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

REPORT AND ORDER

Adopted: December 15, 2004 **Released:** January 6, 2005

By the Commission: Chairman Powell issuing a statement.

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I. INTRODUCTION

1. In this *Report and Order*, we establish licensing and service rules for Earth Stations on Vessels (ESVs) operating in the 5925-6425 MHz/3700-4200 MHz (C-band)[1] and 14.0-14.5 GHz/11.7-12.2 GHz (Ku-band) frequencies.[2] ESVs have been utilized for the past several years to provide telecommunications services, including internet access, to cruises, merchant ships, ferries, barges, yachts,

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

[2] The 14.0-14.5 GHz band also is known as the Ku-band uplink or 14 GHz band; the 11.7-12.2 GHz band also is known as the Ku-band downlink or 12 GHz band. The Ku-band uplink and downlink are allocated to the FSS on a primary basis. We also include a portion of the extended Ku-band (10.95-11.2 GHz and 11.45-11.7 GHz) in our decision today.

and U.S. navy vessels – *i.e.*, any marine craft large enough to meet reasonable size requirements and safely carry a stabilized satellite dish. In our decision today, we allow ESV operations to continue in the C- and Ku-bands, while ensuring that ESVs protect fixed services (FS), fixed-satellite service (FSS) operators, and a limited number of Government operations in these bands from harmful interference.

2. Specifically, we impose certain technical conditions on ESV operations as an application of the FSS with mobile capabilities. In allowing ESVs to continue operations in the C-band, it is our goal to strike the appropriate balance of ESV and FS interests by adopting operational requirements for ESVs in the C-band that will ensure that incumbent and future FS operators are protected from harmful interference. For example, ESVs in the C-band must coordinate spectrum use, adhere to limits on the amount of coordinated spectrum and number of satellites, and comply with a minimum vessel size. We impose fewer operational restrictions in the Ku-band than in the C-band because ESVs are less likely to cause harmful interference to incumbent services in that band. We continue to allow ESV C-band use because the C-band has certain beneficial characteristics not available in the Ku-band. At the same time, we encourage ESV operators to utilize the Ku-band for their operations wherever possible through enhanced rights and limited regulation in that band. Given the relatively limited presence of FS users in the 11.7-12.2 GHz band and our belief that the proliferation of Ku-band satellites is making Ku-band spectrum more accessible and reliable, we view the Ku-band as an ideal operational environment for future ESV growth, particularly for use on inland waterways.

3. In both the C- and Ku-bands, we require ESV operators to protect FSS incumbents through limits on off-axis effective isotropically radiated power (e.i.r.p.) density and to cease operations if the ESV antenna drifts more than 0.5 degrees from the target satellite. We also require operators in both bands to collect and maintain vessel tracking data to assist in identifying and resolving sources of interference. In addition, we add footnotes to the U.S. Table of Frequency Allocations to recognize ESVs as an application of the FSS with primary status. In doing so, we implement, in part, the decision reached at the International Telecommunication Union's (ITU's) 2003 World Radiocommunication Conference (WRC-03), which added a footnote to the International Table of Frequency Allocations stating that, in the 5925-6425 MHz and 14.0-14.5 GHz bands, ESVs may communicate with FSS space stations. We also provide for system licensing (consisting of ESV hub stations and/or blanket licensing for ESV earth stations) in order to give both C- and Ku-band ESV operators greater flexibility in structuring their operations. Finally, consistent with ITU encouragement of administrative cooperation in reaching agreements on the use of ESV systems,[3] we establish a regulatory framework that will enable foreign-licensed ESVs to operate near the United States without causing harmful interference to domestic operations.

4. Licensing ESV operations advances the Commission's goals and objectives for market-driven deployment of broadband technologies. Broadband technologies encompass all evolving high-speed digital technologies that provide consumers integrated access to voice, high-speed data, video-on-demand, and interactive delivery services, which are becoming a fundamental component of modern communications.[4] The maritime market for broadband via satellite-based communications continues to expand. For example, the U.S. cruise ship industry, a primary user of these communications, has grown

[3] *See 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*, The World Radiocommunication Conference (Geneva, 2003) (ITU-R Resolution 902 (WRC-03)).

[4] *See* Federal *Communications Commission Strategic Plan FY 2003-FY 2008, Means and Strategies to meet Goal 1 - Broadband,* page 10, (visited Dec. 13, 2004) <http://www.fcc.gov/omd/strategicplan/strategicplan2003-2008.pdf>.

in recent years.[5] More recently, broadband-based services via satellites became available to students taking academic courses at sea.[6] As ESV operators deploy increasingly innovative broadband services to their subscribers, the rules we adopt today help to assure that, through ESVs, broadband services are available to businesses and consumers on the high seas, coastlines, and inland waterways.

II. BACKGROUND

A. Initial ESV Authorization and Operation

5. In December 1991, Crescomm Transmission Services, Inc. (Crescomm) filed a Petition for Rulemaking to allow it to provide communications to ships via satellite in the C- and Ku-bands.[7] In its Petition, Crescomm proposed to provide satellite-based mobile telecommunications services to vessels in frequencies that are allocated to FSS and terrestrial FS, and requested a blanket license for Very Small Aperture Terminal (VSAT) ESVs.[8] In 1996, the International Bureau (the Bureau) and the Office of Engineering and Technology (OET) issued the *Crescomm Order*, granting a waiver of the Commission's rules that would allow Crescomm to provide its proposed shipboard services in the C- and Ku-bands on a non-conforming use basis, subject to Crescomm filing for and receiving appropriate licensing authority and/or Special Temporary Authority (STA).[9] The *Crescomm Order* required Crescomm to protect against interference to, and accept interference from, any radio services allocated in the bands, and to operate only beyond 100 kilometers (km) (approximately 60 miles) from the U.S. coastline unless Crescomm successfully coordinated its operations with all affected terrestrial FS operators.[10]

6. Maritime Telecommunications Network (MTN), Crescomm's successor-in-interest,[11] applied for and received its first STA to operate ESVs in the C-band on 45 vessels traveling more than 100 km from the U.S. coastline, commencing January 30, 1997.[12] During 1997, MTN's STA was expanded to

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[5] *See* Don Walsh, *Tourism and Terrorism: A Difficult Journey Ahead for the Cruise Ship Industry*, (visited Dec. 13, 2004) <http://www.navyleague.org/sea_power/dec_02_51.php>.

[6] *See Maritime Telecommunications Network Joins Institute for Shipboard Education to Deliver Wireless Internet Access and OceanNews to Semester at Sea*, (visited Dec. 13, 2004) <http://www.mtnsat.com/press/2002/pressrelease_100202_semesteratseaprogram.htm >.

[7] Crescomm Transmission Services, Inc., Petition for Rule Making Request for Pioneer Preference, RM-7912 (filed Dec. 12, 1991) (*Crescomm Petition*).

[8] *Id.* at 1.

[9] *See Mobile Satellite-Based Communications Services by Crescomm Transmission Services, Inc. and Qualcomm Incorporated*, Order, DA 96-650, 11 FCC Rcd 10944, 10948, ¶ 9 & 10949-50, ¶ 12 (Int'l Bur./OET 1996) (*Crescomm Order*). Qualcomm requested and received a waiver of the Table of Frequency Allocations to allow it to provide satellite-based communications to ships in the 12/14 GHz band, via a satellite-based land mobile data system known as OmniTRACS.

[10] *Id.* at 10948-49, ¶¶ 10-11. For the purposes of our ESV rules, "coastline" is synonymous with "baseline," which we define as a combination of the low-water line and closing lines across the mouths of inland water bodies, adjusted from time-to-time by the U.S. Department of State's Baseline Committee. *See infra* footnote 69 & Appendix B (new definitions added to 47 C.F.R. § 25.201).

[11] *Crescomm Order*, 11 FCC Rcd at 10944 n.2.

[12] *See Maritime Telecommunications Network, Inc.*, Order, DA 00-1300, 15 FCC Rcd 23210, 23212, ¶ 4 (Int'l Bur. 2000) (*MTN Order*), *modified*, Order, DA 00-2263, 15 FCC Rcd 19572 (Int'l Bur. 2000), *recon. denied*, Order on Reconsideration and Memorandum Opinion and Order, DA 01-1283, 16 FCC Rcd 11615 (Int'l Bur. 2001) (*MTN Reconsideration Order*). The initial STA expired on July 30, 1997.

allow MTN to operate the ESVs in or near seventeen U.S. ports on a non-harmful interference basis.[13] The Bureau granted MTN's requests to extend the STAs several times from 1997 through 2000.[14] In a January 2000 request to extend its STAs, MTN requested authority to increase the number of vessels equipped with its ESVs.[15] The Bureau granted the STA extension request only as it pertained to U.S.-registered ships, declined to grant STAs for foreign-registered ships, and dismissed without prejudice MTN's request to expand its authority to additional ships.[16] As a result, the Bureau permitted the MTN network to operate ESVs on six U.S. Navy vessels to and from seventeen U.S. ports on a non-harmful interference basis, and also permitted MTN to operate those ESVs at sea beyond 100 km from the U.S. coastline.[17] In 2001, while in the process of converting the C-band ESVs to the Ku-band, MTN requested an STA to operate ten ESVs on U.S.-flagged vessels in the C- and Ku-bands.[18] The Bureau granted that request from July 20, 2001 until September 20, 2001,[19] and renewed a later request for sixty days from September 21, 2001 until November 20, 2001.[20] Subsequent STA requests by MTN have been for the Ku-band only.[21]

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[13] *MTN Order*, 15 FCC Rcd at 23212, ¶ 4 & nn.13-14.

[14] *See, e.g.*, Letter from Helen Disenhaus, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated July 22, 1999) (STA authorization renewed by grant-stamp from July 30, 1999 until January 30, 2000); Letter from Helen Disenhaus, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated Jan. 22, 1999) (STA authorization renewed by grant-stamp from January 30, 1999 until July 30, 1999); Letter from Helen Disenhaus, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated July 17, 1998) (STA authorization renewed by grant-stamp from July 30, 1998 until January 30, 1999); Letter from Helen Disenhaus, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated Jan. 27, 1998) (STA authorization renewed by grant-stamp from January 30, 1998 until July 30, 1998); Letter from Eliot Greenwald, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated Jan. 25, 1997) (STA authorization renewed by grant-stamp from July 30, 1997 until January 30, 1998).

[15] *MTN Order*, 15 FCC Rcd at 23213, ¶ 5. *See also* Letter from Helen Disenhaus, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated Jan. 27, 2000).

[16] *MTN Order*, 15 FCC Rcd at 23214, ¶ 8. In declining to grant STAs for the foreign-registered vessels, the Bureau stated that, pursuant to Section 306 of the Communications Act, the Commission does not have jurisdiction to license ESVs on foreign vessels. The Commission also began to investigate ways to coordinate transmissions from these foreign-registered ships or to have separate bilateral agreements with the countries involved in order to protect domestic terrestrial fixed services. *Id.* at 23214-15, ¶ 9.

[17] *Id.* at 23217, ¶¶ 16-17. *See also MTN Reconsideration Order*, 16 FCC Rcd at 11630-31, ¶¶ 48-51 (affirming the *MTN Order* and extending MTN's STA with regard to the six U.S. Navy vessels through December 1, 2001).

[18] Letter from Eliot J. Greenwald, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated July 6, 2001).

[19] *See id.* The Bureau stated that the authorization was subject to the conditions set forth in the *MTN Reconsideration Order*, 16 FCC Rcd 11615 (reiterating that the STAs only apply to U.S.-registered vessels).

[20] *See* Letter from Eliot J. Greenwald, Counsel for MTN, to Magalie Roman Salas, Secretary, FCC (dated Sept. 18, 2001).

[21] *See* Letter from Raul Rodriguez, Counsel for MTN, to the International Bureau, FCC (dated June 10, 2004) (STA authorization renewed by grant-stamp from June 18, 2004 until Dec. 14, 2004); Letter from Raul Rodriguez, Counsel for MTN, to the International Bureau, FCC (dated Dec. 9, 2003) (STA authorization renewed by grant-stamp from Dec. 17, 2003 until June 17, 2004); Letter from Raul Rodriguez, Counsel for MTN, to the International Bureau, FCC (dated June 11, 2003) (STA authorization renewed by grant-stamp from June 20, 2003 until Dec. 16, 2003); Letter from Raul Rodriguez, Counsel for MTN, to the International Bureau, FCC (dated Jan. 15, 2003) (STA authorization renewed by grant-stamp from January 19, 2003 until June 19, 2003); Letter from Raul Rodriguez, Counsel for MTN, to the International Bureau, FCC (dated Nov. 13, 2002) (STA authorization renewed by grant-stamp from November 19, 2002 until January 19, 2003); Letter from Eliot Greenwald, Counsel for MTN, to Marlene H. Dortch, Secretary, (continued….)

B. International Framework for ESVs

7. The 2000 World Radiocommunication Conference in Istanbul (WRC-2000) adopted Resolution 82, which recognized the ability of ESV licensees to operate using C-band as well as Ku-band FSS networks.[22] Passage of this Resolution prompted the International Telecommunication Union's Radiocommunication Sector (ITU-R) to study the potential for interference from ESVs to FS operations. In particular, the ITU-R Joint Working Party 4-9S (JWP-4-9S), which studies FSS and FS sharing issues, developed several recommendations pertaining to ESV operations.[23] These recommendations described methods that can be used to minimize interference to FS services from ESV operations.

8. At WRC-03, a footnote was added to the International Table of Frequency Allocations stating that in the 5925-6425 MHz and 14.0-14.5 GHz bands ESVs may communicate with space stations in the FSS.[24] WRC-03 established minimum distances from the low-water mark as officially recognized by the coastal state beyond which ESVs can operate without the prior agreement of any administration: 300 km (approximately 180 miles) in the 5925-6425 MHz band and 125 km (approximately 75 miles) in the 14-14.5 GHz band.[25] These minimum distances are conditioned upon technical limitations, such as antenna size and off-axis e.i.r.p. and e.i.r.p.-density limits towards the horizon for ESV stations.[26] The limitations on maximum e.i.r.p. spectral density towards the horizon and maximum e.i.r.p. towards the horizon were adopted by the Conference as a method for protecting incumbent fixed services. The

(Continued from previous page)
FCC (dated June 4, 2002) (STA authorization renewed by grant-stamp from May 18, 2002 until November 18, 2002); Letter from Eliot Greenwald, Counsel for MTN, to Ronald Repasi, International Bureau, FCC (dated Nov. 16, 2001) (STA authorization renewed by grant-stamp from November 20, 2001 until May 18, 2002).

[22] Provisions Relating to Earth Stations Located on Board Vessels which Operate in Fixed-Satellite Service Networks in the Bands 3700-4200 MHz and 5925-6425 MHz, WRC-2000, Resolution 82 (Resolution 82) (noting "that ESVs may operate in FSS networks in the bands 3700-4200 MHz and 5925-6425 MHz under No. 4.4 of the Radio Regulations and shall not claim protection from, nor cause interference to, other services having allocations in the band").

[23] *See Example Approach for Determination of the Composite Area Within Which Interference to Fixed Service Stations from Earth Stations on Board Vessels When Operating in Motion Near a Coastline Would Need to be Evaluated*, (visited Dec. 13, 2004) <http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-SF.1585> (ITU-R Recommendation SF.1585); *The minimum distance from the coastline beyond which in-motion earth stations located on board vessels would not cause unacceptable interference to the fixed service in the bands 5925-6425 MHz and 14-14.5 GHz*, (visited Dec. 13, 2004) <http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-SF.1650> (ITU-R Recommendation SF.1650)*; Guidance for Determination of Interference from Earth Stations on Vessels (ESVs) to Stations in the Fixed Service When the ESV Is Within the Minimum Distance*, (visited Dec. 13, 2004) <http://www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-SF.1649> (ITU-R Recommendation SF.1649); *ITU-R Recommendation SF.1648 Use of Frequencies by Earth Stations on Board Vessels Transmitting in Certain Bands Allocated to the Fixed-Satellite Service*, (visited Dec. 13, 2004) <http://www.itu.int/rec/recommendation.asp?type=products&lang=e&parent=R-REC-SF.1648.> (ITU-R Recommendation SF.1648).

[24] ITU RR 5.457A (WRC-03).

[25] ITU RR 5.457A references ITU-R Resolution 902 (WRC-03), which specifies in Annex 1 that any transmissions from ESVs within the minimum distances shall be subject to the prior agreement of the concerned administration(s). *See* ITU RR 5.457A (WRC-03). ITU Recommendation 37 recommends operational procedures for ESV use that could help achieve such agreements. *See Operational procedures for ESV use*, The World RadioCommunication Conference (Geneva, 2003) (ITU Recommendation 37) Annex 1.

[26] ITU-R Resolution 902 (WRC-03) Annex 1 and Annex 2.

Regulations also encouraged administrations to cooperate with each other in reaching agreement on the use of ESV systems.[27] The final Conference language states that national practices, as well as applicable Recommendations of ITU-R, may be used in reaching frequency usage arrangements.[28]

C. ESV Notice of Inquiry

9. The Commission sought comment on issues surrounding the allocations for and licensing of ESVs in a *Notice of Inquiry* in 2002.[29] The *Notice of Inquiry* focused on portions of the C- and Ku-bands that can best accommodate ESVs and on how to prevent interference to terrestrial FS licensees.[30] Response to the *Notice of Inquiry* indicated general support for operations in both the C- and Ku-bands as well as for the recommendations developed by the ITU-R.[31] Some parties responding to the *Notice of Inquiry* indicated that aspects of the ITU Radio Regulations were too restrictive, specifically, the ITU Radio Regulations regarding offshore coordination distances of 300 km for C-band. These parties also contended that the 125 km coordination distance identified in the ITU Radio Regulations for Ku-band is greater than necessary for ESV operations in the United States because of particular characteristics of FS and FSS operations in the United States.[32] The Fixed Wireless Communications Coalition (FWCC) opposed the licensing of ESVs in the C-band because of concerns about the potential for ESVs to interfere with and affect the growth of FS systems.[33] The FWCC urged the Commission to abandon any further authorization of in-motion ESV operations in the C-band within 300 km of the U.S. coast or FS offshore installations such as the Gulf of Mexico or alternatively, to adopt a rigorous regulatory regime that would prevent interference from ESV operations and include mechanisms to identify the interfering source so that the interference could be quickly eliminated.[34]

D. ESV Notice of Proposed Rulemaking

10. In November 2003, the Commission adopted the *ESV NPRM* to promulgate regulations for U.S.-licensed ESV operations.[35] The Commission proposed to adopt a footnote to the U.S. Table of Frequency Allocations in the C-band that states that ESV use shall not cause harmful interference to, claim protection from, or otherwise impose constraints on the operation or development of other

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[27] ITU-R Resolution 902 (WRC-03).

[28] ITU-R Recommendation 3737, Annex 1.

[29] *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in Bands Shared with Terrestrial Fixed Service*, IB Docket No. 02-10, Notice of Inquiry, FCC 02-18, 17 FCC Rcd 2646 (2002) (*Notice of Inquiry*).

[30] *Id*. at 2650-55, ¶¶ 15-32.

[31] *See, e.g.*, MTN *Notice of Inquiry* Comments at 10 (filed May 10, 2002); Boeing *Notice of Inquiry* Comments at 3 (filed May 10, 2002); Intelsat *Notice of Inquiry* Comments at 2 (filed May 10, 2002) (Intelsat NOI Comments); Inmarsat *Notice of Inquiry* Comments at 4 (filed May 10, 2002) (Inmarsat NOI Comments); SIA *Notice of Inquiry* Comments at 3 (filed May 10, 2002).

[32] MTN *Notice of Inquiry* Reply at 20 (filed June 10, 2002); Inmarsat NOI Comments at 5-6; Intelsat NOI Comments at 4.

[33] FWCC *Notice of Inquiry* Comments at 2-3 (filed May 10, 2002).

[34] *Id*. at 13-14.

[35] *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, Notice of Proposed Rulemaking, FCC 03-286, 18 FCC Rcd 25248 (2003) (*ESV NPRM*).

allocated radio services operating in the C-band.[36] With respect to ESV operations in the Ku-band, because of the light use of the 11.7-12.2 GHz band by terrestrial services, the Commission proposed to adopt a footnote to the U.S. Table of Frequency Allocations that clarifies that ESV operations in that band are considered an application of the FSS and subject to the same regulatory status as other FSS operations.[37] Additionally, the Commission also sought comment on whether to adopt a 2.4 megahertz bandwidth limitation per Earth station or per satellite and whether to adopt the limitations on maximum e.i.r.p. spectral density towards the horizon and maximum e.i.r.p. towards the horizon that the WRC-03 adopted.[38] The Commission sought comment on certain conditions and restrictions on ESV operations including: a minimum distance from the coast of 300 kilometers for C-band operations;[39] a method for determining what and where the ships are at any given time;[40] antenna specifications;[41] limits on the maximum ESV transmitter power;[42] license terms;[43] and methods, where applicable, for prior coordination between ESV and fixed service operators.[44]

11. In response to the *ESV NPRM*, nineteen parties filed comments and thirteen parties filed replies.[45] As discussed in more detail below, commenters involved with the satellite community generally support ESV use of the C-band, while commenters involved with the FS community generally oppose ESV C-band use near the U.S. coastline. All commenters support Ku-band use.

III. DISCUSSION

A. ESV Operations in the Two-Degree Spacing Environment

12. Before discussing requirements of operation in each band, we address an issue that has implications to both bands. Authorizing ESVs (essentially a mobile service) in the C- and Ku-bands (which are conventional FSS bands) presents the challenge of protecting other FSS satellites from the mobile unit's potential harmful interference. To meet that challenge, this *Report and Order* adopts specific off-axis e.i.r.p.-density rules for ESV operations in both the C- and Ku-bands.

13. Generally, U.S.-licensed GSO FSS satellites are spaced two degrees apart along the geostationary orbit.[46] Spacing satellites this closely requires stringent limits on the power density emitted

[36] *ESV NPRM*, 18 FCC Rcd at 25267, ¶ 46.

[37] *Id*. at 25265, ¶ 41.

[38] *Id*. at 25255, ¶ 16.

[39] *Id*. at 25277, ¶ 74.

[40] *Id*. at 25285-86, ¶ 94.

[41] *Id*. at 25278, ¶ 76.

[42] *Id*. at 25283, ¶ 86.

[43] *Id*. at 25285, ¶ 92.

[44] *Id*. at 25275-82, ¶¶ 69-83.

[45] In addition, five parties filed *ex parte* letters after the formal pleading cycle closed. For the complete list of commenters, see Appendix A.

