12, 2010 (Boeing Reply), at 8-9.

[87] We note that ViaSat does not provide a source for its "common" definition of the term "peak."

[88] Thus, ViaSat contends, the Commission did not intend the 0.2 degree level to be a maximum, but rather understood that this level would be exceeded only on rare occasions. ViaSat Petition at 3.

[89] *See* http://www.thefreedictionary.com/peak (last visited July 17, 2012).

[90] *See* ITU Resolution 902 Annex 2.

manufacturers with greater operational flexibility, thereby promoting competition in the maritime broadband marketplace while continuing to ensure that FSS systems would receive no harmful interference. Further, we decline to define the 0.5 degree shutoff angle as a maximum limit. The rule clearly sets forth 0.5 degrees as a shutoff angle for ESV antennas, thereby providing sufficient guidance for when ESV antennas need to cease transmitting.

34. We also decline to modify Section 25.222(a)(1)(ii)(B) (self-declared maximum antenna pointing error rule) in response to ViaSat's assertion that the rule implies that the 0.2 degree antenna pointing error is a maximum limit. The self-declared maximum antenna pointing error rule provides that ESV operators "shall declare a maximum antenna pointing error that may be greater than 0.2 degrees."[91] The Commission referenced the 0.2-degree antenna pointing error in the rule in order to emphasize that declaring a maximum pointing error is an alternative way to comply with ESV antenna pointing requirements. In addition, the Commission did not intend for the self-declared maximum antenna pointing error rule to replicate the 0.2-degree antenna pointing error rule. In the self-declared maximum antenna pointing error rule, the Commission sought to ensure that applicants identified the maximum pointing angle that could be achieved without causing harmful interference and were capable of ceasing emissions if that antenna pointing error were exceeded. The rule, as written, provides ESV operators the flexibility to innovate and develop new approaches to provide services and to protect incumbents, thereby advancing market-driven deployment of broadband services while continuing to ensure that ESV operators protect FSS providers from harmful interference.

35. Second, we decline to require ESV applicants operating under the self-declared maximum antenna pointing error rule to specify both "peak" and "maximum" mispointing levels. As noted above, specifying a "peak" mispointing angle makes it necessary to define the term "peak." By not specifying "peak" mispointing levels, we permit the system designer maximum flexibility. In addition, the Commission intended for the self-declared maximum mispointing angle and the cessation of emission (or shut-off angle) to be the same because it allows an ESV operator to determine its own peak, be it three standard deviations from the mean of a normal distribution as ViaSat contends, or some other definition. More importantly, having these angles be the same ensures that the ESV system ceases transmissions when the system's power levels exceed the off-axis EIRP-density envelope and that we know at what angle this occurs so that we can verify the designer's calculations. Thus, specifying a peak angle would be an unnecessary requirement and could restrict the ESV operator's design of its system.

36. Moreover, we agree with MTN that the changes, as proposed by ViaSat, are unnecessary.[92] These rules have been in effect since 2005 and a number of ESV licenses have been granted. There is no evidence that ESV operators have experienced any difficulty interpreting and applying the antenna pointing error provisions in the ESV rules. We also find that applying new definitions such as "peak" and "maximum" to these angular limits, as proposed by ViaSat, could have the inadvertent effect of creating confusion, a result that could undermine the flexibility intended in the rules and hamper the implementation of ESV systems.

37. Third, we do agree, however, with ViaSat's assertion that the antenna pointing error rule includes both intentional and unintentional antenna mispointing. But contrary to ViaSat's contention, we do not agree that a clarification is necessary. There is nothing in the *ESV Reconsideration Order* to indicate that the list of mispointing examples, which are examples of unintentional mispointing, is all-inclusive. As MTN correctly states, the antenna pointing error rule is understood to include both

[91] 47 C.F.R. § 25.222(a)(1)(ii)(B).