[46] In 1983, the Commission established a two-degree orbital spacing policy to maximize the number of in-orbit satellites serving the United States in either the C-band or the Ku-band. *See Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, CC Docket No. 81-704, Report and Order, FCC 83-184, 54 Rad. Reg. 2d (P & F) 577 (1983); *summary printed in* Licensing Space (continued….)

from an earth station antenna towards satellites other than the target satellite.[47] The Commission established technical rules to govern earth stations communicating with satellites at two-degree orbital separations to ensure that their operations do not cause unacceptable interference to other satellite systems. The power density emitted in directions other than towards the target satellite is known as off-axis e.i.r.p.-density (or "off-axis power-density"). The higher the off-axis power density, the greater the chance for interference to neighboring satellites. Within our rules in the C- and Ku-bands, these off-axis e.i.r.p.-density limits have been expressed, heretofore, as various combinations of allowable earth station antenna patterns (*e.g.*, diameter or gain levels) and separate limits on the power-density fed to the Earth station antenna.[48]

14. In an effort to combine the ESV mobile environment with the FSS, we advance the concept of two-degree spacing for the GSO FSS by directly adopting off-axis e.i.r.p.-density rules for ESV earth station transmitters. We note that the ITU-R has adopted off-axis e.i.r.p.-density limits for both C- and Ku-band ESV transmitters,[49] and that within the record of this proceeding, Boeing has proposed off-axis e.i.r.p.-density rules for Ku-band ESV operations.[50] We agree with Boeing that adopting off-axis e.i.r.p.-density rules, as opposed to adopting multiple operating restrictions that accomplish the same objective, is the proper approach to ESV regulation. We arrive at this decision because, in addition to providing simpler service rules, this approach also provides maximum flexibility to ESV operators in implementing the two-degree spacing limits. For example, an ESV operator will now have the option of using an antenna that may not meet the two-degree spacing antenna pattern specified in Section 25.209 of our rules,[51] as long as the power-density into the antenna is reduced to the point that the off-axis e.i.r.p.-density limits are still met. This, in turn, will provide the ESV operator with a wider option of antennas that may be used to implement service. Meeting the twin goals of increasing operator flexibility, while adopting simpler service rules, leads us to adopt off-axis e.i.r.p.-density rules for ESV operations at both C- and Ku-bands, and is the guiding principle underlying many of our decisions herein. In the respective

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Stations in the Domestic Fixed-Satellite Service, 48 Fed. Reg. 40,233 (Sept. 6, 1983), *on reconsideration*, *Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, CC Docket No. 81-704, Report and Order, FCC 84-487, 99 FCC 2d 737 (1985). At that time, the Commission began assigning adjacent in-orbit satellites to orbit locations two degrees apart in longitude, rather than the three-to-four degrees longitude previously used.

[47] Depending upon the type of system implemented, there may also be limits on the emissions coming from the satellite in order to comply with the two-degree spacing regime.

[48] *See, e.g.*, 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.

[49] *See* ITU-R Resolution 902 (WRC-03), Annex 2. As discussed in the respective C- and Ku-band sections, the ITU-R limits do not conform to our two-degree spacing regime, as they are based on satellites spaced three degrees apart. We therefore do not adopt the ITU limits, but rather use them as guidance for off-axis e.i.r.p. limits geared toward the more stringent two-degree spacing environment.

[50] *See* Boeing Reply, Attachment 1. We also note that Boeing suggested only off-axis e.i.r.p.-density limits for co-polarized transmissions within three degrees along the geostationary arc. The complete set of off-axis e.i.r.p.-density limits that are required for the two-degree spacing regime, however, also include cross-polarized off-axis e.i.r.p.-density and co-polarized off-axis e.i.r.p.-density in directions away from the geostationary arc.

[51] 47 C.F.R. § 25.209.

C- and Ku-band sections below, we discuss specific C- and Ku-band off-axis e.i.r.p.-density limits required to protect FSS satellites operating in a two-degree spaced environment.[52]

B. C-Band Operations

15. The C-band, which includes the downlink at 3700-4200 MHz (or 4 GHz) and the uplink at 5925-6425 MHz (or 6 GHz), is allocated to FS and FSS on a co-primary basis.[53] In this section, we discuss the reasons we are authorizing ESV operators in the C-band and set forth the requirements ESV operators must comply with in the C-band uplink to protect FS operations from harmful interference, including coordination and spectrum, satellite, and power limits. We also adopt requirements to help facilitate interference investigations by the FS community, such as requiring ESV operators to track ESV-equipped vessels and maintain data for use in identifying possible interference sources. We also adopt requirements to protect the FSS satellite as well as more general requirements such as minimum vessel size for ESVs. Finally, we address the regulatory status for C-band ESV uplink and downlink operations.

1. ESV Use of the C-Band

16. We adopt our proposal in the *ESV NPRM* to allow ESV communications in the C-band, subject to certain limitations imposed to protect existing FS and FSS providers in the C-band.[54] We find that licensing ESVs in the C-band would serve the public interest by enabling ESV operators to provide a variety of broadband services to consumers traveling on vessels.[55] In particular, we agree with commenters that ESV-based communications in the C-band are more accessible and reliable than in the Ku-band.[56] C-band coverage extends to very large portions of the Earth's surface, including ocean areas,[57] and communications in the C-band do not suffer as much from the weather-related attenuation that often occurs in areas of high ESV use, such as the Caribbean and the Gulf of Mexico.[58] According

[52] In the respective C- and Ku-band sections below, we also address a number of related off-axis e.i.r.p. limits, including limits on co- and cross-polarized transmissions, and transmissions toward and away from the geostationary orbit, required to provide full protection of FSS operations.

[53] 47 C.F.R. § 2.106.

[54] *ESV NPRM*, 18 FCC Rcd at 25266, ¶ 43.

[55] *See* MTN Comments at 4, 8; Telenor Reply at 6-7.

[56] *See, e.g.*, MTN Comments at 6-9; Stratos Comments at 9-10; Broadband Maritime at 2-3; Telenor Comments at 3-6; SES Americom Comments at 2-3; Inmarsat Comments at 17; Pinnacle Comments at 2; Intelsat Comments at 4. *See also* Intelsat Reply at 1-2 (disagreeing with FWCC's opposition to ESV use of C-band within 300 km of the U.S. coastline).

[57] *See, e.g.*, Broadband Maritime Comments at 2; SES Americom Comments at 3 (acknowledging that, although it is building a satellite that will increase Ku-band coverage of the Pacific Ocean, Ku-band spectrum will be less desirable to ESV operators in the short-term); Telenor Comments at 4. According to Telenor, Ku-band use increases the operating costs for ESV-equipped vessels. For example, if a vessel that requires broad coverage uses the Ku-band, it often must utilize capacity on two or three Ku-band beams rather than a single C-band global beam. *Id.* at 4. The change in Ku-band beams requires trained staff on board and the use of additional equipment. *Id.* Stratos explains that it has military and commercial customers with a significant need for maritime broadband data services on deep-water maritime routes throughout the world, and these needs are best met using the comprehensive coverage offered by C-band satellites. Stratos Comments at 9.

[58] *See* MTN Comments at 7-8; Telenor Comments at 4-5. According to MTN, when Ku-band FSS network availability declines due to precipitation, ESV operators are unable to improve network reliability by using redundant earth stations at different geographic locations (unlike land-based operators). MTN Comments at 8.

to MTN, the C-band offers sufficient commercially-available FSS bandwidth on a global basis to accommodate the high volume of voice, data and video information that flows through ESV networks on a daily basis.[59] Moreover, we find that prohibiting ESV use of the C-band would be overly burdensome for ESV operations particularly for those ESV operators that rely heavily on the C-band for their existing ESV operations.[60]

17. We also agree with commenters who argue that switching from the C-band to the Ku-band (*i.e.*, dual band use) as vessels approach a certain distance from the U.S. coastline would be technically complex and expensive. For example, in these circumstances, ESV operators would be required to lease separate C- and Ku-band transponders to cover the same region, resulting in a higher cost service and inefficient use of spectrum.[61] Similarly, shutting down the C-band operation, pointing the ESV to another satellite, and switching to the Ku-band would not only cause an interruption of service, but might require a person trained in this aspect of ESV operations to be on the vessel.[62]

18. We disagree with FWCC's contention that ESVs should not be allowed to transmit in the C-band within 300 km of the U.S. coastline or FS offshore installations such as in the Gulf of Mexico. Specifically, FWCC argues that ESV transmissions in the C-band may harm critical FS operations, including safety and infrastructure services.[63] FWCC also contends that the C-band is important for future growth of FS and could serve as relocation spectrum for FS in the 1.9 and 2.1 GHz bands.[64] Alternatively, FWCC states that if we permit ESVs to utilize the C-band, we should adopt specific measures to protect FS operations, such as a requirement to coordinate all ESV operations in advance.[65]

19. We address FS operators' concerns in this *Report and Order* without prohibiting ESV C-band use within a specific distance from the coastline. In particular, we set forth reasonable restrictions below designed to enable ESV operators to provide their services in the C-band without

[59] *See* MTN Comments at 6, 8; *see also* Stratos Comments at 9; Broadband Maritime Comments at 2; SES Americom Comments at 3; Telenor Comments at 3-4; Intelsat Comments at 5. In addition, Stratos states the while the C-band may be more heavily used by terrestrial service providers in the United States than the Ku-band, terrestrial service providers in other countries use both C-band and Ku-band frequencies on a primary basis. Stratos, therefore, argues that adopting policies that unduly restrict use of the C-band in favor of the Ku-band would place U.S.-licensed ESVs at a significant competitive disadvantage abroad, and undermine the United States' leadership position in advanced satellite communications services. Stratos Comments at 9.

[60] *See, e.g.*, MTN Comments at 8; Broadband Maritime Comments at 2.

[61] *See* MTN Comments at 9; Stratos Comments at 10. Stratos also argues switching satellite transponders between C-band and Ku-band could cause service interruptions, further undermining the provision of ESV services. Stratos Comments at 10.

[62] *See* Broadband Maritime Comments at 2. Broadband Maritime further contends that the time period for the switch to Ku-band operations is problematic because it would occur around the time when the ship is approaching port, which is a very critical period for communications. *Id.* at 3.

[63] FWCC Comments at 2. FWCC states that the "applications include public safety communications (such as dispatching police and fire vehicles), coordinating the movement of railroad trains, controlling natural gas and oil pipelines, regulating the electric grid, and backhauling wireless telephone traffic, among many others." *Id.*

[64] FWCC Comments at 5. Some commenters support the position taken by FWCC, which opposes ESV use of the C-band within 300 km of the U.S. coastline. *See, e.g.*, Alcatel Reply at 1; American Petroleum Institute Reply at 1; Association of Public-Safety Communications Officials-International, Inc. at 1; King County Comments at 2. *See generally* FWCC Reply at 8, 19-20, 31.

[65] FWCC Comments at 3; FWCC Reply at 2.

imposing harmful interference to FS users in that band. Should interference occur despite these safeguards, we adopt additional requirements for ESV operations to mitigate such occurrences and facilitate any investigation necessary to prevent repeated occurrences. We acknowledge that C-band FS operations include public safety and critical infrastructure users. The collective measures we adopt today should protect all of the different types of incumbent operators in that band. We emphasize that ESV operators who are unable to comply with these requirements will not be allowed to operate in the C-band.

2. Coordination Approach in the C-Band Uplink (6 GHz Band)

20. In the *ESV NPRM*, we proposed to adopt a Coordination Approach to ESV operations in the C-band. Under that approach, ESVs would be required to coordinate all operations in the C-band uplink at 5925-6425 MHz (6 GHz), and comply with additional requirements such as vessel size and recordkeeping requirements.[66] In this *Report and Order*, we adopt the Coordination Approach as modified below. We also set forth conditions on ESVs transmitting in the C-band uplink. We note that it is the ESV transmissions to FSS satellites in the C-band uplink that would pose a risk of harmful interference to FS. Therefore, most of the conditions we adopt to protect FS apply to the C-band uplink at 5925-6425 MHz.

a. Frequency Coordination

21. To utilize the C-band, stationary and in-motion ESV operators will be required to coordinate uplink frequencies with FS stations on-shore and offshore in the 6 GHz band. We find that frequency coordination is one of the essential elements for protecting FS in the 6 GHz band. Frequency coordination is a process that helps to eliminate interference between different satellite systems or between terrestrial microwave systems and satellites.[67] In addition, we agree with the National Spectrum Managers Association (NSMA), which argues that the best method for controlling interference is to prevent it in advance through interference analysis and coordination.[68] Coordination allows service providers to analyze the likelihood of harmful interference in a particular region, and, in turn, to take steps to prevent its occurrence in the first place.

b. Distance from the U.S. Coastline

22. *Background.* In the *ESV NPRM*, the Commission proposed to apply the C-band rules to ESVs traveling within 300 km of the U.S. coastline or an offshore FS installation, the distance adopted by the ITU in Annex 1 to Resolution 902.[69] The Commission sought comment, however, on whether the

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[66] *See ESV NPRM*, 18 FCC Rcd at 25275, ¶ 69.

[67] *See Glossary of Satellite Terms*, (visited Dec. 13, 2004) http://www.satnews.com/free/glossary.html#F.

[68] NSMA Comments at 16.

[69] *ESV NPRM*, 18 FCC Rcd at 25277, ¶¶ 74, 75. Resolution 902 (WRC-03) references "the low-water mark as officially recognized by the coastal States" as the point from which the seaward ESV coordination line/boundary is to be calculated. *See* ITU-R Resolution 902 (WRC-03). In the United States as well as other countries, the "low-water mark" is also known as the "baseline" or "coast line." The baseline is ambulatory and thus the reference points or "baseline points" must be adjusted from time-to-time as the baseline changes due to storms and ocean currents. The baseline points are not just the low-water marks of the mainland shore, but also include islands and "low-water elevations" (*i.e.*, natural rocks). In the United States, the Department of State Ad Hoc Interagency Baseline Committee is responsible for determining the baseline points from which the baseline is calculated. *See United Nations Convention on the Law of the Sea, Dec. 10, 1982*, 21 I.L.M. 1245 (visited Dec. 14, 2004) <http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm>. The large-scale (continued….)

distance should be shorter or longer than 300 km.[70] Specifically, the Commission asked whether the 300-km distance was too burdensome on ESV operators or overly protective for FS users.[71] In addition, the Commission sought comment on how to approach a situation in which the minimum distance from the U.S. coastline falls within the minimum distance of another country such as Canada or Mexico.[72]

23. MTN argues that the Commission should adopt a distance of 100 km from the U.S. coastline, similar to the distance the Commission adopted in the *Crescomm Order*,[73] because ESV operators have operated under these conditions "without incident of interference."[74] FWCC counters, arguing that interference from ESVs is difficult to prove because the FS operator would need to shut down its system as part of its investigation.[75] Instead, FWCC argues that we should adopt 300 km as the minimum distance from the U.S. coastline in order to "to err . . . on the side of caution."[76] Stratos and FWCC, however, express a willingness to accept less than a 300-km coordination distance requirement, as long as that distance is measured from the location of offshore FS stations.[77] The Commission did not specifically address FS offshore installations in the *Crescomm Order*.

24. *Discussion.* We require ESV operators to coordinate operations when their ESVs are within 200 km (approximately 125 miles) from the U.S. coastline.[78] Additionally, we require ESV operators to coordinate operations when their ESVs are within 200 km from FS offshore installations, such as those located in the Gulf of Mexico. As a result, we ensure that all FS operations that fall within the jurisdiction of the United States are protected from harmful interference. We do not agree with FWCC's suggestion that the coordination distance with regard to FS offshore facilities be measured from the

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charts referenced in these two Conventions are the nautical charts and publication created by NOAA's Office of Coast Survey for the U.S. (http://chartmaker.ncd.noaa.gov/).

[70] *ESV NPRM*, 18 FCC Rcd at 25277, ¶ 74.

[71] *Id*.

[72] *Id*. at ¶ 75.

[73] Specifically, in the *Crescomm Order*, the Commission restricted non-coordinated ESV operations to areas beyond 100 km from the U.S. coastline, reasoning that this distance should sufficiently protect FS operations from harmful interference in the 6 GHz band. *See Crescomm Order*, 11 FCC Rcd at 10949, ¶ 11. The Commission also allowed ESV operators to utilize the C-band on coordinated routes within 100 km from the U.S. coastline. *Id.* As discussed, *supra* Section II.A., the Commission subsequently issued STAs authorizing ESV operations in the C-band.

[74] MTN Comments at 19-20. In a later *ex parte* filing, MTN states that "coordination with stations in the Fixed Service in C-Band should not require a coordination distance any farther than 150 kilometers from shore, since the accepted propagation models and MTN's experience have demonstrated that in C-Band even 100 km is a sufficient coordination distance." *See* Letter from Raul Rodriguez, Counsel for MTN, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 02-10 (dated Dec. 1, 2004).

[75] *See* FWCC Reply at 9-10.

[76] *Id*. at 24.

[77] Stratos Reply at 11; Letter from Mitchell Lazarus, Counsel for FWCC, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 02-10, at 2 (dated Dec. 8, 2004) (FWCC Dec. 8 *Ex Parte* Letter). Other commenters also suggest that the coordination distance should be measured from FS offshore operations as well as the U.S. coastline. *See* Pinnacle Comments at 5; API Reply at 5.

[78] ESV operations outside of 200 km will not be required to coordinate, and thus, will have neither the benefits nor costs of coordination.

farthest offshore facility.[79] Rather, the coordination distance we adopt today – 200 km as measured from each FS offshore facility – will adequately protect all offshore facilities.

25. We decline to take a position on whether interference has occurred previously within 100 km from the coastline.[80] We acknowledge, however, that FS operators may, in some instances, be unable to investigate incidents of interference unless they shut down their systems – an impractical solution. Given the difficulty of investigating incidents of harmful interference, we prefer to adopt a conservative distance of 200 km. We agree with those commenters who claim that 300 km is more conservative than necessary to protect FS operators,[81] and consider the success of ESV operations under the STAs referenced above as lending support for a distance that is less than 300 km. Moreover, there is minimal interference risk caused by ESVs traveling between 200 km and 300 km from the coastline. Thus, using a 300 km coordination distance (as compared to our adopted 200 km distance) would unnecessarily burden ESVs located between 200 km and 300 km from the coast while not adding to the protection of the FS. In summary, we conclude that adoption of a 200-km distance should satisfy concerns about possible harmful interference to FS stations without being either overly conservative or overly burdensome. Although we recognize that an appropriate coordination distance may more easily be determined once ESV operators gain more experience coordinating frequencies with FS operators, as some commenters suggest,[82] we will only reexamine the 200-km distance should it become necessary.

c. Coordination Methodology

26. *Background.* For more than 30 years, providers of FSS and FS have coordinated their operations in order to avoid interference with each other in the C-band. In order to coordinate with fixed earth stations, FSS providers initially calculate coordination contours, which define the area within which the detailed coordination with fixed systems must occur. These contours are developed by first selecting a specific azimuth from the Earth station. This azimuth is then used to calculate the worst-case distance from the Earth stations to a fixed receiver where interference may possibly occur. This calculation is repeated at various azimuths around the Earth station and the resulting "worst case" distances are then connected to form a "coordination contour" around the Earth station. This process is used to eliminate from consideration all FS receivers outside of the coordination contour and, therefore, to reduce the number of detailed calculations that must be made to ensure that interference will not occur.

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[79] *See* FWCC Dec. 8 *Ex Parte* Letter at 2.

[80] *Compare* Letter from Raul Rodriguez, Counsel for MTN, to Marlene H. Dortch, Secretary, FCC IB Docket 02-10 (dated Dec. 8, 2004) (MTN Dec. 8, 2004 *Ex Parte* Letter), at 1 (arguing that despite the Commission's specific request for parties to provide examples of interference, no example of real or alleged ESV to FS interference appears in the record generated by the *ESV NPRM*) *with* FWCC Reply at n.15 (recounting a possible incident of ESV interference to FS communications in the vicinity of Newport News, VA that FWCC had placed in the record generated by the *Notice of Inquiry*).

[81] For instance, Inmarsat contends that this distance will "over-protect the majority of fixed links which operate in areas of more benign propagation characteristics and with less sensitive technical characteristics." Inmarsat Comments at 21. *Accord* MTN Comments at 19; Telenor Comments at 5. Indeed, in adopting a 300-km distance, the ITU used interference criteria under the worse case interference-to-noise ratio that must be met while the FS link is undergoing a 24 dB fade. A fade is a natural phenomenon that occurs occasionally within most fixed systems where the wanted signal undergoes a large drop in magnitude because of changes in atmospheric propagation. Significantly, when calculating the minimum distance from the coast in which an ESV could cause interference to a fixed receiver, the ITU took into account an FS receiver located at the low-water mark pointing directly out to sea. *See* ITU-R Rec. SF.1650.

[82] FWCC Reply at 24; Inmarsat Comments at 21. *See also* AAR Reply at 3; API Reply at 5; NSMA Reply at 2.

27. Coordination for ESVs differs from the standard coordination process for fixed Earth stations because the mobility of the ESV adds another dimension to the development of a coordination contour. Instead of developing a coordination contour from a single point, representing the location of a fixed Earth station, a contour must be drawn around the entire area in which an ESV is expected to travel. When traversing from open sea to inland waterways, large vessels are usually confined to known sea-lanes and channels. When the vessel is in a harbor area, it is confined to specific traffic lanes, turning areas and dock areas. These channels, sea-lanes, and dock areas that confine the vessel's motion are collectively the vessel's total operating area when it is near the coast.[83] This operating area encompasses all of the possible paths that the vessel may take while traveling between the ocean and the dock. The outer boundary of the operating areas is termed the "operating contour."

28. The ITU recommended the Composite Area (CA) and Critical Contour Point (CCP) methods to establish coordination contours around a vessel's operating contour.[84] Under the CA method, coordination contours are developed for every point on the vessel's operating contour and then combined to form a "composite coordination area."[85] The CCP method identifies the worst-case points on the vessel's operating contour, from the perspective of potential FS interference; develops a coordination contour around each of these critical points; and combines the individual coordination contours to create a composite coordination area.[86] Under both approaches, the individual coordination contours used to make up the composite coordination contour are calculated as though a fixed Earth station were located at the points of interest. The ITU is working on a third approach called the "Path Integration Approach," that takes the vessel's expected speed into consideration when determining the effect on the FS receiver.[87]

29. *Discussion.* The ITU coordination methods described above should prevent interference to FS operators. Specifically, through simultaneous coordination of all of the paths that the ESV might be expected to take, the ITU coordination methods should reduce the concerns flagged by FWCC that sharing the band with ESVs makes coordination difficult due to ESVs' mobile nature.[88]

30. Because the ITU has developed two different, but acceptable, approaches to coordinating ESVs and fixed services and, in fact, is working on developing a possible third approach, we allow the coordinating parties to agree on a particular coordination method.[89] We encourage ESV operators and

[83] At distances from the coast where these well marked deep-draft channels end, or if the vessel travels parallel to the coast, but within 200 km of the U.S. coastline or an offshore FS installation, an ESV operator will have to define the operational contour that encompasses all the areas that includes the possible paths the vessel will travel.

[84] *See* ITU-R Recommendation SF.1585; ITU-R Recommendation SF.1649.

[85] The sum of all of these individual coordination contours is known as the "Composite Coordination Area."

[86] *See* NSMA Comments at 8.

[87] *See* ITU-R SF.1649, Annex 3. In effect, this approach utilizes the length of time the vessel spends near the mainbeam of the FS antenna to determine the potential for unacceptable interference in the fixed system. Although this approach has potential, it has not been adopted at this point by the ITU as part of a recommended approach to determining the coordination contour for a vessel's operating area.

[88] FWCC Comments at 6.

[89] Rather than incorporate ESV coordination rules into Section 25.203 of our rules as discussed in the *ESV NPRM*, 18 FCC Rcd at 25276, ¶ 72, we rely on the coordinators to select the appropriate ITU method at the time of coordination. We emphasize that once a coordination contour or composite coordination contour has been determined around the vessels operating area, calculations must be done to determine if any fixed system within the contour will receive unacceptable interference from the ESV transmitter. If unacceptable interference is found, just (continued….)

frequency coordinators to utilize the CCP method for identifying those FS stations that potentially could receive interference from ESVs.[90] We prefer the CCP approach because it requires fewer computations than the CA method. In particular, the CCP approach identifies a relatively small set of critical geographic points in order to develop the composite coordination area.[91] As a result, the CCP method should be less costly to use. In addition, based on the record, the CCP method has proven to be reliable for analyzing potential harmful interference from ESVs. The NSMA endorses the CCP method and states that "all in-motion ESV frequency coordination notifications to date" have relied on this method.[92]

31. Although we decline to adopt a specific coordination method, we encourage ESV operators and frequency coordinators to coordinate ports, waterways and maritime channels cooperatively and perhaps collectively to ensure efficient use of the spectrum. Once an ESV assignment is coordinated relative to FS in a given area, ESV operators could then coordinate with one another as necessary to share the assignment in frequency, time, or both.[93] We envision the ESV operators working cooperatively to share and minimize the amount of spectrum needed to be coordinated in each port by informing the coordinators of the ESV technical parameters and the amount of spectrum needed for their fleets in each accessed port, and if appropriate, dividing the relevant costs among themselves.[94] The coordinators could then evaluate the needs of multiple ESV operators and notify the operators if mutually beneficial agreements were possible.

32. In defining the coordination area, we do not require coordinators to account for FS stations that may be installed offshore subsequent to coordination.[95] Such a requirement would not only be unduly burdensome for ESV operators attempting to coordinate, it is inconsistent with the normal coordination process which requires new entrants to protect incumbent users. Furthermore, setting aside spectrum for future stations would mean that some spectrum would lie fallow for potentially lengthy periods of time. Finally, our rules described below, which limit the amount of spectrum that can be coordinated for ESVs in one location, should adequately ensure that additional offshore FS stations can be coordinated into these bands in the future.[96]

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as in a standard coordination, the ESV operator will either have to avoid the FS frequency or negotiate with the FS operator to reach a mutual coordination agreement.

[90] *See ESV NPRM*, 18 FCC Rcd at 25278-79, ¶¶ 76, 77.

[91] The points selected satisfy one or all of the following criteria: (1) any point where the ESV route changes direction (termed a "breakpoint"); (2) points where any vector from an FS receiver antenna intercepts the operating contour; (3) points on the operating contour that are within 10 dB of the main beam of an FS antenna; and/or (4) any point on the operating contour from which the maximum horizon gain of the ESV antenna is directed toward an FS receiver.

[92] *See* NSMA Comments at 2, 8-9. Stratos also supports the CCP method. *See* Stratos Comments at 15.

[93] For this purpose, coordinators and ESV operators could establish a range of parameters, *e.g.*, "up to value x," or "not to fall below value y." This could allow ESV operators to establish a broadband "gateway" into each port, while establishing certainty among the coordinators, ESV operators, and incumbent FS licensees on each path's exact boundaries. This will also provide guidance to additional operators that subsequently attempt to utilize the same path into a port at values within the coordinated range.

[94] For example, recoordination of ports could be done at intervals to coincide with transponder contracts, *i.e.*, ESV operators could lease satellite transponders on a yearly basis at less expense than occasional use contracts for ships that will be using the satellite for most of the year.

[95] *But see* Stratos Comments at 16 (arguing that the Commission should account for future offshore FS stations).

[96] *See infra* Section III.B.2.f.

d. Public Notice of ESV Coordination

33. To ensure that coordination information is readily available to all interested parties, the details of the coordination shall be maintained and available at the frequency coordinator, and shall be filed with the Commission to be placed on Public Notice. 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 any objections are received to the coordination prior to the end of the 30-day comment period of the Public Notice, the licensee shall immediately cease operation of that particular station until the coordination dispute is resolved and the ESV licensee informs the Commission of the resolution.[97]

e. Interference Objective

34. *Background.* In the *ESV NPRM*, the Commission sought comment on whether to apply short-term or long-term interference objectives to ESVs in-motion.[98] An interference objective is a maximum permissible level of interference power density in a receiver that should not be exceeded for more than a specific percentage of time. The FS typically uses two different interference objectives: short-term and long-term. During the coordination process, these objectives, or any other interference objective that is acceptable to all parties, may be used. The goal of coordination is to ensure that the interference power density received by the fixed system is equal to, or less than, the interference objective.

35. In the case of ESVs, the short-term interference objective has been used to protect an FS receiver from the relatively high levels of interference power that may occur when an ESV passes through the main beam of a receiving FS antenna. Relatively high levels of interference power may also be received when an ESV passes close to the main beam axis of the FS receiving antenna. These instances of high levels of interference power experienced by the FS receiver are very short in duration, but have a cumulative effect over time. The percentage of time associated with the short-term interference objective is a measure of the maximum percentage of time the higher levels of interference power should be permitted. The ITU maintains that short-term interference power levels for analog FS systems should not be exceeded for more than 0.01% of the year or 53 minutes during a year.[99] The ITU uses a short-term interference objective of -131 dBW/4kHz (the current U.S. standard for earth station coordination) to protect analog FS systems.[100]

36. Long-term interference is caused by the increase in background noise from multiple noise sources that are actually in view of the FS antenna. This background noise reduces the FS fade margin, causing a decline in the FS performance. The ITU defines long-term interference as interference that exists under "normal conditions," that is, occurring for more than 20 percent of the year.[101] A long-term

[97] These procedures are modeled on the C-band small aperture terminal (CSAT) coordination public notice process, 47 C.F.R. § 25.115(c)(2)(iv).

[98] *ESV NPRM*, 18 FCC Rcd at 25279, ¶ 78.

[99] *See* ITU Radio Regulations, Appendix 7, Annex 7, Table 7b (WRC-03). The ITU maintains that short-term interference power levels for digital FS systems should not be exceeded for more than 0.005% of the time or approximately 26 minutes during a year. *Id.*

[100] The ITU uses a short-term interference objective of -103 dBW/MHz (equivalent to -127 dBW/4 kHz) for digital FS systems. *Id.*

[101] *See* ITU-R Recommendation SF.1006, § 2.1.

interference objective is designed to constrain new transmitting sources from adding to the total receiver noise floor to the point that unacceptable interference occurs. The ITU recommends a long-term interference criterion of -154 dBW/4kHz.[102]

37. The record shows a range of opinions with respect to the use of interference objectives. Some commenters favor the short-term interference objective[103] or believe that the Commission should impose both short-term and long-term interference objectives.[104] The NSMA states that proponents of either short-term or long-term interference objectives support a compromise that falls somewhere between the existing interference objectives.[105] According to the NSMA, the proponents for each objective performed extensive mathematical modeling to suggest a compromise figure, but declined to recommend one.[106] NSMA further states that the appropriate interference objective for dealing with ESV-FS coordination is being developed in the ITU-R. The NSMA notes that ESVs coordinators have been using the more conservative long-term interference objective of -154 dBW/4kHz, associated with 20% of the time, in order to avoid objections by some coordinators who oppose the short-term objective.[107] MTN proposes an alternate interference objective of -145 dBW/4kHz,[108] the same value the NSMA says was tentatively agreed to by experts as a long term objective,[109] but neither party has submitted any technical documentation supporting this value.

38. *Discussion.* In light of the comments provided, we decline to adopt a specific interference objective for ESV operations.[110] First, we agree that an alternative interference objective may be appropriate, but we do not have sufficient information in the record to determine what that objective should be. Second, in the future, an interference objective for ESVs may be determined by the ITU or by other active participants on this issue. Thus, we allow the NSMA and the industry to apply existing standards and to develop the appropriate interference objective for ESVs.[111] If the ESV and FS operators are unable to agree on a particular interference objective, the Commission may consider and exercise any appropriate action within its authority. In the meantime, we encourage the coordinators to continue their efforts on this matter because an agreement on the appropriate interference objectives would benefit all of the parties involved.

f. Spectrum and Satellite Limits

39. We adopt our proposal in the *ESV NPRM* to permit each ESV operator to coordinate 72 megahertz of spectrum in the 5925-6425 MHz band per coordination location, *i.e.*, 36 megahertz uplink

[102] *Id.* (providing parameters to calculate the maximum permissible interference levels).

[103] *See, e.g.*, Pinnacle Comments at 3-4.

[104] *See, e.g.*, FWCC Comments at 15.

[105] NSMA Comments at 10.

[106] *Id*.

[107] *Id*.

[108] MTN Comments at 20.

[109] *See* Letter from Mitchell Lazarus, Counsel for NSMA, to Marlene H. Dortch, Secretary, FCC, IB Docket 02-10, Attach. at 11 (dated Sept. 30, 2004) (NSMA Sept. 30, 2004 *Ex Parte* Letter).

[110] By "interference objective," we mean the long- and short-term interference criteria recommended by the ITU in ITU-R Recommendations SF.1650, SF.1006, and Appendix 7 of the ITU Radio Regulations, for FS coordination.

[111] NSMA Sept. 30, 2004 *Ex Parte* Letter at 11.

per satellite, using at most two satellites.[112] For example, if an ESV operator has three vessels that enter port in Honolulu, Hawaii at the same time, those vessels may utilize, collectively, no more than 36 megahertz uplink on each of two satellites.[113] We decline to grant C-band ESV operators ALSAT authority, which would allow those operators to access any U.S. satellite and non-U.S. satellites on the U.S. Permitted List.[114] Requiring ESVs to utilize no more than two satellites gives individual FS operators more opportunity to find available spectrum for FS operation because ESV operators will not coordinate the full geostationary satellite arc.

40. In addition, ESV operators, collectively, are limited to 180 megahertz of coordinated spectrum for all ESV operations in any given coordination area.[115] The purpose of the 180 megahertz limit is to further guarantee that spectrum is available to FS operators, and to ensure efficient use and sharing of the 5925-6425 MHz band. The 180 megahertz aggregate coordination limit involves two components. First, the total amount of spectrum coordinated by all ESVs at any point on a waterway is limited to 180 megahertz. Second, the aggregate amount of spectrum actually encumbered by ESV operations in an FS link path shall not exceed 180 megahertz.[116] Specifying an amount of spectrum that ESVs can collectively coordinate provides a satisfactory alternative to FWCC's request that all ESV providers operate off of the same two satellites and two transponders per satellite at each port.[117]

41. The two-satellite/36 megahertz per satellite coordination measures we impose on each operator, along with the 180 megahertz aggregate coordination limit, should give both the FS and ESV communities ample access to frequencies for their present and future needs. These measures will simplify sharing between FS and ESVs, and reduce the potential for harmful interference to FS. Further, these measures assure that ESVs encumber only a portion of the C-band spectrum, guaranteeing that C-band spectrum will be available for future FS entry. ESV commenters generally seem willing to operate

[112] *ESV NPRM*, 18 FCC Rcd at 25275, ¶ 69. This proposal derived from our query on whether ESVs could operate under conditions that were similar to CSATs. *See ESV NPRM*, 18 FCC Rcd at 25279-80, ¶ 79. We clarify that ESV operators may use the entire C-band beyond the 200 km coordination distance, *i.e.*, in open ocean areas beyond the minimum distance where terrestrial coordination is not an issue. *Accord* Stratos Comments at 13.

[113] ESV operators will not be allowed to coordinate all 72 megahertz for use with a single satellite, as requested by Stratos. Stratos Comments at 14.

[114] *See ESV NPRM*, 18 FCC Rcd at 25283, ¶ 86. Some commenters filed in support of ALSAT authority in response to the *ESV NPRM*. *See, e.g.*, Broadband Maritime Comments at 6 (supporting ALSAT authority because ESV operators may renegotiate transponder leases and change satellite providers to obtain the best price for transponder capacity without filing an application for each satellite change); PanAmSat Comments at 5 (claiming that ESVs qualifying for routine processing should receive ALSAT authority).

[115] *See ESV NPRM*, 18 FCC Rcd at 25281-82, ¶ 83 (seeking to develop alternatives that might protect FS from harmful interference and still permit operation of ESVs in the C-band).

[116] For example, a new fixed system receiver is required in a location bordered by multiple waterways. ESVs have coordinated on each of those waterways in a manner that the amount of ESV spectrum coordinated on each waterway is less than 180 megahertz. Inadvertently, however, in the fixed service link path, the total spectrum encumbered by ESVs is greater than 180 megahertz. In this case, the FS coordinator and the relevant ESV coordinator(s) should negotiate an adjustment to the ESV coordination(s) as necessary to accommodate the FS and ESV operators. In the unlikely event that the parties are unable to work out an adjustment through the coordinators, then the Commission will work to resolve the dispute in accordance with the underlying purpose of the 180 megahertz coordination limit.

[117] *See* FWCC Dec. 8, 2004 *Ex Parte* Letter at 2.

within these limits.[118] In addition, limiting the number of satellites should allow ESVs to operate geographically closer to FS operations than if ESV operators had full geostationary satellite arc access. Further, these limitations should ease the coordination process for ESV operators by reducing the coordination area. If ESVs have significant future growth, we would expect the growth to occur in the Ku-band frequencies with the regulatory structures set forth in today's *Order*. Nonetheless, if ESV operations also expand in the C-band, the Commission would work to accommodate this growth in the future.

42. Given that the spectrum and satellite limits we adopt above should satisfy the needs of ESV operators and sufficiently protect FS operations, we will not place additional restrictions on the ESV operators' ability to negotiate satellite capacity or spectrum with satellite operators. First, we decline to limit ESV operations to specific portions of the C-band. In the *ESV NPRM*, the Commission requested comment on whether ESV operators should have access only to specific portions of C-band spectrum and whether FS operators should be required to avoid that spectrum.[119] We agree with those commenters who argue that the Commission should not require ESV operators to utilize specific frequencies or restrict ESV operators to a specific block of frequencies at the C-band.[120] For example, MTN argues that ESV operators need access to any portion of the C-band in order to coordinate with FS.[121] Inmarsat concurs, claiming that limiting ESVs to a small portion of spectrum could decrease the number of FSS operators available to provide capacity, thereby subjecting ESV operators to higher rates for the transponders operating in these frequency blocks.[122] Thus, restricting ESV operators to specific frequency blocks potentially increases costs for ESV operators and could complicate the coordination of ESV services in congested ports and waterways.

43. Second, we agree with commenters who argue that the Commission should not require ESV operators to use contiguous blocks of spectrum.[123] Requiring ESV operators to utilize a contiguous block of 36 megahertz per satellite likely would limit their ability to coordinate small amounts of spectrum where necessary, which would benefit neither ESVs nor FS operators.

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[118] *See* Inmarsat Comments at 19; *but see* MTN Reply at 10 (arguing that, although it can accept the spectrum limitation, it fails to understand the need for the limitation) *and* SES Americom Comments at 3-5 (opposing the proposed spectrum limit in the C-band downlink).

[119] *ESV NPRM*, 18 FCC Rcd 25275, ¶ 69.

[120] *See, e.g.*, MTN Comments at 16-17; Stratos Comments at 13; Telenor Comments at 8 (stating that it would not oppose the limitation as long as it applies per vessel and not per service provider); Telenor Reply Comments at 9.

[121] MTN Comments at 17. MTN also argues that the Commission should not require ESV operators to use contiguous spectrum because spectrum availability varies at each port and protecting FS necessitates the use of non-contiguous spectrum. *Id.* at 16.

[122] Inmarsat Comments at 19-20. Inmarsat contends that, if the Commission does limit ESV operators to a specific C-band portion, then new FS links should not be allowed there. Inmarsat Comments at 20.

[123] MTN Comments at 16. The requirements we adopt here are substantially similar to the requirements for VSAT networks operating in the C-band. *See FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum*, IB Docket No. 00-203, First Report and Order, FCC 01-177, 16 FCC Rcd 11511, 11518-19 ¶¶ 13-17 (2001) (*CSAT Order*).

44. Finally, we reject a proposal by certain commenters to require ESV operators to coordinate only the spectrum they will actually use.[124] In 2000, the Commission rejected a similar FWCC proposal to require FSS earth station applicants to demonstrate actual need for spectrum in the C-band.[125] In doing so, the Commission reasoned that earth station licensees need "the flexibility to change transponders or satellites on short notice, and without having to be re-licensed by the Commission, to meet changing operational requirements."[126] Indeed, the Commission rejected FWCC's proposal even though FSS had full-band, full geostationary arc access in the C-band.[127] In this case, ESV operators must comply with satellite limits, including an aggregate 180 megahertz industry-wide coordination limit, unlike FSS earth stations in the C-band. As a result, FS operators will receive even more protection from ESVs than they receive from FSS.

3. ESV Power Limits Toward the Horizon and Minimum Antenna Elevation Angle

45. We adopt the ITU limits for maximum ESV e.i.r.p. spectral density towards the horizon of 17 dBW/MHz and maximum e.i.r.p. towards the horizon of 20.8 dBW (collectively known as "ESV horizon limits").[128] To ensure compliance with these limits, the ESV network must automatically terminate transmissions if an individual ESV exceeds the e.i.r.p. or e.i.r.p. spectral density towards the horizon limits we adopt today.[129] We find that these limits will provide more protection for FS than a

[124] FWCC Comments at 13; NSMA Comments at 17; Pinnacle Comments at 3. FWCC adds that ESV operators should be limited to the azimuths and elevations needed to access the satellites. FWCC Comments at 12-13; FWCC Reply at 20.

[125] *FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum*, IB Docket No. 00-203, Notice of Proposed Rulemaking, FCC 00-369, 15 FCC Rcd 23127, 23144-47 ¶¶ 38-42 (2000).

[126] *Id.* at 23145-46 ¶ 40. Moreover, the Commission stated "that FWCC's proposal would be impractical to implement," explaining how FSS earth station applicants would need to contract for satellite frequencies "although at the time it would be unclear whether the applicant in fact could coordinate the reserved spectrum." *Id.* at 23146 ¶ 41.

[127] The Commission proposed, however, to adopt a new procedure in which the FSS earth station operator that denies a coordination request from an FS operator would need to demonstrate to the frequency coordinator: (1) actual current and recent use of the requested spectrum; and (2) any immediate use of the requested spectrum. *Id.* at 23150, ¶ 53. In a subsequent order, the Commission declined to adopt this proposal on the grounds that insufficient information was on the record to adequately address the issues, noting that both FS and FSS operators rejected the proposal to require FSS operators to demonstrate actual use in certain situations. *See FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum*, IB Docket No. 00-203, Second Report and Order, FCC 02-17, 17 FCC Rcd 2002 (2002) (*CSAT Second Order*), *cited in* SES Americom Reply at 4-5.

[128] ITU-R Resolution 902 (WRC-03) Annex 2. We note that, in bands shared co-equally with the FS, the ITU has additional limits on the e.i.r.p.-density transmitted towards the horizon by an Earth station and the minimum Earth station antenna elevation angle. Specifically ITU RR 21.8 specifies that, between 1 GHz and 15 GHz, the e.i.r.p. transmitted towards the horizon by an Earth station shall not exceed 40 dBW/4 kHz for antenna elevations of zero degrees or less. Assuming a flat spectrum, this limit is equivalent to an e.i.r.p. density of 64 dBW/MHz which is 47 dB higher than the limit for C-band ESVs. ITU RR 21.14 limits transmitting Earth station antenna to a minimum elevation angle of three degrees to be used for international coordination except when agreed otherwise by the concerned administrations. The ESV horizon e.i.r.p.-density limits perform the same service as ITU RR 21.14 by limiting the power transmitted in the direction of potentially affected FS receivers. Therefore, there is no need to also impose ITU RR 21.14 on ESVs.

[129] *See* Appendix B (new Section 25.204(b)).

limitation on the minimum elevation angle of an ESV transmitter. Based upon the off-axis e.i.r.p.-density limits adopted below, we determine that the e.i.r.p. density transmitted 10 degrees from the mainbeam of the ESV antenna could be greater than the ESV horizon limits. Because the horizon limits produce a horizontal transmitted power density that is lower than the power obtained by specifying a minimum elevation angle of 10 degrees, it is not necessary to adopt a minimum elevation angle limit. As a result, FS will receive more protection from the ESV horizon limits than from the 10 degree minimum elevation limits. Additionally, we note that, under Section 25.205 of our rules, all FSS Earth stations, including ESV antennas, are required to operate with an elevation angle of 5 degrees or greater unless the applicant demonstrates that a lower elevation angle is needed or that the antenna will be pointed away from the land masses.[130] We add that even if an ESV applicant applies for, and provides a showing for the use of an elevation angle lower than 5 degrees, the ESV must still meet the ESV horizon limits.[131]

46. In addition, the ESV horizon limits are an important element in protecting the FS from interference. The ESV network shall be capable of muting the ESV transmitter if the ESV horizon limits are exceeded. Specifically, if the ESV horizon limits are exceeded, the transmissions from the ESV must be automatically shut-off by the ESV network and should not be able to be overridden by an individual on the vessel.

4. Additional Measures to Protect FS Operations

47. Although coordination and interference criteria should significantly protect FS, the Coordination Approach we adopt today includes additional measures to protect FS once interference has already occurred, or in the event that the ESV travels outside of the coordinated area. Given the mobile nature of ESVs and the larger area needed for coordination, we require ESV operators to comply with some additional measures to protect FS operations. Specifically, we require C-band ESV operators to: (1) maintain vessel tracking data for one year; (2) supply the vessel tracking data to the frequency coordinator, FS operator, or the Commission within 24 hours upon request;[132] (3) have a point of contact within the United States available 24 hours a day, 7 days per week; and (4) automatically shut-off ESV operations (either at the ESV network operation center or at the ESV) should the vessel travel outside of the coordinated area within the 200 km coordination distance.

48. *Vessel Tracking Data.* We adopt the Commission's proposal in the *ESV NPRM* to require ESV operators to maintain detailed information regarding each ESV's operations.[133] Specifically, ESV network operators must maintain information on the satellite(s) that each vessel uses, operating frequencies and bandwidth used, the time of day, the vessel location (*i.e.*, longitude and latitude), the country of registry of each vessel, and a point of contact for any foreign administration of vessel registration, if applicable.[134] Although MTN supports the retention of vessel tracking data for 90 days,[135] we are persuaded by FWCC that ESV operators should be required to maintain this data for one year.[136] Retaining this data for one year provides FS operators and frequency coordinators more time to

[130] 47 C.F.R. § 25.205.

[131] *See* Appendix B (new Section 25.204(h)).

[132] *ESV NPRM*, 18 FCC Rcd at 25286, ¶ 95; *see also* Stratos Comments at 9.

[133] *See ESV NPRM*, 18 FCC Rcd at 25275, ¶ 70. *Accord* Broadband Maritime Comments at 4.

[134] *See* Appendix B (new Section 25.221(c)(1)-(2)).

[135] *See* MTN Comments at 15, 30 n.79; *see also ESV NPRM*, 18 FCC Rcd at 25275, ¶ 70.

[136] *See* FWCC Comments at 12.

investigate an incidence of interference, including the ability to search for patterns of interference as well as to review a complete cycle of annual propagation effects.

49. *24-Hour Response.* In the *ESV NPRM*, the Commission proposed that ESV operators provide the vessel tracking data to the Commission or frequency coordinator within 72 hours upon request.[137] In general, commenters support that proposal.[138] Because ESV operators should have vessel tracking data readily available, requiring ESV operators to provide a response to the frequency coordinator, FS operator, or the Commission within 24 hours is reasonable. In addition, a shorter response time will help to ensure that the FS operators are able to resolve interference problems more quickly, and potentially more effectively, than if they had to wait 72 hours for such information. We also note that allowing FS operators to request this information directly from ESV operator should facilitate investigations of harmful interference.

50. *24-Hour Contact*. We also require ESV operators to maintain a contact in the United States 24 hours a day, 7 days a week. If ESV operators were only accessible during weekday business hours, it could unnecessarily delay an investigation of interference. This requirement will facilitate the investigative process for FS operators. According to FWCC, ESV operators have consistently failed to provide information that would allow FS operators to investigate incidences of interference.[139] Under today's decision, ESV operators are required to provide information such as vessel tracking data in an expeditious manner, and thus FS operators should be able to obtain the data needed to identify and eliminate interference. As a related matter, we also require ESV operators to provide such contact information to the Commission, and the Commission will post the information on its website.