[92] *See* MTN Reply at 3-4.

deliberate and non-deliberate pointing.[93]

38. Finally, we acknowledge that ESV operators may deviate from both the antenna pointing error and off-axis EIRP-density limits, as provided in Section 25.222(a)(2), once those parameters have been coordinated with the adjacent satellites. However, once again, we disagree with ViaSat that a clarification is necessary. Section 25.222(a) states, in part, that "ESV licensees must comply with the requirements in *either* paragraph (a)(1) or (a)(2) of this section."[94] Section 25.222(a)(2) makes no mention of any constraints on antenna mispointing angles. So, if ESVs operate pursuant to the off-axis EIRP-density limits under paragraph (a)(1), then those operators must remain within those limits when deviating from the antenna pointing error requirement. If ESVs operate at higher off-axis EIRP-density levels, as allowed under paragraph (a)(2), then it follows that those operators may deviate from the antenna pointing error requirement as long as they remain within the agreed-upon higher power levels. Thus, we conclude that it is clear that ESV operations under Section 25.222(a)(2) have no specific limitations on antenna mispointing angles provided that the ESV system technical parameters have been coordinated with satellites adjacent to the target satellite.

C. Procedural Rule Revisions

39. Finally, we adopt procedural rule changes set forth in Appendix B of this Order.[95] First, we place the variable power provisions adopted today in paragraphs (a)(3) and (b)(3) of Sections 25.221 and 25.222 in order to be consistent with the VMES rules, which also have variable power provisions in paragraphs (a)(3) and (b)(3) of Section 25.226.[96] As a result, the subsequent paragraphs are renumbered. For example, the point of contact requirement set forth in paragraph (a)(3) of Section 25.221 can now be found in paragraph (a)(4) and so on. We also modify the newly renumbered Section 25.221(a)(12),[97] which sets forth the coordination requirements, by incorporating the requirement to file coordination notifications electronically via IBFS.[98]

IV. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Certification

40. The Regulatory Flexibility Act of 1980, as amended (RFA),[99] requires that a regulatory flexibility analysis be prepared for notice-and-comment rule making proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."[100] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[101]

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[93] *See id.* at 4 n.9.

[94] 47 C.F.R. § 25.222(a) (emphasis added).

[95] These rule changes are not subject to the notice and comment requirements of the Administrative Procedure Act *See* 5 U.S.C. § 553(b)(3)(A) (2007). All rule changes described in this section are "interpretative rules, general statements of policy, or rules of agency organization, procedure, or practice." *Id.*

[96] *See* 47 C.F.R. §§ 25.226(a)(3), 25.226(b)(3).

[97] Prior to this change, the coordination requirements could be found in Section 25.221(a)(11).

[98] *See infra*, ¶ 7.

[99] The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[100] 5 U.S.C. § 605(b).

[101] 5 U.S.C. § 601(6).

In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[102] A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the U.S. Small Business Administration (SBA).[103]

41. In light of the rules adopted in the *ESV Order*, we find that there are only two categories of licensees that would be affected by the new rules. These categories of licensees are Satellite Telecommunications and Fixed-Satellite Transmit/Receive Earth Stations. The SBA has determined that the small business size standard for Satellite Telecommunications is a business that has $15 million or less in average annual receipts.[104] Currently there are approximately 3,390 operational fixed-satellite transmit/received earth stations authorized for use in the C- and Ku-bands. The Commission does not request or collect annual revenue information, and thus is unable to estimate the number of earth stations that would constitute a small business under the SBA definition. Of the two classifications of licensees, we estimate that only 15 entities will provide ESV service. For the reasons described below, we certify that the policies and rules adopted in this *Second Reconsideration Order* will not have a significant economic impact on a substantial number of small entities.

42. In the *ESV Order*, the Commission established licensing and service rules for ESVs operating in the 5925-6425 MHz/3700-4200 MHz (C-band) and 14.0-14.5 GHz/11.7-12.2 GHz (Ku-band) frequencies. These rules allow ESV operations in the C- and Ku-bands, while ensuring that ESVs protect the fixed service (FS) and fixed-satellite service (FSS) operators, and a limited number of Government operations in these bands from harmful interference. In the *Order on Reconsideration*, the Commission clarified and modified certain ESV rules designed to protect the FSS and the FS in the C- and Ku-bands in order to allow greater operational flexibility for ESVs. For example, ESVs may operate at higher off-axis power-density levels as long as the ESV remains within the parameters of the coordination agreements between the target satellite and adjacent satellites. In this *Second Reconsideration Order*, we further promote operational flexibility while ensuring that the FSS operators are protected from harmful interference by adopting an aggregate power-density rule and a cessation of emission rule for variable power ESV systems.

43. The Commission does not expect a substantial number of small entities to be directly impacted by the rule changes adopted in this *Second Reconsideration Order*. Specifically, we expect that fewer than ten entities will be affected by the variable power rule provisions adopted in this Order. In addition, we believe these new rule provisions will not impose a significant economic impact on small entities and, in fact, will benefit both large and small entities utilizing variable power systems by allowing greater operational flexibility in providing ESV service. Therefore, we certify that the requirements adopted in this *Second Reconsideration Order* will not have a significant economic impact on a substantial number of small entities.

B. Final Paperwork Reduction Act of 1995 Analysis

44. This document does not contain new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain

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[102] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

[103] 15 U.S.C. § 632.

[104] 13 C.F.R. § 121.201, NAICS codes 517410.

any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4).

V. ORDERING CLAUSES

45. IT IS ORDERED that, pursuant to Sections 4(i), 7, 302, 303(c), 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 157, 302, 303(c), 303(e), 303(f) and 303(r), this Second Order on Reconsideration IS ADOPTED. Part 25 of the Commission's Rules IS AMENDED, as specified in Appendix B, effective 30 days after publication in the Federal Register.

46. IT IS FURTHER ORDERED that the Petition for Reconsideration filed by The Boeing Company IS GRANTED in part to the extent described above and IS DENIED in all other respects.

47. IT IS FURTHER ORDERED that the Petition for Reconsideration filed by ViaSat, Inc. IS DENIED.

48. IT IS FURTHER ORDERED that the Final Regulatory Flexibility Certification, as required by Section 604 of the Regulatory Flexibility Act, IS ADOPTED.

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

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

List of Parties

List of Petitioners
The Boeing Company (Boeing)
ViaSat, Inc. (ViaSat)

List of Replies
Boeing
Maritime Telecommunications Network, Inc. (MTN)
ViaSat

Ex Parte Filings
Boeing

APPENDIX B

Rule Revisions

For the reasons discussed above, the Federal Communications Commission amends 47 C.F.R. 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. Amend Section 25.221 as follows:

a. Revise paragraph (a) introductory text;

b. Revise the first sentence of paragraph (a)(1)(ii) and paragraph (a)(1)(iii);

c. Revise paragraph (a)(2);

d. Revise paragraph (a)(2)(iii);

e. Redesignate paragraphs (a)(3) through (a)(12) as paragraphs (a)(4) through (a)(13);

f. Add new paragraph (a)(3);

g. Revise paragraph (b) introductory text;

h. Revise paragraph (b)(2);

i. Revise paragraph (b)(2)(iv);

j. Redesignate paragraphs (b)(3) through (b)(5) as paragraphs (b)(4) through (b)(6);

k. Add new paragraphs (b)(3) and (b)(7).

§ 25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESVs) receiving in the 3700–4200 MHz (space-to-Earth) frequency band and transmitting in the 5925–6425 MHz (Earth-to-space) frequency band, operating with Geostationary Satellite Orbit (GSO) Satellites in the Fixed-Satellite Service.

(a) The following ongoing requirements govern all ESV licensees and operations in the 3700-4200 MHz (space-to-Earth) and 5925–6425 MHz (Earth-to-space) bands transmitting to GSO satellites in the fixed-satellite service. ESV licensees must comply with the requirements in paragraph (a)(1), (a)(2) or (a)(3) of this section and all of the requirements set forth in paragraphs (a)(4)-(a)(13) of this section. Paragraph (b) of this section identifies items that must be included in the application for ESV operations to demonstrate that these ongoing requirements will be met.