51. *Automatic Shut-Off.* Should an ESV travel outside the coordinated area, the likelihood of harmful interference to FS operations could substantially increase. Therefore, we adopt, with some modification, the Commission's proposal in the *ESV NPRM* to require C-band ESV networks to be able to shut-off automatically ESV operations (either at the ESV network operation center or at the ESV) if an ESV moves outside the coordinated area within the 200 km coordination distance.[140] We note that, depending on the coordination method used, the vessel speed could be a significant component in the coordination. When speed is used as a factor in the coordination, we require automatic shut-off when the vessel drops below the coordinated speed. We expect the frequency coordinator to decide whether a particular coordination warrants automatic shut-off when the vessel drops below a certain speed. In addition, we understand that the speed of the vessel would normally vary within different parts of the coordinated area and that the coordination would be based on the slowest expected speed in a given waterway. If this is the case, we expect the ESV operator to implement the capability to shut off ESV transmissions automatically when the vessel drops below the coordinated speed. Like the coordination requirement, an automatic shut-off requirement will be a useful tool in preventing interference to FS operators.

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[137] *See ESV NPRM*, 18 FCC Rcd at 25286, ¶ 95.

[138] *See, e.g.*, FWCC Comments at 3.

[139] *See* FWCC Reply at 9-10; Letter from Mitchell Lazarus, Counsel for FWCC, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 02-10, Attach., Earth Station Vessels, Slide 6 (dated Dec. 6, 2004). According to FWCC, "[a]n ESV could cause interference sufficient to disrupt a vital FS communications link, only to move on and never be traceable as the source of the interference." FWCC Comments at 6. MTN counters that FWCC has never directly contacted MTN to request information about a potential case of interference to a FS link in the 6 GHz band. *See* MTN Dec. 8, 2004 *Ex Parte* Letter at 1.

[140] *See ESV NPRM*, 18 FCC Rcd at 25284, ¶ 88. In the *ESV NPRM*, we did not specify that the automatic shut-off would occur at the ESV network operations center.

52. We agree with FWCC to the extent that it argues that there should be an automatic shut-off mechanism if the ESV moves outside the coordinated area or falls below the coordinated speed.[141] However, we decline to adopt FWCC's proposal that each ESV be equipped with a Global Positioning System (GPS) based subsystem capable of automatically ceasing transmissions.[142] Instead, we require that the automatic (*i.e.*, not manual) shut-off capability must be under the control of the ESV network and must not be subject to manual override by an individual on the vessel. By giving ESV operators the discretion to have the automatic shut-off capability at their network operations center or on the vessel, ESV operators can implement this requirement flexibly without making major changes to their systems.[143]

53. *Real-Time Data Access*. We decline to allow FS operators to have real-time access to ESV information, including ESV vessel itinerary, satellites, frequency, and bandwidth, as proposed by FWCC,[144] particularly given our decision to require that a point of contact be available at all times. Telenor proposes, as an alternative, to have two on-line databases that are automatically updated.[145] We decline to adopt Telenor's proposal. The additional measures discussed above, such as a vessel tracking requirement, are less complicated and more reliable and efficient than Telenor's proposal.

54. *Antenna Size Limits*. As discussed further below, we do not adopt antenna size limits for C-band ESV operations.[146] We recognize that the ITU restricted antenna size in order to limit the number of vessels capable of installing ESVs, thereby reducing the potential for harmful interference to FS operators.[147] Given the mature development of the FS systems in the 6 GHz band, we agree with the ITU's justification for constraining the number of ESVs. To achieve this same purpose, however, we adopt a coordination requirement,[148] off-axis e.i.r.p.-density limits for ESVs,[149] and a vessel gross tonnage limit.[150] We find that these restrictions will significantly decrease the number of operational ESVs and accomplish the same goals as the ITU antenna size limitations.

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[141] *See, e.g.*, FWCC Reply at 3-4.

[142] *See, e.g.*, FWCC Comments at 3, 12; Letter from Mitchell Lazarus, Counsel, FWCC, to Marlene H. Dortch, Secretary, FCC, IB Docket 02-10 at Slide 7 (dated July 29, 2004). *See also* American Petroleum Institute Reply at 4; Association of American Railroads Comments at 3.

[143] Imposing an automatic shut-off requirement at the ESV is overly burdensome and unnecessarily expensive. *See* Pinnacle Comments at 5; Schlumberger Comments at 10; MTN Reply at 11; Stratos Reply at 8-9.

[144] *See* FWCC Comments at 3. *See also* Stratos Comments at 9 (arguing that such information could be made available on a confidential basis); Telenor Comments at 8-9; *ESV NPRM*, 18 FCC Rcd at 25286, ¶ 95.

[145] One database, which would be accessed by ESV operators, would contain data regarding specific FS frequencies being used at certain locations. The second database would contain particular ESV frequencies for vessels operating in a specific region, as opposed to a specific location and would be used by FS operators to investigate an incidence of interference. Telenor Comments at 9.

[146] *See infra* ¶ 56.

[147] *See* ITU-R Resolution 902 (WRC -03) considering (j).

[148] *See supra* Section III.B.2.

[149] *See infra* Section III.B.5.a.

[150] *See infra* ¶ 61.

5. Technical Requirements for Protecting Fixed-Satellite Operations

a. Off-Axis E.I.R.P.-Density Limits and Associated Rules

55. In order to protect C-band fixed-satellite operations from harmful interference, we adopt off-axis e.i.r.p.-density limitations on co-polarized transmissions along the geostationary arc that are in accordance with the two-degree spacing rules.[151] The ITU placed off-axis e.i.r.p.-density limits on ESVs operating in the 5925-6425 MHz band.[152] However, the ITU limits are not consistent with the Commission's two-degree spacing rules, which are designed to protect FSS satellites spaced about two degrees apart in orbit along the geostationary arc. The limitations we set forth today are a direct result of combining Section 25.209, which sets forth antenna envelope limitations, and Section 25.212(d), which sets forth the constraints on power density delivered to the antenna.[153] The result of this combination is a constraint on off-axis e.i.r.p.-density needed to protect other FSS systems in the geostationary satellite orbit from co-polarized signals. The off-axis e.i.r.p. limits for ESV transmitters operating in the C-band are:[154]

Maximum e.i.r.p. Density			Off-Axis Angle
26.3 – 25log(θ)	dBW/4kHz	for	1.0° <= θ <= 7°
5.3	dBW/4kHz		7° < θ <= 9.2°
29.3 – 25log(θ)	dBW/4kHz		9.2° < θ <= 48°
-12.7	dBW/4kHz		48° < θ <= 180°

Where:
θ: is any angle in degrees from the axis of the main lobe along the geostationary arc.

56. Because we have adopted off-axis e.i.r.p.-density limits to protect FSS satellites, we decline to adopt the Commission's proposal in the *ESV NPRM* to require C-band ESV networks to utilize an antenna that is 4.5 meters or greater in diameter.[155] The off-axis e.i.r.p.-density limits may be met either

[151] *See supra* Section III.A.

[152] ITU-R Resolution 902 (WRC-03) Annex 2.

[153] *See* 47 C.F.R. §§ 25.209, 25.212(d).

[154] The limitations developed are only applicable for digital traffic. Because commenters have only discussed digital traffic, we do not find it necessary to develop rules for analog ESV traffic and will not be implementing analog service rules. The off-axis e.i.r.p.-density limits listed here pertain to emissions from a single transmitter if the selected modulations permit one carrier per channel at the satellite receiver. If an ESV operator chooses to implement a modulation technique, such as CDMA, that can operate with multiple co-frequency transmissions from different vessels being simultaneously received at the same satellite, the limiting off-axis power-density would then be determined by the aggregate power received at the neighboring satellites. That is, if "N" ESV transmitters were each operating on the same frequency channel, to the same satellite, at the same time, the e.i.r.p.-density limit on each individual transmitter would be reduced by a factor of 10*log(N), in dB. For example, if five vessels were equipped with CDMA ESV transmitters all communicating to the same satellite, in the same uplink bandwidth, the e.i.r.p.-density of the individual transmitters would be reduced by a factor of 10*log(5) or 7.0 dB.

[155] *See ESV NPRM*, 18 FCC Rcd at 25283, ¶ 86. Specifically, the Commission proposed that ESV network applications or applications for hub earth stations utilizing the 6 GHz band would be routinely processed for license approval if they met the following criteria: (1) 4.5 meter antennas or larger that are consistent with Section 25.209; (2) power levels consistent with Sections 25.211(d) and 25.212(d); (3) antenna pointing accuracies of +/- 0.2 degrees or better; and (4) completed frequency coordination, where appropriate. *ESV NPRM*, 18 FCC Rcd at 25284-85, ¶ 91. The Commission noted that if ESV operators used smaller antennas or different power levels, they would be (continued….)

through the use of a sufficiently large antenna, with an appropriate input power density, or by the use of a smaller antenna by reducing the input power density to the antenna. Because it is possible to meet the off-axis e.i.r.p.-density limits by using an antenna smaller than 4.5 meters for certain ESV-supplied services and, because we will permit as much flexibility as possible to the ESV operator, we refrain from adopting a minimum antenna size limit for ESVs.

57. As stated, the limit discussed immediately above addresses a limit on off-axis e.i.r.p.-density for co-polarized signals transmitted towards the geostationary orbit. Additional rules are required to fully protect all C-band FSS operations. These additional rules include: off-axis e.i.r.p.-density limits for co-polarized signals in directions other than along the geostationary orbit; off-axis e.i.r.p.-density limits for cross-polarized signals; and limits on the sidelobe structure of the ESV antennas. All of these limits have existing counterparts in Part 25 that are expressed as antenna envelope limitations and constraints on power-density delivered to the antenna. The corresponding rules we adopt for ESVs in the C-band are contained in new Section 25.221.[156] To assist in identifying potential interference from ESV operations, FSS operators can request vessel tracking data from the ESV operator's point of contact.[157]

b. Pointing Accuracy

58. Consistent with the ITU pointing accuracy limitation, and for the protection of neighboring FSS satellites, we require C-band ESV operators to maintain a peak tracking error of 0.2 degrees for all antennas within their licensed networks. Additionally, if the ESV antenna drifts more than 0.5 degrees from the intended satellite, the ESV terminal on the vessel must cease transmitting automatically until the ESV antenna is, once again, pointing to within 0.2 degrees of the intended satellite.

6. Vessel Size and Geographic Limitations

59. In the *ESV NPRM*, the Commission stated that vessels following the Coordination Approach would need to be 300 gross tons or larger, consistent with ITU-R JWP-4-9S Recommendations.[158] Vessel size may restrict the vessel's ability to access certain waterways as well as mitigate the impact of ESV operations on FS operations.[159] The Commission also sought comment on whether C-band ESV operations should be allowed in bodies of water, such as in the Great Lakes or large rivers in the United States, in addition to oceans.[160]

60. Some commenters support our proposal to adopt a minimum vessel size of 300 gross tons.[161] Other commenters urge the Commission to adopt a minimum vessel size of 5,000 gross tons because it would ensure that ESV operations remain on deep draft vessels that are restricted to coastal waters or

(Continued from previous page)
required to file an initial lead application that included technical analysis demonstrating that adjacent satellite operators that could be impacted would not experience harmful interference in accordance with the off-axis e.i.r.p.-density requirement. *Id.*

[156] *See* Appendix B (new Section 25.221(a)(1)-(4)).

[157] *See supra* ¶ 50.

[158] *ESV NPRM*, 18 FCC Rcd at 25275, ¶ 70.

[159] *Id*.

[160] *Id*. at 25283-84, ¶ 87.

[161] *See, e.g.*, Inmarsat Comments at 20; MTN Comments at 21.

major waterways.[162] These commenters are concerned that, without a larger vessel size requirement, the ESV operators could access the C-band while traveling on inland waterways.[163] For example, King County, which is located in the Puget Sound region of the State of Washington, explains that its public safety and service agencies rely on voice and data radio systems that are linked together by FS systems located in the 6 GHz band.[164]

61. *Vessel Size.* We adopt 300 gross tons as the minimum vessel size for ESVs utilizing the C-band, based on the ITU's recommendation to place C-band ESVs on vessels that are greater than 300 gross tons. A minimum vessel size will protect FS operations from interference by reducing the number of ESVs that could operate in the C-band. We decline, however, to adopt a larger vessel size, such as FWCC's proposal for a 5,000 gross ton minimum. Although a 300 gross ton minimum allows more ESV operators to access the C-band than a 5,000 gross ton minimum, we agree with commenters that a 5,000 gross ton requirement is not needed to protect FS operations.[165] Moreover, FWCC acknowledges that this restriction would be less critical if the Commission restricted ESV access to spectrum,[166] and we have done so by limiting ESV operators to 180 megahertz of coordinated spectrum at any given coordination area.[167]

62. The other C-band restrictions set forth in this *Report and Order* should limit the number of ESVs in the C-band, in addition to protecting FS from harmful interference by ESVs operating in that band. For example, some ESVs may not be willing to incur the costs of compliance with the other C-band requirements. Those operators may, instead, opt to use Ku-band. The remaining ESV operators will coordinate and comply with the other C-band requirements, thereby helping to ensure that FS operators are protected from harmful interference.

63. *Geographic Limitations.* We acknowledge that vessels that are 300 gross tons or larger could access inland waterways and harbors. We decline, however, to impose any geographic limitations on ESV operators utilizing the C-band, as long as they are able to satisfy the limitations we place on them in this *Order*. We believe that limiting access to certain waterways could be unnecessarily restrictive for ESV operators. For example, certain ESV operators that utilize the C-band may already be operating or plan to operate on inland waterways. If we were to prohibit ESV C-band users from traveling on inland

[162] FWCC Comments at 13-14. *See also* APCO Comments at 1-2; API Reply at 3-4. In particular, FWCC claims that the proposed limit of 300 gross tons would result in the dramatic expansion of ESV use by smaller ships capable of traveling through inland waterways. FWCC Comments at 13 (claiming that, as a result, the potential for interference to FS operations would increase to unacceptable levels).

[163] *See, e.g.*, FWCC Comments at 13-14; King County Comments at 1-2.

[164] King County Comments at 1. King County contends that identifying and resolving interference in the C-band could be difficult because state and local government agencies do not have the time or the equipment needed to perform these tasks. King County Comments at 2. Broadband Maritime disagrees with King County, claiming that even though ESV operators have been operating in the Puget Sound for several years, King County fails to cite a single reported case of harmful interference to FS operations. Broadband Maritime Reply at 3. Although Broadband Maritime contends that there have been no claims of interference from FS operations in the Puget Sound, we decline to draw a conclusion as to whether ESVs have previously caused interference to the FS operations.

[165] MTN Reply at 11 (stating that this requirement is "patently unnecessary given the routine manner in which 'in motion' ESVs can be identified"); Stratos Reply at 10 (stating that this size is unwarranted). *See also* Intelsat Comments at 6-7 (stating that coordination is the most effective means for protecting FS).

[166] *See* FWCC Dec. 8, 2004 *Ex Parte* Letter at 2.

[167] *See supra* ¶¶ 40-41.

waterways, we could inadvertently prohibit access to certain ports that are accessible only through an inland waterway. Moreover, inland waterways will more likely be congested from a communications perspective, so there should be a natural incentive for ESV operators to use the Ku-band. If there is spectrum available in the C-band, however, it would be inefficient from a spectrum management perspective not to let ESV operators coordinate use of that spectrum, consistent with the conditions outlined herein.

64. In addition, we are not persuaded by King County's contention that ESV operators should not be allowed on inland waterways because, even if ESV operators were required to comply with C-band requirements such as coordination, harmful interference may still occur to its critical public safety operations.[168] Although interference-free operations may not be guaranteed, we are satisfied that the measures we adopt today will substantially reduce the risk of harmful interference to FS on inland waterways. Thus, if ESV operators can comply with the C-band requirements designed to protect FS operations, they may utilize the spectrum in the C-band, regardless of geographic location.

65. We also disagree with FWCC's contention that the availability of terrestrial-based broadband for smaller vessels traveling through inland or "close-in coastal waters" merits prohibited ESV use in these areas.[169] Commission policy is to promote competition wherever possible. FWCC's line of reasoning contradicts this policy by limiting consumer choice. In addition, FWCC fails to consider that this option may be less convenient for certain vessel operators. For example, a vessel may routinely access both inland waterways and the ocean, and terrestrial services would not provide coverage for the vessel as it traveled the open sea.

66. We acknowledge NSMA's concern that coordinating on inland waterways and certain coastal waters may pose a challenge in terms of identifying the boundaries in which vessels travel. According to NSMA, NOAA maps set forth the "deep draft" channels or sea lanes that assist in identifying the potential areas that in-motion vessels could occupy for the purposes of interference analysis.[170] To the extent that these paths are not identifiable in inland waterways, ESV operators will need to create "maps" of their planned routes and boundaries in which their vessels will travel, and use those maps as a standard during the coordination process.

7. The Non-Coordinated Approach

67. We decline to adopt the Non-Coordinated Approach that the Commission proposed in the *ESV NPRM*. Under the Non-Coordinated Approach, ESV operators would not be required to coordinate, but would be subject to additional requirements and have fewer benefits than coordinated ESV operators, such as a two-year license term.[171] We find that this approach would not adequately protect FS operations because, unlike coordination, it does not effectively prevent interference from happening.[172]

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[168] *See* King County Comments at 2.

[169] FWCC Reply at 23; *see also* King County Comments at 1-2.

[170] *See* NSMA Comments at 6.

[171] *See ESV NPRM*, 18 FCC Rcd at 25273-25275, ¶¶ 63-68. In comparison, the Commission proposed a fifteen-year license term for coordinated ESV operators. *See id.* at 25275, ¶ 70.

[172] *See, e.g.*, FWCC Reply at 14 (stating that "[t]he measures proposed for the non-coordinated operation merely facilitate identification of the offending vessel and *only after the interference occurs*."); NSMA Comments at 16 (stating that unacceptable interference may be "only potentially correctable on a post facto basis via an interference complaint"); Pinnacle Comments at 2 (stating that the Non-Coordinated Approach "represents an unnecessary risk to microwave operations").

The NSMA contends that the Non-Coordination Approach, even with the additional conditions proposed, would not be sufficient to protect FS operations.[173] In this Order we have adopted an approach that emphasizes prevention of interference for ESV use of the C-band, and that prevention is achieved only through coordination.

68. In support of the Non-Coordinated Approach, Broadband Maritime suggests that the FS would not suffer from interference if a number of stringent limits were placed on non-coordinated ESV operations, such as a minimum antenna elevation angle of 20 degrees, a more constraining limit on power emitted towards the horizon than the ITU limit provided in Resolution 902, and a 300 kHz limit on the bandwidth of the ESV transmit signal.[174] We decline to create a separate licensing regime involving non-coordination based on factors essentially tailored for a single operator. First, while these limits may reduce the probability of interference to the FS as compared to not imposing such limits, they do not effectively prevent interference. Second, Broadband Maritime's suggested limits do not analyze the worst case for FS and uses atypical FS system parameters.[175] For example, if a Broadband Maritime ESV were transmitting using the limitations it has put forth, interference to FS would be possible during a FS system fade.[176] Frequency coordination, on the other hand, takes the fading phenomenon into account in determining the amount of interference power a fixed system will receive from an FSS earth station, and, therefore, is a safer approach to eliminating the possibility of interference. Moreover, we find Broadband Maritime's suggested limitations are too constraining to form the basis for a licensing approach to address the entire ESV industry.[177]

69. Finally, we are not persuaded by commenters' arguments that coordination would be impractical and too costly for ESV operators that infrequently visit the same U.S. ports.[178] For example, Telenor argues that both a Coordination and a Non-Coordination Approach are necessary for those ESV operators finding the Coordination Approach "difficult if not impossible."[179] We find that the benefits of the Coordination Approach to ESV operators (*i.e.*, giving them a right to operate in the coordinated spectrum on a primary basis) outweigh the burdens cited (*i.e.*, additional costs or work). Indeed, ESV operators using ports infrequently may be able to find methods for reducing coordination costs, such as making arrangements with other operators to share facilities that fall within existing coordination agreements.[180] Given the risk of interference to FS and lack of benefits for ESV operators under the Non-Coordinated Approach, we conclude that ESV operators should coordinate or, alternatively, consider operating in the Ku-band for which we adopt less stringent restrictions.

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[173] NSMA Comments at 16.

[174] *See* Letter from Eliot J. Greenwald, Counsel, Broadband Maritime, to Marlene H. Dortch, Secretary, FCC, IB Docket 02-10, at 1-2 (dated Nov. 11, 2004).

[175] *Accord* Letter from Mitchell Lazarus, Counsel, FWCC, to Marlene H. Dortch, Secretary, FCC, IB Docket 02-10 at 1, Attachment (dated Nov. 19, 2004).

[176] *See supra* footnote 81 (defining "fade").

[177] For example, a 20-degree minimum elevation limit would exclude vessels from operating in most of Alaska, and would significantly limit the satellites available from New England ports. Similarly, the 300 kHz bandwidth limit would allow an ESV system to provide only voice and relatively slow internet services, rather than the broadband technologies envisioned by our action today.

[178] *See* Broadband Maritime Comments at 3; Broadband Maritime Reply at 5; Telenor Reply at 8-9.

[179] Telenor Reply at 8-9.

[180] *See supra* ¶ 31 (discussing cooperation among ESV operators to accomplish coordination).

8. Regulatory Status for ESVs in the C-Band Uplink (6 GHz Band)

70. *Background.* In the *ESV NPRM*, the Commission sought comment on the regulatory status (*i.e.*, primary, secondary) that should be assigned to ESVs utilizing the C-band.[181] Specifically, the Commission proposed to adopt domestic rules authorizing ESVs to operate in the C-band on a non-harmful interference basis (NIB) so that FS operations in that band would be protected.[182] The Commission also sought comment on whether to assign a different regulatory status for ESV operations, such as when ESVs were not in motion.[183] Some commenters propose that if ESVs coordinate their operations with terrestrial service systems, the Commission should assign primary status to ESVs.[184] Once coordination is achieved with an ESV, these commenters see no need to assign NIB status.[185] FWCC and Stratos support the licensing of ESVs on a NIB basis, whether or not they coordinate. FWCC claims that FS, as the incumbent, is entitled to full protection.[186] FWCC also contends that assigning primary status for coordinated ESVs would prevent FS expansion in highly populated areas where demand is high for FS.[187] Stratos contends that licensing ESVs on an NIB basis is consistent with the approach adopted in other Commission proceedings in which the Commission allowed a service on an NIB basis with a co-primary service.[188]

71. *Discussion.* Given our decisions that ESVs in the 6 GHz band are required to coordinate operations, limited to two satellite/36 megahertz per satellite per operator per location, and 180 megahertz of aggregate coordinated spectrum industry-wide per location, we assign primary status to ESVs operating in the 6 GHz band. As a result, once ESV operators have coordinated a frequency in a particular area, the first-come, first-served principle applies, meaning that new entrants into that geographic area will be required to coordinate those frequencies with the ESV operators. Accordingly, we place a footnote in the U.S. Table of Allocations as follows:

> NG181 In the band 5925-6425 MHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

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[181] *See ESV NPRM*, 18 FCC Rcd at 25259-61, ¶¶ 27-30.

[182] *Id*. at 25260-61, ¶ 30.

[183] *Id*.