(1) * * *

(ii) Except for ESV systems operating under paragraph (a)(3), each ESV transmitter must meet one of the following antenna pointing error requirements:

(A) * * *

(B) * * *

(iii) Except for ESV systems operating under paragraph (a)(3), each ESV transmitter

must meet of one the following cessation of emission requirements:

(A) * * *

(B) * * *

(2) The following requirements shall apply to an ESV that uses off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this Section. An ESV or ESV system operating under this subsection shall file certifications and provide a detailed demonstration(s) as described in paragraph (b)(2) of this section.

(i) * * *

(ii) * * *

(iii) The ESV shall operate in accordance with the off-axis EIRP spectral-densities that the ESV supplied to the target satellite operator in order to obtain the certifications listed in paragraph (b)(2) of this section. Except for ESVs with variable power systems, the ESV shall automatically cease emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator. For ESVs using variable power systems, the individual ESV transmitter shall automatically cease or reduce emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limits supplied to the target satellite operator; the individual transmitter must be self-monitoring and capable of shutting itself off; and if one or more ESV transmitters causes the aggregate off-axis EIRP-densities to exceed the off-axis EIRP-density limits supplied to the target satellite operator, then the transmitter or transmitters shall cease or reduce emissions within 100 milliseconds of receiving a command from the system's central control and monitoring station.

(3) The following requirements shall apply to an ESV system that uses variable power-density control of individual simultaneously transmitting co-frequency ESV earth stations in the same satellite receiving beam unless that ESV system operates pursuant to paragraph (a)(2). An ESV system operating under this subsection shall provide a detailed demonstration as described in paragraph (b)(3) of this section.

(i) The effective aggregate EIRP-density from all terminals shall be at least 1 dB below the off-axis EIRP-density limits defined in paragraph (a)(1)(i), with the value of N=1. In this context the term “effective” means that the resultant co-polarized and cross-polarized EIRP-density experienced by any GSO or non-GSO satellite shall not exceed that produced by a single transmitter operating 1 dB below the off-axis EIRP-density limits defined in paragraph (a)(1)(i). An ESV system operating under this subsection shall provide a detailed demonstration as described in paragraph (b)(3)(i) of this section.

(ii) The individual ESV transmitter shall automatically cease or reduce emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limits specified in paragraph (a)(3)(i). The individual transmitter must be self-monitoring and capable of shutting itself off. If one or more ESV transmitters causes the aggregate off-axis EIRP-densities to exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i), then the transmitter or transmitters shall cease or reduce emissions within 100 milliseconds of receiving a command from the system's central control and monitoring station.

(4) There shall be a point of contact in the United States, with phone number and address, available 24 hours a day, seven days a week, with authority and ability to cease all emissions

from the ESVs, either directly or through the facilities of a U.S. Hub or a Hub located in another country with which the United States has a bilateral agreement that enables such cessation of emissions.

(5) For each ESV transmitter, a record of the ship location (*i.e.,* latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than 1 year. Records will be recorded at time intervals no greater than every 20 minutes while the ESV is transmitting. The ESV operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, or the Commission within 24 hours of the request.

(6) ESV operators communicating with vessels of foreign registry must maintain detailed information on each vessel's country of registry and a point of contact for the relevant administration responsible for licensing ESVs.

(7) ESV operators shall control all ESVs by a hub earth station located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a hub earth station location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary.

(8) ESV operators transmitting in the 5925-6425 MHz (Earth-to-space) frequency bands to GSO satellites in the fixed-satellite service (FSS) shall not seek to coordinate, in any geographic location, more than 36 megahertz of uplink bandwidth on each of no more than two GSO FSS satellites.

(9) ESVs shall not operate in the 5925-6425 MHz (Earth-to-space) and 3700-4200 MHz (space-to-Earth) frequency bands on vessels smaller than 300 gross tons.

(10) ESVs, operating while docked, that complete coordination with terrestrial stations in the 3700-4200 MHz band in accordance with §25.251, shall receive protection from such terrestrial stations in accordance with the coordination agreements, for 180 days, renewable for 180 days.

(11) ESVs in motion shall not claim protection from harmful interference from any authorized terrestrial stations or lawfully operating satellites to which frequencies are either already assigned, or may be assigned in the future in the 3700-4200 MHz (space-to-Earth) frequency band.