[184] *See, e.g.*, Inmarsat Comments at 3; Intelsat Comments at 5-6; MTN Comments at 15; PanAmSat Comments at 2-3 (arguing that primary status should be given to coordinated ESVs, but that the license term should be shorter than 15 years). In fact, MTN opposes the Coordination Approach as proposed by the *ESV NPRM* because it imposes regulatory burdens on ESVs, but only affords ESVs NIB status. *See* MTN Comments at 13. Intelsat explains that ESV operators should be treated like FSS operators because, from a technical perspective, coordinated fixed earth stations and coordinated ESV operations along specific routes have similar characteristics. *See* Intelsat Comments at 5-6. *See also* Inmarsat Comments at 3 (arguing that "ESVs [should] be considered as part of the primary FSS"). Inmarsat, however, only supports primary status for ESVs that are in fixed location.

[185] Intelsat Comments at 6. *See also* MTN Comments at 15 (claiming that imposing NIB status on coordinated ESVs overprotects FS stations).

[186] FWCC Reply at 6-9.

[187] *Id.* at 8.

[188] Stratos Reply at 4 n.7.

72. We agree with commenters who argue that ESV operators should have an incentive to spend the time and expense to coordinate with FS operators.[189] In addition, because the ESV operators would be receiving full licenses, as opposed to temporary authorization, we believe that it is appropriate to provide those ESV operations with primary status. We also agree with FWCC that the Communications Act requires the Commission to protect incumbents from harmful interference.[190] We satisfy this requirement by placing operating conditions on ESVs in the C-band.

9. Regulatory Status for ESVs in the C-Band Downlink (4 GHz Band)

73. In the C-band downlink, or 4 GHz band, ESVs are receive-only, and thus, do not pose a risk of harmful interference to FS operations in that band. Therefore, we do not require ESV operators to coordinate their operations in the C-band downlink. It is possible however, that ESVs may receive interference from FS transmitters in this band. For this reason, the ITU has stated that in-motion ESVs cannot claim protection from C-band FS transmitters.[191] To implement the decision of the ITU, we adopt the Commission's proposal in the *ESV NPRM* to allow in-motion ESVs to communicate with FSS satellites as long as ESV operators do not claim protection from interference or constrain the operation or expansion of other allocated radio services in the C-band downlink.[192] Moreover, we believe that protection from harmful interference is not warranted because a moving ESV will likely experience such interference intermittently. Most commenters support this approach for similar reasons.[193] We note that there are no secondary services allocated in the United States for the 3700-4200 MHz band. Therefore, to provide ESVs protection from possible non-conforming uses of the band, while requiring ESVs to accept interference from the primary FS transmissions, we grant in-motion ESVs receiving in the 4 GHz band secondary status by adding footnote NG180 below.

74. We decline to adopt in full the Commission's tentative conclusion in the *ESV NPRM* that stationary ESVs, like in-motion ESVs, must accept all interference in the C-band downlink.[194] Interference received by an ESV on a docked vessel would not be transitory, but would be of longer duration and therefore, of a more serious nature than interference received by an ESV on a moving vessel. Because of the more serious nature of interference to ESVs while docked, we allow ESV operators to obtain protection for their dockside ESVs by coordinating the relevant downlink frequencies for 180 days, and renewable thereafter for terms of 180 days. A 180-day coordination requirement is consistent with the temporary-fixed earth station rules in Part 25 of the Commission's rules[195] and addresses FWCC's concern that a given coordinated location at a port is occupied by an ESV only

[189] *See, e.g.*, MTN Comments at 15 (arguing that assigning NIB status provides no incentives for ESVs to invest the time and expense required to coordinate with FS stations).

[190] FWCC Reply at 7 (arguing that failing to provide full protection to the incumbent violates the Communications Act as well as principles of fairness). In particular, FWCC claims that, under the Communications Act, the Commission must "[m]ake such regulations not inconsistent with law as it may deem necessary to prevent interference between stations . . . ." *Id*.

[191] *See* ITU-R Resolution 902 (WRC-03) Annex 1.

[192] *ESV NPRM*, 18 FCC Rcd at 25266, ¶ 44.

[193] *See, e.g.*, Inmarsat Comments at 11; MTN Comments at 11-12.

[194] *See ESV NPRM*, 18 FCC Rcd at 25266, ¶ 44.

[195] *See* 47 C.F.R. § 25.277(a) (allowing earth stations to operate on a temporary-fixed earth station basis when it remains in one location for less than six months). This is also consistent with the Bureau's statement in the *MTN Order* that the ESV operator's "proposed dockside service is a temporary-fixed earth station service rather than a permanent fixed earth station service." *MTN Order*, 15 FCC Rcd at 23210, ¶ 24.

intermittently.[196] We clarify, however, that dockside ESVs are not classified formally as temporary-fixed earth station services under Section 25.277 of our rules, because certain requirements for temporary-fixed earth stations would not be appropriate for ESVs. For example, the authorization and coordination period for temporary-fixed stations lasts only as long as the temporary-fixed station remains in a particular location.[197] Unlike temporary-fixed earth stations, the coordination period for docked ESVs will be 180 days regardless of how long the ESV remains docked. In other words, dockside ESVs would coordinate frequencies at a particular dockside location for 180 days, and will be entitled to protection from interference during the entire coordination period, instead of being required to coordinate frequencies every time the ESV enters and leaves port – a requirement that would be overly burdensome. We make this differentiation based on output from WRC-03 indicating that fixed ESVs should be treated as ordinary FSS system Earth stations in the international context.[198] Accordingly, we place a footnote in the U.S. Table of Allocations stating the following:

> NG180 In the band 3700-4200 MHz (space-to-Earth), earth stations on vessels (ESVs) may be authorized to communicate with space stations of the fixed-satellite service and, while docked, may be coordinated for up to 180 days, renewable. ESVs in motion must operate on a secondary basis.

C. Ku-Band Operations

75. In this section, we set forth the requirements ESV operators must comply with in the Ku-band uplink at 14.0-14.5 GHz, the Ku-band downlink at 11.7-12.2 GHz, and the "extended" Ku-band downlink at 10.95-11.2 GHz and 11.45-11.7 GHz. To promote ESV use of the Ku-band, we adopt new rules and amend the Table of Frequency Allocations in a manner that provides a regulatory environment that is less restrictive than the C-band. In addition, we impose specific restrictions on Ku-band ESV operations to ensure that FSS systems and certain government services are adequately protected from the potential interference ESV operators may cause.

1. Regulatory Status for ESVs in the Ku-Band

76. We adopt our proposal in the *ESV NPRM* to authorize ESV operations on a primary basis in the Ku-band uplink at 14.0-14.5 GHz and the Ku-band downlink at 11.7-12.2 GHz, by adding a footnote to the Table of Frequency allocations to reflect ESV's primary status in these bands.[199] There are currently no primary terrestrial applications licensed in the uplink (14.0-14.5 GHz) portion of the band. As a result, unlike the C-band, we do not require Ku-band operators to coordinate with fixed terrestrial systems.[200]

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[196] *See* FWCC Reply at 27.

[197] *See* 47 C.F.R. § 25.277.

[198] *See, e.g.*, Inmarsat Comments at 11-12 (citing ITU-R Resolution 902 (WRC-03)); MTN Comments at 12 (same).

[199] In the *ESV NPRM*, the Commission sought comment on its proposal to authorize Ku-band ESV operations on a primary basis and the ramifications that would result from such an authorization. *ESV NPRM*, 18 FCC Rcd at 25260, ¶ 30.

[200] The Commission's Table of Frequency Allocations lists Radionavigation as a primary allocation in the 14.0-14.2 GHz band. However, we note that footnote US292 makes Radionavigation secondary for FSS. *See* 47 C.F.R. § 2.106 US292.

77. The Commission received broad support in the record for authorizing ESV operations on a primary basis in the Ku-band.[201] Assigning primary status to Ku-band ESVs permits these operations to be considered a recognized application within FSS networks that will ensure ESVs' ability to access multiple satellites following FSS inter-system coordination.[202] Affording Ku-band primary status, in the manner in which we adopt today, is also consistent with the decisions reached at WRC-03.[203]

78. We find that the alternative proposal we set forth in the *ESV NPRM* to allocate ESVs as a secondary mobile-satellite service (MSS) application would not be in the public interest.[204] We agree with those commenters who argue that inter-system coordination among FSS operations can be more readily accomplished if each service within the allocation is afforded primary status.[205] Furthermore, allocating ESV operations on a secondary basis conflicts with the fundamental goal of this *Order* to encourage ESV use of the Ku-band by offering a less restrictive operating environment with greater, *i.e.*, primary, regulatory rights. We find that the technical limitations we adopt below for Ku-band ESVs will ensure compatibility with other primary FSS applications in these bands.

2. Changes to the U.S. Table of Frequency Allocations for the Ku-Band

79. We adopt our proposal to modify the U.S. Table of Frequency Allocations to reflect the primary status of ESV operations in the Ku-band.[206] Based on our decision to permit ESVs in the Ku-band to communicate with satellites of the FSS, we add the following non-Federal Government footnote NG183 to the U.S. Table of Frequency Allocations for these bands:

> NG183 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

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[201] *See, e.g.*, Boeing Comments at 6-7; MTN Comments at 25 n.60; Stratos Comments at 3; Inmarsat Comments at 4; Intelsat Comments at 2; Tachyon Comments at 2; Schlumberger Comments at 9; Stratos Reply at 12; SES Americom Reply at 2.

[202] Boeing Comments at 6; Inmarsat Comments at 3; Stratos Comments at 7-8.

[203] Boeing Comments at i, 7 (noting that "[t]he decisions taken at WRC-03 establish that ESV operations in the Ku-band should be treated as a primary service under the Commission rules [because] Footnote 5.457A, which permits ESV operations in Ku-band FSS spectrum in accordance with Resolution 902, is associated with the FSS primary allocation in the International Table of Frequency Allocations."); Inmarsat Comments at 4 (arguing that "[t]hrough footnote 5.457A, WRC-03 clearly authorized ESVs to operate as part of FSS networks which are allocated on a primary basis."); *see also* ITU-R Resolution 902 (WRC-03), noting b (referencing the regulatory procedures of Article 9 apply for ESVs operating a specified fixed points). We note that Article 9 of the ITU Radio Regulations is used internationally for the coordination of primary FSS earth stations. As described below, we do not adopt a coordination requirement or different operational conditions for "in-motion" Ku-band ESVs. We therefore find that allocating Ku-band ESVs as an application of our primary FSS allocation, while not identical to, is nonetheless consistent with the conclusions reached at WRC-03.

[204] The Commission sought comment on whether ESV operations would be better accommodated by a secondary MSS allocation. *ESV NPRM*, 18 FCC Rcd at 25260, ¶ 30. The Commission noted that allocating Ku-band ESVs as MSS would place U.S. ESVs at a lower priority than might be the case for foreign licensed ESV operators. *Id.*

[205] Inmarsat Comments at 4.

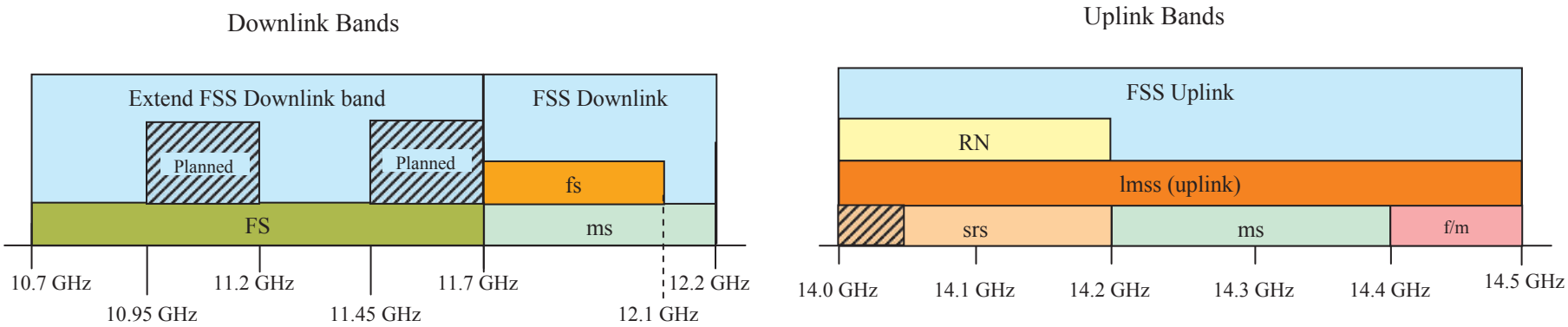
[206] *ESV NPRM*, 18 FCC Rcd at 25260 & 25265, ¶¶ 30, 41-42.

Modifying the table in this manner will put parties on notice that mobile receivers may be operating in the band.[207]

80. As Figure 1 illustrates, there are a significant number of service allocations in the downlink (10.95-11.2 GHz and 11.45-12.2 GHz) and uplink (14.0-14.5 GHz) portions of the Ku-band that we authorize for ESV operations. The effect that ESV operations may have on these allocations is discussed in greater detail below.

[207] The Commission's Table of Frequency Allocations, 47 C.F.R. § 2.106, is subdivided into the International Table of Frequency Allocations (columns 1-3), the U.S. Table of Frequency Allocations (columns 4 and 5), and a cross-reference to FCC Rule Parts (column 6). The International Table mirrors the ITU Radio Regulations and is included in the Commission's Rules for informational purposes only. 47 C.F.R. § 2.104(a). We are making several editorial amendments to the International Table in order to conform it to the 2004 edition of the ITU Radio Regulations. First, in the band 5925-6425 MHz, reference to footnotes 5.457A and 5.457B is added to the right of the direct Table entry "FIXED-SATELLITE (Earth-to-space)." Second, in the list of international footnotes, the text of four international footnotes is revised as follows: in footnote 5.457B, "the Libyan Arab Jamahiriya" is placed in correct order and the word "the" is added to "Syrian Arab Republic"; in footnote 5.487, the words "the provisions of" are removed; in footnote 5.487A, the misspelling of the word "geostationary" is corrected; and in footnote 5.488, the end of the first sentence is revised to read "subject to the provisions of No. 9.14 for coordination with stations of terrestrial services in Regions 1, 2, and 3." Third, WRC-03 suppressed footnote 5.491. Therefore, we take this opportunity to remove footnote 5.491 from the Region 3 Table and from the list of international footnotes.

Figure 1: FSS Ku-Bands Allocations



Key:

	ms	: Secondary Mobile Except Aeronautical
	RN	: Gov. and Non-Gov Radionavigation Services (secondary to FSS – see US292)
	srs	: Secondary Gov. and Non-Gov Space Research Service
		: NASA TDRSS Operational band
	f/m	: Secondary Gov. Fixed and Mobile Services
	lmss	: Secondary Land Mobile Satellite Service
	FSS	: Fixed Satellite Service
		: ITU Planned Portion of FSS Extended Band
	fs	: Secondary Gov. Fixed Service (see FN 5.486)
	FS	: Primary Fixed Service

Additionally, the radio astronomy service may use 14.47-15.0 GHz

a. Ku-Band Downlink: 10.95-11.2 GHz & 11.45-12.2 GHz

81. The allocations and operating conditions for portions of the Ku-band downlink spectrum we impose today differ based on several factors, including the fact that commercial and government operations are located in portions of the Ku-downlink band. We discuss each band separately below.

(i) Changes to the U.S. Table of Allocations in the 11.7-12.2 GHz Band

82. *Background*. The U.S. Table of Frequency Allocations for the 11.7-12.2 GHz band includes a primary allocation for FSS downlink operations. Additionally, there is a footnote allocation for the Government fixed service in the 11.7-12.1 GHz portion of the band.[208] There are also secondary allocations for mobile (except aeronautical) service and a secondary footnote allocation for non-government fixed systems in this band.[209] The Local Television Transmission Service (LTTS) is the principal service licensed in the secondary allocations in this band.[210] In the *ESV NPRM*, the Commission sought comment on whether LTTS operators make significant use of the 11.7-12.2 GHz band.[211] The Commission proposed removing the secondary allocations for fixed and mobile except aeronautical mobile services if little LTTS use were shown.[212]

83. *Discussion.* We remove the secondary mobile allocation from this band to afford primary Ku-band ESV operations better protection from in-band interference from secondary transmitters. We received no comment from LTTS licensees in this proceeding.[213] A recent review of our licensing databases indicates that there are about 50 LTTS licenses in service in the 11.7-12.2 GHz bands. We

[208] *See* 47 C.F.R. § 2.106 (footnote 5.486 appears in the Federal Government portion of the Table). The U.S. Table of Frequency Allocations (47 C.F.R. § 2.106 columns 4 and 5) is subdivided into the Federal Government Table of Frequency Allocations (Federal Government Table) and the non-Federal Government Table of Frequency Allocations. The Federal Government Table is administered by the National Telecommunications and Information Administration (NTIA) and is included in the Commission's Rules for informational purposes only. 47 C.F.R. § 2.105(a) and (d)(3). With the concurrence of NTIA, we are making several editorial amendments to the Federal Government Table. First, footnote 5.486 (secondary fixed service allocation in the band 11.7-12.1 GHz) is removed from the Federal Government Table because our research finds that this footnote had been inadvertently added to Federal Government Table. Second, footnote 5.490 (existing and future terrestrial services shall not cause interference to the BSS) is removed from the band 12.2-12.7 GHz in the Federal Government Table because this spectrum is allocated for exclusive non-Federal Government use. Third, because of these actions, there are no entries in the Federal Government Table for the blocks that represent the bands 11.7-12.1 GHz, 12.1-12.2 GHz, and 12.2-12.7 GHz. It is NTIA's standard practice not to split frequency bands unless there is a reason to do. Therefore, these bands are being merged to form the band 11.7-12.7 GHz.

[209] *See* 47 C.F.R. § 2.106 (footnote 5.486 appears in the non-Federal Government portion of the Table).

[210] Additionally, there are three Common Carrier Fixed point-to-point licensees shown in the Commission's ULS data base. These operations are listed as either temporary fixed (WPJB305) or temporary mobile (KK7264 and KL4973). As secondary services, these licensees cannot cause harmful interference to, and must accept any interference from, the primary FSS service including ESVs.

[211] *ESV NPRM*, 18 FCC Rcd at 25261, ¶ 31.

[212] The Commission also proposed removing, if necessary, the associated Part 101 rules relating to LTTS operations in this band. *ESV NPRM*, 18 FCC Rcd at 25261, ¶ 31.

[213] Several commenters supported the Commission's proposal to remove the LTTS allocation from this portion of the Ku-band. MTN Comments at 25 n.60; Boeing Comments at 11-12; Inmarsat Comments at 5, 8-9; Stratos Comments at 17.

understand that LTTS licenses specify that they may use alternate operational frequencies that are not located in the Ku-band. Given that LTTS is licensed in other bands, we find it unlikely that removing the secondary mobile allocation from this band will have a deleterious effect on current or future LTTS operations.[214]

84. As we are removing this allocation completely from the band, we will no longer consider future LTTS license applications for the 11.7-12.2 GHz band as of March 1, 2005, and "grandfather" current LTTS licensees to operate as a secondary mobile service 11.7-12.2 GHz band with the understanding that the Commission will not renew these licenses.[215] Accordingly, we modify the appropriate portions of Part 101 of our rules to reflect the revised status of LTTS operations in the 11.7-12.2 GHz band, and add footnote NG184 to the U.S. Table of Allocations.[216]

(ii) ESV Operations in the 10.95-11.2 GHz and 11.45-11.7 GHz Bands

85. *Background*. The frequency band 10.7-11.7 GHz is allocated internationally for FSS on a primary basis. Within the United States, this band is referred to as the "extended" Ku-band,[217] and FSS use of this band is reserved for international systems by footnote NG104.[218] In the United States, these bands are used by the fixed service for LTTS, Microwave Business, Microwave Public Safety, and Common Carrier Fixed Point-to-Point operations.[219]

86. *Discussion.* We agree with Intelsat and Boeing's proposals to extend our authorization of Ku-band ESV downlink operations to include the 10.95-11.2 GHz and 11.45-11.7 GHz portion of the "extended" Ku-bands.[220] We do, however, require ESV operations in these bands to operate on a non-protected basis. That is, ESV operators must accept interference from all current and future FS operations in these bands. These portions of the Ku-band are used by ESVs for reception only and it is

[214] Boeing notes that if we were to decide to maintain this secondary allocation in the 11.7-12.1 GHz band it would be possible for current or future LTTS operations to disrupt Ku-band ESV operations that are now allocated on a primary basis. Boeing Comments at 11.

[215] In the *ESV NPRM*, the Commission sought comment on whether existing LTTS operations should be "grandfathered" and allowed to operate in the Ku-band if this allocation was removed. Noting the difficulty of protecting moving receivers from possible interference from terrestrial services, the Commission alternatively proposed precluding Ku-band ESVs from claiming protection from such operations. *ESV NPRM*, 18 FCC Rcd at 25261, ¶ 32 (noting Annex 1 to Resolution 902 at WRC-03 states that: "ESVs in motion shall not claim protection from transmissions of terrestrial services operating in accordance with Radio regulations").

[216] *See* Appendix B.

[217] The so-called "extended Ku-band" includes allocations at 12.75-13.25 GHz, 13.75-14.0 GHz, 10.7-10.95 GHz, 10.95-11.2 GHz, 11.2-11.45 GHz, and 11.45-11.7 GHz. Within the "extended" Ku-band downlink, the 10.7-10.95 GHz and 11.2-11.45 GHz bands are authorized for use in accordance with ITU-R Appendix 30 B, which provides for the planned use of the GSO FSS. The rules we adopt today only apply to Ku-band operations at 10.95-11.2 GHz and 11.45-11.7 GHz.

[218] *See* 47 C.F.R. § 2.106 NG104 (stating that "[t]he use of the bands 10.7-11.7 GHz (space to Earth)…by the fixed satellite service in the geostationary-satellite orbit shall be limited to international systems, *i.e.*, other than domestic systems").

[219] A search of the ULS database reveals that the majority of services using the band are Common Carrier Fixed Point-to-Point. There are a total of 2106 active Common Carrier Fixed Point to Point licensees, 164 active Microwave Business licensees, 410 active Microwave Public Safety licensees, and 73 active LTTS licensees.

[220] Intelsat Comments at 2; *see also* Boeing Reply at 4-5.

virtually certain that any additional ESV-related satellite transmissions will not interfere with other operations in the band.[221] Although NG104 of the Table of Frequency Allocations limits the use of these bands to international systems,[222] we agree with Boeing that the original intent of this footnote was to protect future FS growth by limiting the wide proliferation of FSS earth stations.[223] Because we find that Ku-band ESV downlink operations will not interfere with current or future FS operations, and because ESVs will not receive protection from interference in this band, we agree with Boeing that the intent of NG104 will not be undermined by allowing ESVs to operate domestically in the 10.95-11.2 GHz and 11.45-11.7 GHz bands.[224] Accordingly, we add the following non-Federal Government footnote NG182 to the U.S. Table of Frequency Allocations for these bands:

> NG182 In the bands 10.95-11.2 GHz and 11.45-11.7 GHz, earth stations on vessels (ESVs) may be authorized to communicate with U.S. earth stations through space stations of the fixed-satellite service but must accept interference from terrestrial systems operating in accordance with Commission Rules.

b. Ku-Band Uplink: 14.0-14.5 GHz

87. The U.S. Table of Frequency Allocations for the 14.0-14.5 GHz band includes a primary allocation for FSS uplink operations.[225] The Table also includes secondary allocations for mobile (except aeronautical mobile), MSS (including AMSS), Government and Non-Government Space Research and Radionavigation services.[226] There is also a footnote providing protection, to the extent practicable, of radio astronomy services (RAS) in a small portion of this band.[227] There are no primary FS allocations in any portion of the 14.0-14.5 GHz band.