(12) ESVs operating within 200 km from the baseline of the United States, or within 200 km from a U.S.-licensed fixed service offshore installation, shall complete coordination with potentially affected U.S.-licensed fixed service operators prior to operation. The coordination method and the interference criteria objective shall be determined by the frequency coordinator. The details of the coordination shall be maintained and available at the frequency coordinator, and shall be filed with the Commission electronically via the International Bureau Filing System (http://licensing.fcc.gov/myibfs/) to be placed on public notice. The coordination notifications must be filed in the form of a statement referencing the relevant call signs and file numbers. Operation of each individual ESV may commence immediately after the public notice is released that identifies the notification sent to the Commission. Continuance of operation of that ESV for the duration of the coordination term shall be dependent upon successful completion of the normal public notice process. If, prior to the end of the 30-day comment period of the public

notice, any objections are received from U.S.-licensed fixed service operators that have been excluded from coordination, the ESV licensee shall immediately cease operation of that particular station on frequencies used by the affected U.S.-licensed fixed service station until the coordination dispute is resolved and the ESV licensee informs the Commission of the resolution.

(13) ESV operators must automatically cease transmission if the ESV operates in violation of the terms of its coordination agreement, including, but not limited to, conditions related to speed of the vessel or if the ESV travels outside the coordinated area, if within 200 km from the baseline of the United States, or within 200 km from a U.S.-licensed fixed service offshore installation. Transmissions may be controlled by the ESV network. The frequency coordinator may decide whether ESV operators should automatically cease transmissions if the vessel falls below a prescribed speed within a prescribed geographic area.

(b) Applications for ESV operation in the 5925-6425 MHz (Earth-to-space) band to GSO satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312, and associated Schedule B, the applicable technical demonstrations in paragraphs (b)(1), (b)(2) or (b)(3) and the documentation identified in paragraphs (b)(4) through (b)(7) of this section.

* * * * *

(2) An ESV applicant proposing to implement a transmitter under paragraph (a)(2) of this section and using off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or paragraph (a)(3)(i) of this section shall provide the following certifications and demonstration(s) as exhibits to its earth station application:

(i) * * *

(ii) * * *

(iii) * * *

(iv) Except for variable power ESVs applicants, a demonstration from the ESV operator that the ESV system is capable of detecting and automatically ceasing emissions within 100 milliseconds when the transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator. Variable power ESV applicants shall provide a detailed showing that an individual ESV terminal is capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator; that the individual transmitter is self-monitoring and capable of shutting itself off; and that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving the appropriate command from the system's central control and monitoring station if the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP spectral-densities supplied to the target satellite operator.

(3) An ESV applicant proposing to implement an ESV system under paragraph (a)(3) of this section and using variable power-density control of individual simultaneously transmitting co-frequency ESV earth stations in the same satellite receiving beam shall provide the information in paragraphs (b)(3)i) and (b)(3)(ii) as exhibits to its earth station application. The International Bureau will place these showings on Public Notice along with the application.

(i) The ESV applicant shall provide a detailed showing of the measures it intends to employ to maintain the effective aggregate EIRP-density from all simultaneously

transmitting co-frequency terminals operating with the same satellite transponder at least 1 dB below the EIRP-density limits defined in paragraph (a)(1)(i) of this section. In this context the term "effective" means that the resultant co-polarized and cross-polarized EIRP-density experienced by any GSO or non-GSO satellite shall not exceed that produced by a single ESV transmitter operating at 1 dB below the limits defined in paragraph (a)(1)(i) of this section.

(ii) The ESV applicant shall provide a detailed showing that an individual ESV terminal is capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limit specified in paragraph (a)(3)(i) and that the individual transmitter is self-monitoring and capable of shutting itself off. The ESV applicant shall also provide a detailed showing that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving the appropriate command from the system's central control and monitoring station if the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i).

(4) There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate.

(5) The point of contact information referred to in paragraph (a)(4) of this section and, if applicable, paragraph (a)(7) of this section, must be included in the application.

(6) ESVs that exceed the radiation guidelines of §1.1310 of this chapter must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

(7) Except for ESV systems operating pursuant to paragraph (a)(2) of this section, ESV systems authorized pursuant to this section shall be eligible for a license that lists ALSAT as an authorized point of communication.