88. The secondary allocation for MSS, including AMSS, spans the entire 14.0-14.5 GHz band.[228] We agree with those parties who argue that the presence of secondary MSS, including AMSS, will not

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[221] Intelsat Comments at 2; Boeing Reply at 4.

[222] *See* 47 C.F.R. § 2.106 NG104.

[223] Boeing Reply at 5.

[224] Boeing Reply at 5. Boeing also notes that "[i]n addition to the new extended Ku-band downlink bands proposed by Intelsat, U.S. licensed ESVs operating in international or foreign waters in ITU Regions 1 and 3 would need to use the Ku-band downlink frequencies allocated in those regions (*i.e.*, the 12.2-12.75 GHz band) in order to provide two-way services, rather than the downlink band allocated within Region 2." Boeing urges the Commission to permit this additional use by U.S.-licensed ESVs in accordance with the allocations in ITU Regions 1 and 3. Boeing Reply at 5. Though the Commission's rules do not have extraterritorial application, we acknowledge that the Ku-band is not harmonized on a world-wide basis and thus, U.S.-licensed ESV operators are free to operate in the Ku-band in ITU Regions 1 and 3 in accordance with the rules of the administrations whose waters they operate in, including portions of the Ku-band not used by the United States.

[225] 47 C.F.R. § 2.106.

[226] *Id*. *See also supra* Figure 1.

[227] 47 C.F.R. § 2.106 US203 (stating that "every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed or mobile services in [the 14.47.14.5 GHz band]. Should such assignments result in harmful interference to [radio astronomy observations made at sites listed in the footnote] the situation will be remedied to the extent practicable.").

[228] *See Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise* (continued….)

pose a concern to ESV operators in the 14.0-14.5 GHz band.[229] As a primary operation in this band, ESVs are functionally equivalent to conventional FSS operations, while MSS, as a secondary operation, is required to protect ESV operations and not afforded additional protections.[230]

(i) Federal Government Stations in the 14.0-14.2 GHz Band

89. The 14.0-14.2 GHz band is allocated on a secondary basis to the space research service for Federal Government and non-Federal Government use.[231] The only currently-authorized non-FSS facilities in this portion of the Ku-band uplink are two National Aeronautics and Space Administration (NASA) space research Tracking and Data Relay Satellite System (TDRSS) receive facilities (located in Guam and White Sands, New Mexico) that operate with frequency assignments in the 14.0-14.05 GHz band.[232] We note that the interference rejection filtering associated with the existing TDRSS leaves them vulnerable to interference to varying degrees. The White Sands facility, for example, has only minimal interference rejection filtering across the entire 14.0-14.5 GHz band, while the Guam facility has somewhat better filtering above 14.2 GHz.[233] We also note that NASA plans to establish another TDRSS receive facility on the east coast of the United States within two-to-three years, with several mid-Atlantic region sites under consideration. We would expect that any future NASA facilities operating in this band would be equipped with state-of-the-art interference rejection filtering.

90. We recognize the importance of protecting these space research facilities from receiving harmful interference. As a condition of licensing, we therefore require ESV operators proposing operations in the 14.0-14.2 GHz band and planning to travel within 125 km of the NASA TDRSS sites at Guam or White Sands to coordinate through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee's (IRAC) to resolve any potential concerns.[234] NTIA/IRAC coordination will be necessary only when an ESV operates in the 14.0-14.2

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Update the Rules in this Frequency Range, ET Docket No. 02-305, Report and Order, 18 FCC Rcd 23426, 23454-55 ¶¶ 76, 78 (2003).

[229] MTN Comments at 25; Stratos Comments at 16; Inmarsat Comments at 8.

[230] MTN Comments 25-26.

[231] We recently proposed removing the primary allocation for radionavigation in the 14.0-14.2 GHz band from the Table of Frequency Allocations. *See Review of Part 87 of the Commission's Rules Concerning the Aviation Radio Service*, WT Docket No. 01-289, Report and Order and Further Notice of Proposed Rulemaking, FCC 03-238, 18 FCC Rcd 21432, 21472 ¶ 85 (2003).

[232] *See Amendment of Parts 2, 25 and 73 of the Commission's Rules to Implement Decisions from the World Radiocommunication Conference (Geneva, 2003) (WRC-03) Concerning Frequency Bands Between 5900 KHz and 27.5 GHz and to Otherwise Update the Rules in this Frequency Range*, ET Docket No. 04-139, Notice of Proposed Rulemaking, FCC 04-74, 19 FCC Rcd 6592, 6609 n.74 (2004).

[233] The diplexer for the White Sands earth stations provides only 35 dB or less of interference attenuation from 14.35 to 14.5 GHz, while the diplexer at the Guam earth station provides little to no interference protection from 14.05 to 14.23 GHz, but provides 70 dB of attenuation at 14.48 GHz. *See* Letter from Robert E. Spearing, Deputy Associate Administrator for Space Communications, Office of Space Flight, NASA, to Craig Holman, Regulatory Counsel, The Boeing Company, at Figure 2 (Dec. 18, 2001), *cited in The Boeing Company*, Order and Authorization, DA 01-3008, 16 FCC Rcd 22645, 22648 n.21 (Int'l Bur./OET 2001).

[234] NTIA is responsible for managing the government portion of the Table of Frequency Allocations. In bands shared between Federal and non-Federal Government services, the Commission and NTIA operate under a long-standing coordination agreement. *See NTIA Manual, Basic Coordination Arrangement Between IRAC and the FCC*, (continued….)

GHz band within 125 km of the Guam or White Sands TDRSS sites, and ESVs may not operate in the 14.0-14.2 GHz band within 125 km of the TDRSS sites until such coordination has taken place.[235] We require NTIA/IRAC coordination as a condition to licensing as opposed to a prerequisite to licensing. Thus, we do not require a Ku-band ESV operator to complete this coordination prior to receiving a Commission ESV license.[236]

91. In deference to the U.S. assets operated by NASA, we expect the coordination to be conducted on an equal basis between NASA and the ESV operator, even though the space research service is a secondary allocation in the 14.0-14.2 GHz portion of the 14.0-14.5 GHz FSS uplink band, while ESVs are primary. Ku-band ESV operators must notify the International Bureau once they have completed this coordination. Upon receipt of such notification, the Bureau will release a public notice stating that operations within the new coordination zone may commence in 30 days if no party has opposed such operations. Should NTIA seek to provide similar protection to future TDRSS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA should notify the International Bureau that the TDRSS site is nearing operational status. The Bureau will then issue a notice requiring all Ku-band ESV operators to cease operations in the 14.0-14.2 GHz band within 125 km of the new TDRSS site until they coordinate with NTIA/IRAC regarding the new site. After NTIA/IRAC coordination has been completed at the new TDRSS receive site, ESV operations will again be permitted to operate in 14.0-14.2 GHz within 125 km of the new TDRSS site, subject to any operational constraints developed in the coordination process. Due to the wideband nature of the TDRSS downlink signal, coordination between ESV operations and future operational TDRSS earth stations will be required in the 14.0-14.2 GHz band. However, NASA will endeavor to design any future TDRSS earth stations to minimize the coordination impact on ESVs from TDRSS operations below 14.2 GHz.

92. Given that the operational range of ESVs is limited to oceans, large rivers and lakes, and because NASA will have a very limited number of space research earth stations that will be receiving from the Government data relay satellites, we conclude that coordination between ESVs and TDRSS operations is possible, should not unnecessarily delay Ku-band ESV operators from initiating their licensed service in areas that may interfere with TDRSS sites, and will not prove to be a burden for ESVs.[237]

(ii) Changes to the U.S. Table of Allocations in the 14.2-14.4 GHz Band

93. Based on the same justifications discussed above regarding LTTS operations in the 11.7-12.2 GHz band,[238] we remove the secondary mobile (except aeronautical) allocation from the 14.2-14.4 GHz band, thus precluding new LTTS operations and revising the status of existing LTTS operations in this

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Chapter 8.3.1, (visited Dec. 13, 2004) <http://www.ntia.doc.gov/osmhome/redbook/8.pdf>. *See also ESV NPRM*, 18 FCC Rcd at 25262, ¶ 34 (discussing NTIA coordination).

[235] As we noted *supra* ¶ 8, WRC-03 established the minimum distance from the low-water mark as officially recognized by the coastal state beyond which ESVs can operate without the prior agreement of any administration as 125 km in the 14-14.5 GHz band.

[236] *See, e.g.*, Stratos Comments at 18; Inmarsat Comments at 6; *but see* SOI Comments at 10 (supporting a "pre-licensing" IRAC coordination requirement).

[237] MTN has acknowledged that it will coordinate its use of the 14.0-14.2 GHz band with NTIA/IRAC. MTN Comments at 25 (citing Letter from Raul R. Rodriguez, Counsel to MTN, to Marlene Dortch, Secretary, FCC, File No. SES-LIC-20011130-02259 (Nov. 22, 2002)).

[238] *See supra* Section III.C.2.a.(i).

band. Similar to the 11.7-12.2 GHz band, the 14.2-14.4 GHz band contains a secondary mobile allocation available for LTTS operations. An initial review of the Commission's licensing database found 25 LTTS licenses for this band but did not yield information regarding how many licensees were using this spectrum for LTTS operations.[239] No parties provided evidence of any active LTTS operations in this band. Given the apparently limited use by LTTS licensees of the mobile allocation and their ability, under the terms of their license, to operate in alternative spectrum, we alter the Table of Frequency allocations to remove the secondary mobile (except aeronautical) allocation and thus preclude future LTTS operations from the 14.2-14.4 GHz band.[240]

94. Because we remove the secondary mobile (except aeronautical) allocation completely from the band, we will no longer consider future LTTS license applications for the 14.2-14.4 GHz band as of March 1, 2005. However we "grandfather" current LTTS licensees to operate as a secondary mobile service in the 14.2-14.4 GHz band with the understanding that the Commission will not renew these licenses.[241] As a secondary service these operations must accept interference from primary Ku-band ESV operations. Accordingly, we modify the appropriate portions of Part 101 of our rules to reflect the revised status of LTTS operations in the 14.2-14.4 GHz band and add footnote NG184 to the U.S. Table of Allocations.[242]

(iii) Federal Government Stations in the 14.4-14.5 GHz Band

95. We note that there are several secondary Federal Government mobile, fixed and transportable telemetry operations in the 14.4-14.5 GHz band. In the *ESV NPRM*, the Commission sought comment on the extent to which this band is used to provide these services, and whether these services could be adequately protected if ESV operations were permitted in this band.[243] The record in this proceeding indicates that there is a need to ensure ESVs have access, on a primary basis, to the full 14.0-14.5 GHz band to provide its services and to allow for consistent operations given its access to these frequencies in foreign locations.[244] We did not receive any comment on secondary Federal Government mobile, fixed and transportable use of this band, and therefore the standard primary/secondary sharing environment applies. However, we did receive comment with regard to protecting RAS operations in the

[239] *ESV NPRM*, 18 FCC Rcd at 25263-64, ¶ 37. The Commission sought comment on whether this secondary allocation should be removed, whether existing operations in this band should be grandfathered or required to cease operations, and if such operations were allowed to continue what their status should be relative to ESV operations. The Commission noted that a 2001 study by the Boeing Corporations in a separate proceeding indicated that most LTTS operators licensed in this band were no longer in business and those that were operating indicated they did not utilize the 14 GHz band. *ESV NPRM*, 18 FCC Rcd at 25263-64, ¶ 37.

[240] *See* Stratos Comments at 19; Inmarsat Comments at 8-9.

[241] In the *ESV NPRM*, the Commission sought comment on whether existing LTTS operations should be "grandfathered" and allowed to operate in the Ku-band if this allocation was removed. Noting the difficulty of protecting moving receivers from possible interference from terrestrial services, the Commission alternatively proposed precluding Ku-band ESVs from claiming protection from such operations. *ESV NPRM*, 18 FCC Rcd at 25261, ¶ 32 (noting Annex 1 to Resolution 902 states that: "ESVs in motion shall not claim protection from transmissions of terrestrial services operating in accordance with Radio regulations.").

[242] *See* Appendix B.

[243] *ESV NPRM*, 18 FCC Rcd at 25265, ¶ 38.

[244] MTN Comments at 26; Inmarsat Comments at 9-10.

14.47-14.5 GHz band.[245] Three radio observatory sites were specifically mentioned in conjunction with ESVs.[246] Cornell, the operator of the Arecibo Observatory on Puerto Rico, suggests protection in the 14.47-14.5 band from ESVs within approximately 90 km of the observatory.[247] CORF requests protection of the radio observatories when ESVs are within 125 km of Mauna Kea, Hawaii or within 45 km of the radio observatory on St. Croix, Virgin Islands.[248]

96. While RAS operations in the 14.47-14.5 GHz band are important, they are limited to specific geographical locations and do not require broad exclusion zones to protect them from interference. Consistent with the Commission's proposal in the *ESV NPRM*,[249] as a condition of licensing, we require ESV operators proposing operations in the 14.47-14.5 GHz band and planning to travel within the above-described distances from these three radio observatory sites to coordinate through NTIA/IRAC to resolve any potential concerns. NTIA/IRAC coordination is a condition to licensing as opposed to a prerequisite to licensing, and we do not require a Ku-band ESV operator to complete this coordination prior to receiving a Commission ESV license. Ku-band ESV operators must notify the International Bureau once they have completed coordination. Upon receipt of such notification, the Bureau will release a public notice stating that operations within the new coordination zone may commence in 30 days if no party has opposed such operations.

97. We note that radio observations in the 14.47-14.5 GHz band are not performed on a continuous basis and are usually scheduled in advance.[250] Thus, coordination between ESVs and RAS operations is possible, should not unnecessarily delay Ku-band ESV operators from initiating their licensed service in areas that may interfere with RAS sites, and should not prove to be a burden for ESVs. Indeed, one Ku-band ESV operator has committed to coordinating with IRAC in this band.[251] To assist in this effort, we agree with Boeing's suggestion that RAS observatories should provide advance notice to ESV operators regarding their observations.[252]

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[245] MTN Comments at 26; Cornell Comments at 2-5; NRAO Comments at 1-3; CORF Comments at 1-7. Radio astronomy has permissive use of the 14.47-14.5 GHz band for the observatories listed in footnote US203 to the U.S. Table of Frequency Allocations, 47 C.F.R. § 2.106 US203.

[246] These three observatories are not listed for the 14.47-14.5 GHz band in 47 C.F.R. § 2.106 US203.

[247] Cornell Comments at 5 (the Arecibo Observatory is located at latitude 18° 20' 46" W, longitude 66° 45' 11" N).

[248] CORF Comments at 6-7 n.5 (the radio observatory at Mauna Kea, Hawaii is located at latitude 19° 48' N, longitude 155° 28' W; the observatory on St. Croix, Virgin Islands is located at latitude 17° 46' N, longitude 64° 35' W). *See also* NRAO Comments at 3.

[249] *ESV NPRM*, 18 FCC Rcd at 25265, ¶ 39.

[250] *See, e.g.*, MTN Reply at 13 (emphasizing the intermittent nature of radio astronomy observations).

[251] *See* MTN Comments at 26.

[252] Boeing Comments at 14. We note that in the 1.6/2.4 GHz service rules, we require the radio astronomy community to provide similar information to 1.6/2.4 GHz Mobile-Satellite Service licensees. *See* 47 C.F.R. § 25.213(a)(1)(vi). We expect that the radio astronomy community would provide to ESV operators the same information to facilitate the ESV operators' coordination efforts.

3. Technical Requirements for Protecting Fixed-Satellite Operations

a. Off-Axis E.I.R.P.-Density Limits and Associated Rules

98. As an alternative to modifying our VSAT technical requirements to accommodate ESV operations, Boeing asserts that the Commission should adopt ESV-specific technical limitations to ensure these systems conform to acceptable performance criteria.[253] Specifically, Boeing proposes aggregate off-axis e.i.r.p.-density limits along the geostationary satellite arc for co-polarized signals of Ku-band ESVs.[254]

99. We adopt Boeing's proposal by combining the antenna performance requirements of Section 25.209(g) and the input power density to the antenna requirements of Section 25.212(c) of the Commission's rules,[255] to produce off-axis e.i.r.p.-density limits for ESV transmitters. The limits that Boeing proposed are consistent with the limits for routinely licensed VSAT transmitters for co-polarized signals transmitted towards the geostationary orbit. We therefore adopt the following off-axis e.i.r.p.-density limits for ESV transmitters operating in the Ku FSS bands:[256]

Maximum e.i.r.p. Density			Off-Axis Angle
$15 - 25\log(\theta)$	dBW/4kHz	for	$1.25 \leq \theta \leq 7°$
-6	dBW/4kHz		$7° < \theta \leq 9.2°$
$18 - 25\log(\theta)$	dBW/4kHz		$9.2° < \theta \leq 48°$
-24	dBW/4kHz		$48° < \theta \leq 180°$

Where:
θ: is an angle in degrees from the axis of the main lobe along the geostationary orbit.

100. Additionally, Boeing argues that the Commission should allow minor variations in the ESV antenna performance where it would not adversely affect neighboring satellites.[257] For the Ku-band earth stations, the allowable variations are set forth in Section 25.209(a). We agree with Boeing that the antenna gain variations captured in Section 25.209(a), for Ku-band antennas, are part of the VSAT antenna envelope upon which we are basing the ESV off-axis power density limitations.[258] In this manner, the allowance for these variations is incorporated into the operational conditions we adopt for Ku-band ESVs. The off-axis e.i.r.p.-density limits discussed immediately above apply to co-polarized signals transmitting towards the geostationary orbit. To be consistent with the Commission's two-degree spacing rules, we also adopt e.i.r.p.-density limits for co-polarized transmissions in directions other than

[253] Boeing Comments at 14.

[254] *See supra* footnote 50 and accompanying text.

[255] This rule Section deals with antenna performance requirements for Ku-band narrow band transmissions.

[256] The off-axis e.i.r.p.-density limits listed here pertain to emissions from a single transmitter if the selected modulations permit one carrier per channel at the satellite receiver. *See supra* footnote 154 for an example of how an ESV operator might be able to limit off-axis power-density should it choose to implement a modulation technique, such as CDMA, that can operate with multiple co-frequency transmissions from different vessels being simultaneously received at the same satellite.

[257] Boeing Comments at 20; Boeing Reply at 15.

[258] Boeing Comments at 20; Boeing Reply at 14-15.

the geostationary orbit and cross-polarized e.i.r.p.-density limits. We add Section 25.222 to our rules to reflect this decision.

101. We disagree with Boeing's assertion that Ku-band ESV operators should be allowed to coordinate uplink transmissions with adjacent satellite operators in excess of the limits described above, up to the limits contained in ITU-R Resolution 902.[259] Boeing points out that other administrations implement their respective FSS systems under a three-degree spacing regime, as opposed to the Commission's two- degree spacing, and that ESV applicants should be able to demonstrate compliance with blanket licensing rules by demonstrating compliance with the off-axis e.i.r.p.-density limits contained in Resolution 902, rather than the Commission's two-degree spacing limits, and obtain a certificate of non-interference from the satellite providers.[260] While we recognize that other administrations operate under a three-degree FSS spacing regime and may, therefore, permit higher off-axis power limits, to operate with satellites licensed by the Commission, we expect U.S.-licensed FSS space station operations to meet the off-axis e.i.r.p.-density limits contained in Section 25.222 of the Commission's rules.

b. ESV Power Limits Toward the Horizon and Minimum Antenna Elevation Angle

102. In the *ESV NPRM*, the Commission sought comment on whether it should limit the antenna elevation angle for Ku-band ESV operations to "some minimum value" and, if so, what that value should be.[261] Commenters who addressed this issue proposed either a 10 or 15 degree minimum elevation angle for Ku-band ESVs.[262] Inmarsat, taking a different approach, notes that ITU-R Resolution 902 contains limits on e.i.r.p. and e.i.r.p.-density towards the horizon of 16.3 dBW and 12.5 dBW, respectively (collectively, "ESV horizontal limits"), and argues that if these limits are adopted, a minimum elevation angle limit is unnecessary.[263] Inmarsat further argues that the ESV operator would be permitted to operate with additional flexibility because the ESV horizontal limit approach allows the ESV operator to perform a trade-off between the two parameters of horizontal e.i.r.p. and elevation angle, while achieving the same level of interference protection with respect to any terrestrial receive stations.[264] We agree, and in the interest of providing operational flexibility to Ku-band ESV operators, and to provide NASA/TDRSS operations the technical certainty they require to share spectrum with ESV operators,[265] we adopt these ESV horizontal limits in that portion of the band shared with NASA/TDRSS operations. Specifically, we adopt the two limits contained in ITU Resolution 902, an e.i.r.p. towards the horizon of no greater than 16.3 dBW, and an e.i.r.p.-density towards the horizon of no greater than 12.5 dBW/MHz.[266] We note that under Section 25.205 of our rules, all FSS Earth stations, including ESV antennas, are required to operate with an elevation angle of 5 degrees or greater, unless the applicant

[259] The off-axis e.i.r.p.-density limits provided in Annex 2 to ITU-R Res. 902 (WRC-03) are approximately 23 dB higher than the limits for two-degree spacing being addressed here.

[260] Boeing Comments at 20-21.

[261] *ESV NPRM*, 18 FCC Rcd at 25267, ¶ 47.

[262] MTN Comments at 21; SOI Comments at 10.

[263] Inmarsat Comments at 13; *see* ITU-R Resolution 902 (WRC-03), Annex 2.

[264] Inmarsat Comments at 13.

[265] *See supra* Section III.C.2.b.(i).

[266] *See* 47 C.F.R. § 25.204(i).

demonstrates that a lower elevation angle is needed, or that the antenna will be pointed away from the land masses.[267]

c. Antenna Size and Pointing Accuracy

103. We decline to adopt our proposal, set forth in the *ESV NPRM*, to require a minimum antenna size for Ku-band ESVs.[268] We are satisfied that the off-axis e.i.r.p limits in this *Order* adequately protect adjacent satellite systems and ensure that ESVs do not cause harmful interference to adjacent FSS satellite operators. However, consistent with WRC-03, we require that Ku-band ESV operators maintain a pointing accuracy of no less than 0.2 degrees for all antennas within their licensed network.

104. Incorporating a smaller antenna size for Ku-band ESV operations into our rules is supported by current ESV operators[269] and complies with the conclusions of WRC-03.[270] We find, however, that we can provide the same protection to adjacent satellite operators by adopting off-axis e.i.r.p. limits for ESV operations. As a result, we eliminate the need to regulate the specific size of the antenna being used. We also agree with those commenters who argue the Commission should adopt an antenna pointing accuracy requirement of 0.2 degrees and note that this value is consistent with the technical parameters contained in Resolution 902.[271] In fact, one Ku-band ESV operator has already taken steps towards implementing this capability in its ESV network.[272] Furthermore, if the ESV antenna drifts more than 0.5 degrees from the intended satellite, the ESV terminal on the vessel must cease transmitting automatically until the ESV antenna is, once again, pointing to within 0.2 degrees of the intended satellite.[273] Limiting all Ku-band ESV antennas in this manner ensures adequate protection to adjacent FSS satellites.

d. Additional Requirements

105. We adopt our proposal in the *ESV NPRM* to allow Ku-band ESVs to receive authority to operate with any U.S. licensed satellite and non-U.S. satellite on the Permitted List (ALSAT

[267] 47 C.F.R. § 25.205.

[268] *ESV NPRM*, 18 FCC Rcd at 25270, ¶ 55. The Commission proposed that ESV networks that sought routine processing to operate in the Ku-band would have to meet the requirements of Section 25.134(a)(1) of our rules and have a minimum antenna diameter of 1.2 meters.

[269] Intelsat Comments at 16.

[270] WRC-03 stated, in Resolution 902, that licensing organizations may authorize the deployment of smaller antennas (down to 0.6 meters) at 14 GHz so long as the interference to FS would be no greater than would be caused by 1.2 meter antennas. *See* ITU-R Resolution 902 (WRC-03). The Commission noted that smaller antenna sizes would decrease the cost of certain ESVs and therefore would be desirable to operators. *ESV NPRM*, 18 FCC Rcd at 25271, ¶ 56.

[271] Stratos Comments at 20; Boeing Comments at 21; MTN Comments at 29; Inmarsat Comments at 14; SES Americom Comments at 8. ITU Resolution 902 suggests a peak tracking accuracy of 0.2 degrees. *See* ITU-R Resolution 902 (WRC-03), Annex 2.

[272] MTN Comments at 29 (noting its success with using stabilized antenna systems and controllers that can detect within 100 milliseconds if the pointing error should ever exceed 0.5 degrees and cease transmission immediately.)

[273] *See* Appendix B (new Section 25.222(a)(7)).

authority).[274] We find significant support in the record for granting Ku-band ESVs ALSAT authority.[275] Affording this flexibility to Ku-band ESV operators helps to ensure the viability of the service by providing them the flexibility to negotiate with multiple satellite service providers.[276] This flexibility also encourages all Ku-band ESV operators to design their systems in a manner that will protect satellite service providers with which they currently interface as well as those with which they may seek to interface in the future.

106. The ability to utilize numerous FSS satellite capacity providers also will enhance competition and reduce the costs of providing ESV services.[277] Specifically, giving ESV operators the flexibility to alternate among satellite providers as necessary affords these operators the opportunity to negotiate market-based pricing for transponder capacity.[278] Moreover, requiring Ku-band ESV operators to file an application every time they wish to change satellite providers is costly to both the applicant and the Commission.

107. In the *ESV NPRM*, the Commission proposed that Ku-band ESV network operators be required to prove, via an affidavit, that its operations have been successfully coordinated with adjacent satellite licensees that are two degrees removed from the satellite used by the ESV operator.[279] We find that requiring submission of an affidavit stating that this coordination has taken place is unnecessary given the operational conditions and off-axis e.i.r.p. limits we require of Ku-band ESV systems. These conditions and limits adequately protect adjacent systems that are two-degrees removed from the GSO orbit location used by the ESV system.

108. We also decline to adopt the proposal, set forth in the *ESV NPRM*, to require transmitter power control for Ku-band ESVs as a method of avoiding interference to satellites that are adjacent to the satellite receiving transmissions from the ESV.[280] Mandating a showing that a Ku-band ESV operator has the ability to control dynamically its transmitter power, via its hub station or other methods, is unnecessary given the off-axis e.i.r.p. limits we adopt today.[281] The record indicates that many commenters agree.[282] For example, Intelsat argues that there are no special provisions for mandating power control for VSAT systems and therefore ESVs, which have similar network characteristics, should operate under rules comparable to those of VSATs.[283] Boeing asserts that, so long as the off-axis e.i.r.p.

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[274] *ESV NPRM*, 18 FCC Rcd at 25270, ¶ 53. The Commission noted that the alternative would be to grant Ku-band ESVs the authority to access individual satellites only. *Id.*

[275] Broadband Maritime Comments at 6; Boeing Comments at 28; Inmarsat Comments at 15; SOI Comments at 11; Stratos Reply at 12.

[276] Broadband Maritime Comments at 6; Boeing Comments at 30.

[277] Boeing Comments at 30.

[278] Broadband Maritime Comments at 6.

[279] *ESV NPRM*, 18 FCC Rcd at 25269, ¶ 51. *See also* 47 C.F.R. § 25.134(a), (b).

[280] *ESV NPRM*, 18 FCC Rcd at 25269-70, ¶ 53.

[281] MTN Comments at 29.

[282] Inmarsat Comments at 14; Boeing Comments at 31; MTN Comments at 29.

[283] Intelsat compares § 25.204(e) of our rules, which limits the use of uplink power control for earth station operating above 10 GHz to only that forward power control necessary to overcome precipitation fading plus, at most, 1 dB, and § 25.204(g) which mandates adaptive uplink power control for FSS earth station operating in the 20-30 GHz (continued….)

is below the limits we adopt in our rules, the Commission should not mandate the methods by which these limits are maintained.[284] We agree with Boeing and Intelsat and see no reason to develop special rules for ESVs with regard to uplink power control so long as they operate within the off-axis e.i.r.p. limits adopted in this Order. [285]

4. "In-Motion" Ku-Band ESVs

109. We note that ITU-R Resolution 902 establishes regulatory provisions requiring in-motion Ku-band ESVs to accept interference from terrestrial services.[286] This would apply to interference from services of higher status and to services with co-equal status to ESVs. However, there are no co-primary terrestrial services in the 11.7-12.2 GHz band where ESVs are primary, and in the 10.95-11.2 GHz and 11.45-11.7 GHz bands, ESV operators are required to accept interference from terrestrial services whether the ESVs are in-motion or stationary. Therefore, unlike in the C-band, we find it unnecessary to differentiate between in-motion and stationary ESVs in the Ku-band.[287]

5. Size Limitations of Vessels Utilizing Ku-Band ESVs

110. We decline to adopt a size restriction for vessels operating with ESVs in the Ku-band.[288] As explained above, we impose a minimum vessel size requirement for ESV operations in the C-band, to limit interference with the terrestrial services that may share the band.[289] Unlike the C-band, there are very few terrestrial systems currently operating in the Ku-band, and those are allocated on a secondary basis.[290] Thus, in contrast to the C-band, concerns that ESVs in the Ku-band will interfere with terrestrial services are significantly reduced. Accordingly, it is not necessary to impose size restrictions on Ku-band ESV-equipped vessels to protect terrestrial operations.

111. Moreover, limiting ESV operations to vessels of a certain size would undermine our goal of promoting ESV use in the Ku-band. Specifically, an unnecessary size restriction on vessels utilizing ESVs in the Ku-band would unjustifiably preclude use of this service on smaller vessels, which are capable of navigating inland and coastal waterways. [291] By making Ku-band ESVs available to vessels

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band. *See* Intelsat Comments at 14. Intelsat is correct, ESV operation will be similar to that of VSATs under § 25.204(e) and should not require mandated uplink power control under § 25.204(g).

[284] Boeing Comments at 31.

[285] MTN notes that its hub already exercises uplink power control over all Ku-band ESVs within its network. MTN Comments at 29.

[286] ITU-R Resolution 902 (WRC-03).

[287] *See supra* Section III.B.9. Indeed, the Commission questioned whether there was a need to delineate between "in-motion" and stationary Ku-band ESVs. *ESV NPRM*, 18 FCC Rcd at 25261-62, ¶ 32.

[288] In the *ESV NPRM*, the Commission sought comment on whether Ku-band ESV operations should be limited to vessels that are 300 gross tons or larger, similar to the restriction for C-band ESVs. However, the Commission did acknowledge that such a restriction may not be appropriate given the current limited terrestrial use of the 14.0-14.5 GHz band *ESV NPRM*, 18 FCC Rcd at 25270, ¶ 54.

[289] *See supra* Section III.B.6.

[290] Stratos Comments at 17. We note that Ku-band ESV operators will have to coordinate with a limited number of Federal Government sites. *See supra* Sections III.C.2.b.(i) and III.C.2.b.(iii).

[291] Stratos Comments at 17; Boeing Comments at 28.

capable of carrying a standardized Ku-band ESV system that meets our technical rules, we allow for more ubiquitous use of this service.[292] The record in this proceeding supports this conclusion.[293]

6. Ku-Band ESV Data Tracking

112. In the unlikely event that we are presented with an interference concern regarding Ku-band ESV operations, we require Ku-band ESV hub operators to have the capability to track and maintain certain data regarding their ESV operations.[294] Specifically, ESV network operators must maintain information on the satellite(s) that each vessel uses, operating frequencies and bandwidth used, the time of day, the vessel location (*i.e.*, longitude and latitude), the country of registry of each vessel, and a point of contact for any foreign administration of vessel registration, if applicable.[295] We require Ku-band ESV operators to maintain their tracking data for one year.[296] Although we note that some ESV operators are capable of tracking certain data regarding their ESV operations on a real time basis,[297] we agree with those commenters who argue that the risk associated with ubiquitous distribution of such tracking information outweighs the benefit it may provide in preventing interference to other operators.[298]

113. As with the C-band,[299] Ku-band ESV operators must have a point of contact in the United States available 24 hours a day, 7 days a week that will be able to respond immediately to Ku-band ESV system interference concerns. This point of contact must have the ability to immediately terminate Ku-band ESV operations upon request by the Commission. Furthermore, to assist in resolving any unexpected interference concerns with incumbents, Ku-band ESVs operators must provide ESV tracking information within 24 hours upon request from frequency coordinators, fixed service operators, fixed-satellite service operators, NTIA, or the Commission.[300] Our point of contact requirement mitigates the need for requiring Ku-band ESV operators to provide third party access to this information. In the unlikely event that Ku-band ESVs interfere with another licensed operator, the Commission may require the Ku-band ESV operator to cease operations until the interference concern is resolved.

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[292] Indeed, smaller vessels are most suited for Ku-band operations because the Ku-band operates at a higher frequency and ESV operators can offer antennas which are smaller and require less deck space. In addition the antennas are lighter in weight and the stabilizing platforms operate with lower power demands, allowing for easier stabilization on smaller vessels.

[293] MTN Comments at 26; Inmarsat Comments at 15; SOI Comments at 10; Stratos Reply at 12; SES Americom at 5; Boeing Comments at 27-28.

[294] *See* Appendix B (new Section 25.222(c)(1) & (2)).

[295] *Id*.

[296] *See* Appendix B (new Section 25.222(c)(1)).

[297] MTN Comments at 30; Inmarsat Comments at 13.

[298] *See* MTN Comments at 30; Boeing Comments at 26; Inmarsat Comments at 13; Intelsat Comments at 6; *but see* NRAO Comments at 2 (supporting either an password protected internet database showing or a single point of contact to resolve ESV interference concerns).

[299] *See supra* Section III.B.4.

[300] In the *ESV NPRM*, the Commission sought comment on whether it would be necessary to require Ku-band ESV operators to maintain vessel tracking information on a real time basis and to make such information available on a secure basis. *ESV NPRM*, 18 FCC Rcd at 25267, ¶ 47.

D. ESV Licensing Considerations

1. Blanket Licensing of Earth Stations

114. *Background*. In the *ESV NPRM*, the Commission sought comment on whether ESV networks should be permitted to operate via our CSAT[301] and VSAT blanket licensing procedures under Part 25 of our rules.[302] The Commission considered this approach appropriate because the number and mobility of ESV locations would make it impractical to license ESVs on a site-by-site basis.[303]

115. *Discussion*. We adopt a blanket licensing approach that is consistent with the approach used for CSATs and VSATs, but that also takes into account the unique operational characteristics of ESVs. We find that adopting a blanket licensing approach specifically addressing C- and Ku-band ESV operations allows for the expeditious processing of ESV licenses and accommodate spectrum uses planned by ESV operators. Blanket licensing also is preferable to individually licensing ESV earth stations,[304] as ESV operators will likely deploy large numbers of technically identical earth stations that will operate over a wide geographic area.[305] Most commenters support our proposal regarding blanket licensing.[306]

116. To ensure that the rules we adopt today are readily implemented and enforceable, we will issue an ESV system license (consisting of a hub and/or blanket earth station license) to applicants who demonstrate that they are capable of controlling all aspects of the ESV network.[307] By making the ESV system licensee responsible for meeting the operational considerations we adopt today, we ensure the protection of other in-band and out-of-band licensees. As noted above, C-band ESV operators must

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[301] In May 2001, the Commission amended Part 25 of its rules to allow operators to obtain licenses for a limited class of CSAT earth station networks under a single authorization. *See CSAT Order*, 16 FCC Rcd 11511, *terminating proceeding*, *CSAT Second Order*, 17 FCC Rcd 2002.

[302] *ESV NPRM*, 18 FCC Rcd at 25268, ¶ 48 & 25282-83, ¶¶ 84-86.

[303] *ESV NPRM*, 18 FCC Rcd at 25268, ¶ 48.

[304] We see the demand for individual (as opposed to network) ESV earth station use as limited and because there was no comment on the need for individual earth station licensing, we decline to adopt such a provision in this *Order*. *See, e.g.*, *ESV NPRM*, 18 FCC Rcd at 25269, ¶ 52.

[305] Stratos Comments at 19 *see also* Boeing Comments at 19; Inmarsat Comments at 13; Intelsat Comments at 2-3, 5; SES Americom Comments at 6; PanAmSat Comments at 3; Telnor Comments at 2; SOI Comments at 9; Stratos Comments at 19; Stratos Reply at 13; SES AMERICOM Reply at 5. We recognize that there may be instances where ESV operators do not own or operate their own Network Operating Centers or Satellite Hub Earth Stations. In any event, we will require both C- and Ku-band ESV operators to conform to our rules regarding hub operations in the United States. *See* 47 C.F.R. §§ 25.271, 25.221 & 25.222.

[306] *See, e.g.*, Broadband Maritime Comments at 5; MTN Reply at 10; PanAmSat Comments at 5; SES AMERICOM Comments at 6-7; Stratos Comments at 19-20.

[307] We will not authorize ESVs unless they comply with the rules we adopt today and can be directly shut down by a control point in the United States. *See* Appendix B (new Sections 25.221(c)(3) & 25.222(c)(3)). We also note that an ESV operator will be required to obtain the applicable Commission authorizations if that operator intends to provide global facilities-based and resale telecommunications services and/or Inmarsat services. *See, e.g.*, *Maritime Telecommunications Network, Inc.*, File Nos. ITC-214-19970131-00052 (granting MTN the ability to provide facilities-based and resale phone service under Section 63.18(e)(1) and (e)(2) of the Commission's rules) and ITC-214-19970506-00253 (granting MTN the ability to provide INMARSAT Mobile Satellite Service).

coordinate their operations with the fixed service.[308] Therefore, C-band ESV licenses will be conditioned in a manner that requires C-band ESV operation within 200 km of any port to be coordinated with FS operations.

117. Consistent with all of the findings of this *Order*, we adopt Sections 25.221 and 25.222, modify Sections 25.115, 25.130, 25.201-.205, 25.271, and 25.277, and revise Part 25 of the Commission's rules accordingly.[309] Furthermore, we delegate authority to the International Bureau to revise its earth station license application procedures and related forms to conform to the rules we adopt today. Specifically, we note that the information requested on Form 312 will need to be altered. There are, moreover, additional and ongoing rulemakings that may also require modifications to Form 312. Because we intend to modify Form 312 only after all the applicable rulemakings have been completed, there will be a period of time after the effective date of this Order during which Form 312 will not be altered to accommodate ESV applications. In the interim, ESV applicants should utilize Form 312 and submit attachments providing the relevant information and certifications reflected in the rules we adopt today.

2. License Term

118. We adopt the tentative conclusion we reached in the *ESV NPRM* to license ESV operations for a term of fifteen years.[310] We agree with commenters who argue that this license term provides ESVs with regulatory certainty.[311] Moreover, a fifteen year license term is consistent with our licensing approach for other networks of earth stations.[312] We find no compelling reason to shorten this licensing term or otherwise treat ESV licensees any differently than other earth station licensees. In particular, we disagree with FWCC that a shorter license term of two years with case-by-case renewals "provides the needed mechanism for ongoing enforcement, given the transient nature of ESV operation."[313] We find that the enforcement remedies available to the Commission will adequately resolve any interference actions brought by FS licensees throughout an ESV operator's license term, regardless of its length. In addition, the operational requirements set forth in this *Order* for ESVs fully protects FS operators from harmful interference, regardless of license term.

E. Regulation of ESV Operations Based on Vessel Country of Registry

119. As set forth in detail above, ESVs are a mobile application of FSS technology and, therefore, have a higher potential for creating interference to terrestrial and space systems than other FSS applications operating in the same frequencies. We have crafted the rules in this item with the goal of controlling this potential interference to other co-frequency applications. There are three very important

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[308] *See supra* Section III.B.2.

[309] *See* Appendix B.

[310] In the *ESV NPRM*, the Commission tentatively concluded that authorized ESV operations would be licensed for fifteen year terms and sought comment on alternative license terms. *ESV NPRM*, 18 FCC Rcd at 25271 & 25285 ¶¶ 58 & 92.

[311] MTN Comments at 15; *see also* Inmarsat Comments at 23; Stratos Comments at 15.

[312] *ESV NPRM*, 18 FCC Rcd at 25271, ¶ 58 (citing 47 C.F.R. § 25.121); *see also* MTN Comments at 26; Boeing Comments at 31; Intelsat Comments at 7; MTN Reply at 10.

[313] *See* FWCC Reply at 22; FWCC Comments at 13. In fact, Stratos argues that a two-year license term, along with other restrictions proposed by FWCC, is too burdensome. Stratos Reply at 7.

regulatory factors related to the technical rules under which ESVs must operate: the vessel's country of registry; the country in which an ESV hub is located; and the physical location of the vessel if a claim of interference occurs. This section addresses the U.S. requirements that apply to ESV operations under possible combinations of these factors.

1. U.S.-Registered Vessels

120. Under the Communications Act and ITU Radio Regulations,[314] the Commission is responsible for licensing the ESV operations of all U.S.-registered vessels, other than by stations owned and operated by the Federal Government. As a result, we are concerned about the potential for interference that may be caused by ESVs operating on U.S.-registered vessels. For this reason, to comply with the requirements of Section 25.271 of our rules, U.S.-registered vessels operating ESVs must have 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.[315] This obligation applies regardless of whether or not the hub through which the ESV communicates is in the United States, and without concern for the location of the vessel (*i.e.*, in U.S. waters, international waters, or waters controlled by a foreign administration). Specifically, the point of contact must have a direct connection to the hub's network functions controlling the U.S. vessels.

121. ESVs operating on U.S.-registered vessels must operate in accordance with our technical rules in U.S. and international waters. To ensure that these ESV operations do not present a risk of harmful interference to radio operations in other countries, we also set forth procedures concerning operations by Commission-licensed ESVs near the coasts of other countries.[316] Prior to operations within the distances to a foreign administration's coast line specified in Resolution 902, the ESV operator must ascertain whether the relevant administration may have operations that could be affected by ESVs, and determine whether those administrations have adopted specific requirements concerning ESV operations. Once the vessel enters foreign waters, the ESV must operate under our technical rules, or those of the foreign administration, which ever is more constraining.[317] To the extent that all relevant administrations have identified geographic areas from which ESV operations would not affect their radio operations, ESV operators would be free to operate within those identified areas without further action.

2. Non-U.S.-Registered Vessels Communicating with U.S. Hubs

122. Section 306 of the Communications Act provides that the Commission does not have the authority to license radio stations, such as ESVs, on vessels registered by foreign administrations (foreign-registered vessels).[318] Both Sections 301 and 306 of the Communications Act, however, give the

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[314] *See* 47 U.S.C. § 301(e); ITU RR 18.8.

[315] *See* 47 C.F.R. § 25.271.

[316] The Commission sought comment on the licensing of ESVs on board U.S. flagged ships that travel on the high seas or near the coast of other countries. *See ESV NPRM*, 18 FCC Rcd at 25289, ¶ 102.

[317] We also encourage bilateral arrangements between the United States and the foreign administration that would spell out the specific technical rules that an ESV must meet in foreign waters. In this regard, we note that a there are a number of regional efforts underway, in Europe and the Americas, to develop requirements for ESV operations, consistent with the framework of Resolution 902. These efforts are likely to provide greater certainty for ESV operators as to the geographic areas in which their operations may affect other radio operations.

[318] "Section 301 of this Act shall not apply to any person sending radio communications or signals on a foreign ship while the same is within the jurisdiction of the United States, but such communications or transmission shall be (continued….)

Commission the authority and responsibility to adopt regulations to protect U.S.-licensed radio communications systems from receiving harmful interference from these vessels.[319] Given the likelihood that U.S. hub operators will communicate with ESVs on foreign-registered vessels, and particularly in U.S. waters, we adopt certain measures to protect U.S. satellite and terrestrial licensees.[320]

123. One approach would be to prohibit operations by ESVs on ships of foreign registry near U.S. coasts, and to prohibit U.S. hub stations from serving such ESVs. We conclude that this approach would be overly restrictive and contrary to Resolution 902, which "encourages concerned administrations to cooperate with administrations that license ESVs."[321] Bilateral agreements between the United States and the relevant administrations of foreign-registered vessels would also ensure U.S. licensees adequate protection from ESVs on foreign-registered vessels. We conclude that, if the United States has entered into a bilateral agreement with a ship's licensing administration, permitting U.S. hub operators to communicate with ESVs operating on board a foreign-registered vessel consistent with that agreement is in the public interest.[322] As we noted in the *ESV NPRM*, this approach promotes the agreement reflected in Recommendation 37 at WRC-03.[323]

124. Absent a bilateral agreement, we require that an ESV operator using a U.S. hub to communicate with ESVs on foreign-registered vessels be responsible for ensuring that the operations of the ESVs comply with all of our rules, including but not limited to coordination with FS in the C-band.[324] Failure to do so could result in sanctions, including possible license forfeiture. Accordingly, the ESV operator communicating with foreign-registered vessels through a U.S. hub must have a point of contact with the capability to terminate transmissions of ESVs that cause interference or otherwise fail to comply with the rules we adopt in this Order.[325] Licensing ESV operators in a manner that requires such control over all ESVs with which the hub communicates ensures an environment where potential interference can be properly managed.[326]

125. We disagree with those commenters who support prohibiting U.S. ESV hubs from communicating with ESVs on foreign-registered vessels if no bilateral agreement exists between the

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transmitted only in accordance with such regulations designed to prevent interference as may be promulgated under the authority of this Act." 47 U.S.C. § 306. *See also MTN Order*, 15 FCC Rcd at 23214-15, ¶ 9; *MTN Reconsideration Order*, 16 FCC Rcd at 11620, ¶ 13 & 11630 ¶ 46.

[319] 47 U.S.C. §§ 301, 306.

[320] The Commission sought comment on how to treat ESVs on vessels of foreign registry that communicate with a U.S.-licensed hub operator under our rules. *ESV NPRM*, 18 FCC Rcd at 25288-89, ¶¶ 100-102.

[321] ITU-R Resolution 902 (WRC-03).

[322] Stratos Comments at 22; Boeing Comments at 24; MTN Comments at 32.

[323] *See* ITU-R Resolution 902 (WRC-03) & Recommendation 37.

[324] Many commenters agree that U.S. hubs should be able to communicate with ESVs on foreign-registered vessels. *See* MTN Comments at 32; Boeing Comments at 24; Stratos Comments at 22; Pinnacle Comments at 6; Inmarsat Comments at 25; Broadband Maritime Comments at 7-8. *Cf.* Boeing Comments at 25 (noting that under this scenario, a foreign-registered ESV would be associated with a U.S. ESV license when it is operating within the appropriate coordination distances of the United States).

[325] *See, e.g.*, 47 C.F.R. § 25.271.

[326] Inmarsat Comments at 24.

United States and the country of foreign registry.[327] Given the fact that the relevant bilateral negotiations have yet to begin, adopting this approach would have the same effect as limiting ESV communications to ships of U.S. registry.[328] Furthermore, the demand for ESV service on ships of foreign registry within U.S. territorial waters is likely to be high given the high traffic in U.S. ports and the industries that these ships serve. Requiring a bilateral agreement to be in place prior to operation, when negotiations on such agreements have not yet begun, would deny ESV operators access to a significant portion of this market.