3. Amend Section 25.222 as follows:

a. Revise paragraph (a) introductory text;

b. Revise the first sentence of paragraph (a)(1)(ii) and paragraph (a)(1)(iii);

c. Revise paragraph (a)(2);

d. Revise paragraph (a)(2)(iii);

e. Redesignate paragraphs (a)(3) through (a)(7) as paragraphs (a)(4) through (a)(8);

f. Add new paragraph (a)(3);

g. Revise paragraph (b) introductory text;

h. Revise paragraph (b)(2);

i. Revise paragraph (b)(2)(iv);

j. Redesignate paragraphs (b)(3) through (b)(5) as paragraphs (b)(4) through (b)(6); and

k. Add new paragraphs (b)(3) and (b)(7).

§ 25.222 Blanket Licensing provisions for Earth Stations on Vessels (ESVs) receiving in the 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), 11.7–12.2 GHz (space-to-Earth)

frequency bands and transmitting in the 14.0–14.5 GHz (Earth-to-space) frequency band, operating with Geostationary Orbit (GSO) Satellites in the Fixed-Satellite Service.

(a) The following ongoing requirements govern all ESV licensees and operations in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) frequency bands and 14.0-14.5 GHz (Earth-to-space) bands transmitting to GSO satellites in the fixed-satellite service. ESV licensees must comply with the requirements in either paragraph (a)(1), (a)(2) or (a)(3) of this section and all of the requirements set forth in paragraphs (a)(4) through (a)(8) of this section. Paragraph (b) of this section identifies items that must be included in the application for ESV operations to demonstrate that these ongoing requirements will be met.

(1) * * *

(ii) Except for ESV systems operating under paragraph (a)(3), each ESV transmitter must meet one of the following antenna pointing error requirements:

(A) * * *

(B) * * *

(iii) Except for ESV systems operating under paragraph (a)(3), each ESV transmitter must meet of one the following cessation of emission requirements:

(A) * * *

(B) * * *

(2) The following requirements shall apply to an ESV that uses off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this Section. An ESV or ESV system operating under this subsection shall file certifications and provide a detailed demonstration(s) as described in paragraph (b)(2) of this section.

(i) * * *

(ii) * * *

(iii) The ESV shall operate in accordance with the off-axis EIRP spectral-densities that the ESV supplied to the target satellite operator in order to obtain the certifications listed in paragraph (b)(2) of this section. Except for ESVs with variable power systems, the ESV shall automatically cease emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator. For ESVs using variable power systems, the individual ESV transmitter shall automatically cease or reduce emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limits supplied to the target satellite operator; the individual transmitter must be self-monitoring and capable of shutting itself off; and if one or more ESV transmitters causes the aggregate off-axis EIRP-densities to exceed the off-axis EIRP-density limits supplied to the target satellite operator, then the transmitter or transmitters shall cease or reduce emissions within 100 milliseconds of receiving a command from the system's central control and monitoring station.

(3) The following requirements shall apply to an ESV system that uses variable power-density control of individual simultaneously transmitting co-frequency ESV earth stations in the same satellite receiving beam unless that ESV system operates pursuant to paragraph (a)(2). An ESV system operating under this subsection shall provide a detailed demonstration as described in paragraph (b)(3) of this section.

(i) The effective aggregate EIRP-density from all terminals shall be at least 1 dB below

the off-axis EIRP-density limits defined in paragraph (a)(1)(i), with the value of N=1. In this context the term "effective" means that the resultant co-polarized and cross-polarized EIRP-density experienced by any GSO or non-GSO satellite shall not exceed that produced by a single transmitter operating 1 dB below the limits defined in paragraph (a)(1)(i). An ESV system operating under this subsection shall provide a detailed demonstration as described in paragraph (b)(3)(i) of this section.

(ii) The individual ESV transmitter shall automatically cease or reduce emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limits specified in paragraph (a)(3)(i). The individual transmitter must be self-monitoring and capable of shutting itself off. If one or more ESV transmitters causes the aggregate off-axis EIRP-densities to exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i), then the transmitter or transmitters shall cease or reduce emissions within 100 milliseconds of receiving a command from the system's central control and monitoring station.

(4) There shall be a point of contact in the United States, with phone number and address, available 24 hours a day, seven days a week, with authority and ability to cease all emissions from the ESVs, either directly or through the facilities of a U.S. hub or a hub located in another country with which the United States has a bilateral agreement that enables such cessation of emissions.

(5) For each ESV transmitter, a record of the ship location (*i.e.,* latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than 1 year. Records will be recorded at time intervals no greater than every 20 minutes while the ESV is transmitting. The ESV operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, NTIA, or the Commission within 24 hours of the request.

(6) ESV operators communicating with vessels of foreign registry must maintain detailed information on each vessel's country of registry and a point of contact for the relevant administration responsible for licensing ESVs.

(7) ESV operators shall control all ESVs by a hub earth station located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a hub earth station location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary.

(8) In the 10.95-11.2 GHz (space-to-Earth) and 11.45-11.7 GHz (space-to-Earth) frequency bands ESVs shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future.

(b) Applications for ESV operation in the 14.0-14.5 GHz (Earth-to-space) band to GSO satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312, and associated Schedule B, the applicable technical demonstrations in paragraphs (b)(1), (b)(2) or (b)(3) and the documentation identified in paragraphs (b)(4) through (b)(7) of this section.

* * * * *

(2) An ESV applicant proposing to implement a transmitter under paragraph (a)(2) of this section and using off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or

paragraph (a)(3)(i) of this section shall provide the following certifications and demonstration(s) as exhibits to its earth station application:

(i) * * *

(ii) * * *

(iii) * * *

(iv) Except for variable power ESVs applicants, a demonstration from the ESV operator that the ESV system is capable of detecting and automatically ceasing emissions within 100 milliseconds when the transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator. Variable power ESV applicants shall provide a detailed showing that an individual ESV terminal is capable of automatically ceasing or reducing emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator; that the individual transmitter is self-monitoring and capable of shutting itself off; and that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving the appropriate command from the system's central control and monitoring station if the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP spectral-densities supplied to the target satellite operator.

(3) An ESV applicant proposing to implement an ESV system under paragraph (a)(3) of this section and using variable power-density control of individual simultaneously transmitting co-frequency ESV earth stations in the same satellite receiving beam shall provide the information in paragraphs (b)(3)(i) and (b)(3)(ii) as exhibits to its ESV application. The International Bureau will place these showings on Public Notice along with the application.

(i) The ESV applicant shall provide a detailed showing of the measures it intends to employ to maintain the effective aggregate EIRP-density from all simultaneously transmitting co-frequency terminals operating with the same satellite transponder at least 1 dB below the EIRP-density limits defined in paragraph (a)(1)(i) of this section. In this context the term “effective” means that the resultant co-polarized and cross-polarized EIRP-density experienced by any GSO or non-GSO satellite shall not exceed that produced by a single ESV transmitter operating at 1 dB below the limits defined in paragraph (a)(1)(i) of this section.

(ii) The ESV applicant shall provide a detailed showing that an individual ESV terminal is capable of automatically ceasing emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP-density limit specified in paragraph (a)(3)(i) and that the individual transmitter is self-monitoring and capable of shutting itself off. The ESV applicant shall also provide a detailed showing that one or more transmitters are capable of automatically ceasing or reducing emissions within 100 milliseconds of receiving the appropriate command from the system's central control and monitoring station if the aggregate off-axis EIRP spectral-densities of the transmitter or transmitters exceed the off-axis EIRP-density limits specified in paragraph (a)(3)(i).

(4) There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate.

(5) The point of contact referred to in paragraph (a)(4) and, if applicable paragraph (a)(7) of this section, must be included in the application.

(6) ESVs that exceed the radiation guidelines of §1.1310 of this chapter must provide, with their

environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

(7) Except for ESV systems operating pursuant to paragraph (a)(2) of this section, ESV systems authorized pursuant to this section shall be eligible for a license that lists ALSAT as an authorized point of communication.

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