126. In summary, so long as the ESV operators, through the U.S. hub, maintain control over the remote ESV operations, we find that ESVs on foreign-registered vessels communicating through a U.S. hub should be afforded the same rights and be subject to the same restrictions as those on U.S.-registered vessels while within 200 km of U.S. coastlines or FS offshore installations for C-band operations (*i.e.*, the distance triggering our coordination obligations) and within 125 km of U.S. coastlines for Ku-band operations (*i.e.*, the ITU Resolution 902 demarcation point beyond which Ku-band ESVs can operate without prior agreement of any administration). These ESVs should operate in accordance with our technical rules in international waters and beyond 200 km of U.S. coastlines or FS offshore installations for C-band operations and 125 km of U.S. coastlines for Ku-band operations as well. We encourage bilateral arrangements that will delineate the specific technical rules that an ESV on foreign-registered vessels communicating through a U.S. hub must meet when operating in the waters of foreign administrations.

3. Non-U.S.-Registered Vessels Communicating with Non-U.S. Hubs

127. Article 4 of the ITU Radio Regulations sets forth the general international principles and rules regarding the assignment and use of frequencies. ITU Radio Regulation 4.4 (ITU RR 4.4) permits licensing of services that do not otherwise conform to the Radio Regulations so long as those services do not cause interference to, or claim protection from interference by, other services licensed in compliance with the Radio Regulations.[329] We expect some administrations to authorize ESV operations on its registered vessels based solely on ITU RR 4.4.

128. We permit both C- and Ku-band ESVs to operate on foreign-registered vessels through hubs located outside of the United States within 300 km of the U.S. coastline under the following two conditions.[330] First, where there is a bilateral agreement between the United States and the administration of country in which the hub is located, we will permit ESVs operations under the terms of

[327] *See* FWCC Reply at 26; NRAO Comments at 3.

[328] *See* Telnor Reply at 11; Inmarsat Comments at 24-25.

[329] The full text of ITU RR 4.4 reads as follows: "Administrations of the Member States shall not assign a station to any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to , and shall not claim protection from harmful interference caused by, as station operating in accordance with the provisions of the Constitution, the Convention and these Regulations."

[330] The Commission sought comment on the treatment of ESVs that operate on vessels registered with foreign administrations through hubs located outside of the United States. *ESV NPRM*, 18 FCC Rcd at 25290, ¶ 103. We noted under Resolution 902, Annex 1 "[a]ny transmission from ESVs within the minimum distances shall be subject to the prior agreement of the concerned administration(s)," and that the United States is a concerned administration in the 5925-6425 MHz and 14.0-14.5 GHz Bands. *Id.* (*citing* ITU-R Resolution 902 (WRC-03) Annex 1). The Commission also noted that ESVs may be authorized internationally in these bands pursuant to ITU RR 4.4 and as such, can operate so long as they "not claim protection from, nor cause interference to, other services having allocations in these bands."

the agreement.[331] Second, we will permit ESV operations under ITU RR 4.4 provided the vessel's registering administration has authorized those operations under ITU RR 4.4.[332] We expect that any ESV operating pursuant to ITU RR 4.4 will not cause interference to the operations of any U.S. licensee. Once the Commission is aware that an administration has authorized ESV operations under ITU RR 4.4, we will actively engage that administration in reaching a bilateral agreement in a manner that is consistent with the rules we adopt in this Order.[333] We expect that any bilateral agreement will specify a point-of-contact for the cessation of transmission from the ESV and the technical parameters under which the ESV must operate while within 300 km of the U.S. coast. If none of these conditions apply, the vessel is not permitted to operate ESVs within 300 km of the U.S. coastline. Should we find evidence that ESVs on foreign-registered vessels communicating with non-U.S. hubs cause interference to any U.S.-licensed satellite or terrestrial system, we will take all appropriate actions, including requesting that the appropriate foreign administration require the foreign-registered vessel to cease further ESV operations within 300 km of the U.S. coastline.

IV. CONCLUSION

129. Our action today promotes market-based deployment of broadband technologies to consumers traveling on the open seas and waterways in and around the United States and its territories. In this *Report and Order*, we adopt licensing rules and operational requirements to authorize ESV operations in both the C- and Ku- bands. This authority provides regulatory certainty to all licensees in these bands by elevating ESV operational status from temporary to licensed authority. We acknowledge the unique character of ESVs as a primary application in the FSS with mobile capabilities, and require ESV operations to protect incumbent FS, FSS and a limited number of Government operations. As such, this *Report and Order* permits operations in the C-band, while encouraging greater use of the Ku-band by affording Ku-band ESV licensees greater rights and fewer regulatory restrictions. Finally, we recognize the international character of ESV networks and set forth a framework for U.S.- and foreign-licensed ESVs in conformance with both the Communications Act and international accords on ESV operations.

V. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Certification

130. The Regulatory Flexibility Act of 1980, as amended (RFA),[334] 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."[335] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[336]

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[331] *See* Inmarsat at 26.

[332] *See, e.g.*, Boeing Comments at 25; Inmarsat Comments at 26.

[333] We encourage foreign administrations to raise any matters that may not comport with the rules and operating restrictions adopted in this Order as appropriate for treatment in bilateral agreements with the United States.

[334] 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).

[335] 5 U.S.C. § 605(b).

[336] 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.[337] 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).[338]

131. The *IRFA* included a wide range of possible licensees that might be affected by the proposals contained in the *ESV NPRM*.[339] In light of the rules adopted in the *ESV Order,* we believe 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/Received Earth Stations. The SBA has developed a small business size standard for Satellite Telecommunications, which consists of all such companies having $12.5 million or less in annual revenue.[340] 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.

132. Pursuant to the RFA, the Commission incorporated an Initial Regulatory Flexibility Analysis (IRFA) into the *ESV NPRM*.[341] In the IRFA, the Commission tentatively concluded that the proposals contained in the *ESV NPRM* were the least burdensome alternatives for all entities, both large and small. We received no comments in response to the IRFA. For the reasons described below, we now certify that the policies and rules adopted in this *Report and Order* will not have a significant economic impact on a substantial number of small entities.

133. In 2003, the Commission adopted the *ESV NPRM* seeking comments on its proposals to license Earth Stations on Vessel (ESV) hub stations for operation in both the Ku-band and the C-band. In this *Report and Order*, the Commission establishes 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.[342] These rules allow ESV operations in the C- and Ku-bands, while ensuring that ESVs protect fixed services (FS), fixed-satellite service (FSS) operators, and a limited number of Government operations in these bands from harmful interference.

134. ESVs have been used for the past several years to provide telecommunications services, including internet access, to cruise ships, merchant ships, ferries, barges, yachts, and U.S. navy vessels –

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[337] 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."

[338] 15 U.S.C. § 632.

[339] *ESV NPRM*, 18 FCC Rcd at 25304-08, Appendix B. The Commission listed the categories of small entity licensees that could be affected by the proposed rules as follows: Satellite Telecommunications; Space Stations (Geostationary); Fixed Satellite Transmit/Receive Earth Stations; Cellular and Other Wireless Telecommunications; and Paging.

[340] 13 C.F.R. § 121.201, NAICS code 517410.

[341] *ESV NPRM*, 18 FCC Rcd at 25304-08, Appendix B.

[342] We also include a portion of the extended Ku-band (10.95-11.2 GHz and 11.45-11.7 GHz) in our decision today.

i.e., any marine craft large enough to meet reasonable size requirements and safely carry a stabilized satellite dish. Licensing ESV operations advances the Commission's goals and objectives for market-driven deployment of broadband technologies. The market for broadband via satellite-based communications continues to expand. As ESV operators deploy increasingly innovative broadband services to their subscribers, the rules will assure that, through ESVs, broadband services are available to businesses and consumers on the high seas, coastlines, and inland waterways.

135. In this *Report and Order*, the Commission imposes certain technical conditions on ESV operations as an application of the FSS with mobile capabilities. By allowing ESVs to continue operations in the C-band, the Commission strikes the appropriate balance of ESV and FS interests by adopting strict operational requirements for ESVs in the C-band that will ensure that incumbent and future FS operators are protected from harmful interference. The Commission imposes fewer operational restrictions in the Ku-band than in the C-band because ESVs are less likely to cause harmful interference to incumbent services in that band. The Commission encourages ESV operators to utilize the Ku-band for their operations wherever possible through enhanced rights and limited regulation in that band. Given the relatively limited presence of FS users in the 11.7-12.2 GHz band and the Commission belief that the proliferation of Ku-band satellites are making Ku-band spectrum more accessible and reliable, the Commission views the Ku-band as an ideal operational environment for future ESV growth. The availability of Ku-band spectrum for non-coordinated use could help reduce costs to both large and small entities. We believe that it will have no significant economic impact on small entities because ESV operators will have the ability to choose the spectrum (C- or Ku-band) that meets their needs and will not be precluded from being licensed in each band. In addition, permitting this flexibility will greatly reduce interference problems.

136. In both C- and Ku-bands, the Commission requires ESV operators to protect FSS incumbents through limits on off-axis effective isotropically radiated power (e.i.r.p.) density and to cease operations if the ESV antenna drifts more than 0.2 degrees from the target satellite.[343] We also require operators in both bands to collect and maintain vessel tracking data to assist in identifying and resolving sources of interference. The Commission also provides for independent licensing of ESV hub stations and blanket licensing for ESV earth stations in order to give both C- and Ku-band ESV operators greater flexibility in structuring their operations. Finally, consistent with ITU encouragement of administrative cooperation in reaching agreements on the use of ESV systems,[344] the Commission established a regulatory framework that will enable foreign-licensed ESVs to operate near the United States without causing harmful interference to domestic operations. Again, a flexible approach will benefit all entities, and the requirements should not have a significant economic impact on small entities.

137. ESV operators are required to establish a database for tracking the location of ESV remote earth stations and to maintain a point of contact for resolving possible claims of harmful interference. The Commission does not expect small entities to incur significant costs associated with this requirement. The new licensing rules will benefit both large and small entities by streamlining the process for obtaining authority from the Commission to provide ESV service. Licensees will have certainty in the provision of service because the new rules will provide license terms of 15 years rather

[343] In this *Report and Order*, the Commission adopts footnotes to the U.S. Table of Frequency Allocations to recognize ESVs as an application of the FSS with primary status. In doing so, the Commission implements, in part, the decision reached at the International Telecommunication Union's (ITU's) 2003 World Radiocommunication Conference (WRC-03), which added a footnote to the International Table of Frequency Allocations stating that, in the 5925-6425 MHz and 14.0-14.5 GHz bands, ESVs may communicate with FSS space stations.

[344] ITU-R Resolution 902 (WRC-03).

than the current procedure whereby a licensee receives temporary authorization for 6 months. In addition, the new rules provide a simplified means of resolving issues of harmful interference. Small entities will benefit from the flexibility of being able to operate in the Ku-band where there are very few restrictions. We believe these requirements are nominal and do not impose a significant economic impact on small entities.

138. Therefore, we certify that the requirements adopted in this *Report and Order* will not have a significant economic impact on a substantial number of small entities.

139. **Report to Congress**: The Commission will send a copy of the Order, including a copy of the Final Regulatory Flexibility Certification, in a report to Congress.[345] In addition, the Commission will send a copy of the Order, including a copy of the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the SBA. A copy of the Order and Final Regulatory Flexibility Certification will also be published in the Federal Register.[346]

B. Final Paperwork Reduction Act of 1995 Analysis

140. This *Report and Order* contains either new or 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 modified information collection contained in this proceeding.

141. All comments regarding the requests for approval of the information collection should be submitted to Judith B. Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to Judith-B.Herman@fcc.gov, phone 202-418-0214.

VI. ORDERING CLAUSES

142. IT IS ORDERED that, pursuant to Sections 4(i), 7, 302(a), 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(a), 303(c), 303(e), 303(f) and 303(r), the *Report and Order* IS ADOPTED and that Parts 2, 25, and 101 of the Commission's Rules ARE AMENDED, as specified in Appendix B, effective 30 days after publication in the Federal Register. The collection of information contained herein is contingent upon approval by the Office of Management and Budget.

143. IT IS FURTHER ORDERED that the Regulatory Flexibility Certification, as required by Section 604 of the Regulatory Flexibility Act and as set forth above, IS ADOPTED.

[345] *See* 5 U.S.C. § 801(a)(1)(A).

[346] *See* 5 U.S.C. § 605(b).

144. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Report and Order*, 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 Commenters

Comments
Association of Public-Safety Communications Officials-International, Inc.
The Boeing Company
Broadband Maritime Inc.
Cornell University
Fixed Wireless Communications Coalition
Inmarsat Ventures Ltd.
Intelsat Global Service Corporation
King County
Maritime Telecommunications Network
National Academies' Committee on Radio Frequencies
National Radio Astronomy Observatory
National Spectrum Managers Association
PanAmSat Corporation
Pinnacle Telecom Group
Schlumberger Omnes, Inc.
SES AMERICOM, Inc.
Stratos Offshore Services Co.
Tachyon Networks Incorporated
Telenor Satellite Services, Inc.

Reply Comments
Alcatel
American Petroleum Institute
Association of American Railroads
The Boeing Company
Broadband Maritime Inc.
County of Los Angeles
Fixed Wireless Communications Coalition
Intelsat Global Service Corporation
Maritime Telecommunications Network
National Spectrum Managers Association
SES AMERICOM, Inc.
Stratos Offshore Services Co.
Telenor Satellite Services, Inc.

Ex Parte Letters
The Boeing Company
Broadband Maritime Inc.
Fixed Wireless Communications Coalition
Maritime Telecommunications Network
National Spectrum Managers Association

Other Filings
Fixed Wireless Communications Coalition (Motion to Strike)

APPENDIX B

Final Rules

For the reasons discussed above, the Federal Communications Commission amends 47 C.F.R. parts 2, 25 and 101, as follows:

PART 2 --FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

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

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

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

a. Revise pages 55, 57, 64 and 66.

b. In the list of international footnotes, revise footnotes 5.457B, 5.487, 5.487A, and 5.488; and remove footnote 5.491.

c. In the list of non-Federal Government footnotes, add footnotes NG180, NG181, NG182, NG183 and NG184.

§ 2.106 Table of Frequency Allocations.

The revisions and additions read as follows:

* * * * *

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
See previous page for 3600-4200 MHz	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		3700-4200	3700-4200 FIXED NG41 FIXED-SATELLITE (space-to-Earth) NG180	International Fixed (23) Satellite Communications (25) Fixed Microwave (101)
4200-4400 AERONAUTICAL RADIONAVIGATION 5.438 5.439 5.440			4200-4400 AERONAUTICAL RADIONAVIGATION 5.440 US261		Aviation (87)
4400-4500 FIXED MOBILE			4400-4500 FIXED MOBILE	4400-4500	
4500-4800 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE			4500-4800 FIXED MOBILE US245	4500-4800 FIXED-SATELLITE (space-to-Earth) 5.441 US245	
4800-4990 FIXED MOBILE 5.442 Radio astronomy			4800-4940 FIXED MOBILE US203 US342	4800-4940 US203 US342	
5.149 5.339 5.443			4940-4990 5.339 US311 US342 G122	4940-4990 FIXED MOBILE except aeronautical mobile 5.339 US311 US342	Private Land Mobile (90) Fixed Microwave (101)
4990-5000 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149			4990-5000 RADIO ASTRONOMY US74 Space research (passive) US246		
5000-5150 AERONAUTICAL RADIONAVIGATION 5.367 5.443A 5.443B 5.444 5.444A			5000-5250 AERONAUTICAL RADIO-NAVIGATION US260	5000-5150 AERONAUTICAL RADIO-NAVIGATION US260 5.367 5.444A US211 US344 US370	Satellite Communications (25) Aviation (87)

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
5570-5650 MARITIME RADIONAVIGATION MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 5.450B 5.450 5.451 5.452			5570-5600 MARITIME RADIONAVIGATION US65 RADIOLOCATION G56 US50 G131 5600-5650 MARITIME RADIONAVIGATION US65 METEOROLOGICAL AIDS RADIOLOCATION G56 5.452 US50 G131	5570-5600 MARITIME RADIONAVIGATION US65 RADIOLOCATION US50 5600-5650 MARITIME RADIONAVIGATION US65 METEOROLOGICAL AIDS RADIOLOCATION 5.452 US50	RF Devices (15) Maritime (80) Private Land Mobile (90)
5650-5725 RADIOLOCATION MOBILE except aeronautical mobile 5.446A 5.450A Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455			5650-5925 RADIOLOCATION G2	5650-5830 Amateur 5.150 5.282	RF Devices (15) ISM Equipment (18) Amateur (97)
5725-5830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455 5.456	5725-5830 RADIOLOCATION Amateur 5.150 5.453 5.455				
5830-5850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455 5.456	5830-5850 RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455			5830-5850 Amateur Amateur-satellite (space-to-Earth) 5.150	ISM Equipment (18) Amateur (97)
5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150		5850-5925 FIXED-SATELLITE (Earth-to-space) US245 MOBILE NG160 Amateur 5.150	ISM Equipment (18) Private Land Mobile (90) Personal Radio (95) Amateur (97)
5925-6700 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE			5925-6425	5925-6425 FIXED NG41 FIXED-SATELLITE (Earth-to-space) NG181	International Fixed (23) Satellite Commun. (25) Fixed Microwave (101)

10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A (Earth-to-space) 5.484 MOBILE except aeronautical mobile	10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 5.484A MOBILE except aeronautical mobile		10.7-11.7 US211	10.7-11.7 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 US211 US355 NG104 NG182	Satellite Communications (25) Fixed Microwave (101)
11.7-12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE	11.7-12.1 FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A Mobile except aeronautical mobile 5.485 5.488	11.7-12.2 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE	11.7-12.7	11.7-12.2 FIXED-SATELLITE (space-to-Earth) NG143 NG145 NG183 5.488 NG184	Satellite Communications (25)
	12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.485 5.488 5.489	5.487 5.487A 5.492			
5.487 5.487A 5.492	12.2-12.7 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE	12.2-12.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile BROADCASTING 5.484A 5.487		12.2-12.7 FIXED BROADCASTING-SATELLITE	Satellite Communications (25) Fixed Microwave (101)
12.5-12.75 FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space)	5.487A 5.488 5.490 5.492	12.5-12.75 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.493		5.487A 5.488 5.490	
5.494 5.495 5.496	See next page for 12.7-12.75 GHz		See next page for 12.7-12.75 GHz		See next page for 12.7-12.75 GHz

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14-14.25 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504C 5.506A Space research 5.504A 5.505			14-14.2 RADIONAVIGATION US292 Space research	14-14.2 FIXED-SATELLITE (Earth-to-space) NG183 RADIONAVIGATION US292 Mobile-satellite (Earth-to-space) Space research	Satellite Communications (25) Maritime (80) Aviation (87)
14.25-14.3 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.506A 5.508A Space research 5.504A 5.505 5.508 5.509			14.2-14.4	14.2-14.47 FIXED-SATELLITE (Earth-to-space) NG183 Mobile-satellite (Earth-to-space)	Satellite Communications (25)
14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Radionavigation-satellite 5.504A	14.3-14.4 FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite 5.504A	14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Radionavigation-satellite 5.504A			
14.4-14.47 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.506A 5.509A Space research (space-to-Earth) 5.504A			14.4-14.47 Fixed Mobile	NG184	
14.47-14.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A			14.47-14.5 Fixed Mobile US203 US342	14.47-14.5 FIXED-SATELLITE (Earth-to-space) NG183 Mobile-satellite (Earth-to-space) US203 US342	

* * * * *

INTERNATIONAL FOOTNOTES

* * * * *

5.457B In the bands 5925-6425 MHz and 14-14.5 GHz, earth stations located on board vessels may operate with the characteristics and under the conditions contained in Resolution 902 (WRC-03) in Algeria, Saudi Arabia, Bahrain, Comoros, Djibouti, Egypt, United Arab Emirates, the Libyan Arab Jamahiriya, Jordan, Kuwait, Morocco, Mauritania, Oman, Qatar, the Syrian Arab Republic, Sudan, Tunisia and Yemen, in the maritime mobile-satellite service on a secondary basis. Such use shall be in accordance with Resolution 902 (WRC-03).

* * * * *

5.487 In the band 11.7-12.5 GHz in Regions 1 and 3, the fixed, fixed-satellite, mobile, except aeronautical mobile, and broadcasting services, in accordance with their respective allocations, shall not cause harmful interference to, or claim protection from, broadcasting-satellite stations operating in accordance with the Regions 1 and 3 Plan in Appendix 30.

5.487A Additional allocation: in Region 1, the band 11.7-12.5 GHz, in Region 2, the band 12.2-12.7 GHz and, in Region 3, the band 11.7-12.2 GHz, are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis, limited to non-geostationary systems and subject to application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the broadcasting-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

5.488 The use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 is subject to application of the provisions of No. 9.14 for coordination with stations of terrestrial services in Regions 1, 2 and 3. For the use of the band 12.2-12.7 GHz by the broadcasting-satellite service in Region 2, see Appendix 30.

* * * * *

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG180 In the band 3700-4200 MHz (space-to-Earth) earth stations on vessels (ESVs) may be authorized to communicate with space stations of the fixed-satellite service and, while docked, may be coordinated for up to 180 days, renewable. ESVs in motion must operate on a secondary basis.

NG181 In the band 5925-6425 MHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

NG182 In the bands 10.95-11.2 GHz and 11.45-11.7 GHz, earth stations on vessels (ESVs) may be authorized to communicate with U.S. earth stations through space stations of the fixed-satellite service but must accept interference from terrestrial systems operating in accordance with Commission Rules.

NG183 In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), earth stations on vessels (ESVs) are an application of the fixed-satellite service (FSS) and may be authorized to communicate with space stations of the FSS on a primary basis.

NG184 Land mobile stations in the bands 11.7-12.2 GHz and 14.2-14.4 GHz and fixed stations in the band 11.7-12.1 GHz that are licensed pursuant to Part 101, Subpart J of the Commission's Rules as of March 1, 2005 may continue to operate on a secondary basis until their license expires. Existing licenses issued pursuant to Part 101, Subpart J will not be renewed in the bands 11.7-12.2 GHz and 14.2-14.4 GHz.

* * * * *

PART 25 – SATELLITE COMMUNICATIONS

3. 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.

4. Part 25 is amended by adding new Section 25.221 and Section 25.222 to the Table of Contents to read as follows:

* * * * *

§ 25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESV) 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 Satellites in the Fixed-Satellite Service.

§ 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 Satellites in the Fixed-Satellite Service.

* * * * *

5. Section 25.115 is amended by adding paragraph (a)(2)(iii) to read as follows:

§ 25.115 Application for earth station authorizations.

*****

(a)(2)(iii) The earth station is not an ESV.

*****

6. Section 25.130 is amended by revising paragraph (a) to read as follows:

§ 25.130 Filing requirements for transmitting earth stations.

(a) Applications for a new or modified transmitting earth station facility shall be submitted on FCC Form 312, and associated Schedule B, accompanied by any required exhibits, except for those earth station applications filed on FCC Form 312EZ pursuant to § 25.115(a). All such earth station license applications must be filed electronically through the International Bureau Filing System (IBFS) in accordance with the applicable provisions of part 1, subpart Y of this chapter. Additional filing requirements for Earth Stations on Vessels are described in §§ 25.221 and 25.222 of this part.

* * * * *

7. Section 25.201 is amended by adding the following definitions in alphabetical order to read as follows:

§ 25.201 Definitions.

* * * * *

Ambulatory. Not stationary. Baselines from which maritime boundaries are measured change with accretion- and erosion-caused ambulation of the boundaries themselves.

Baseline. The line from which maritime zones are measured, also known as the coast line. The baseline is a combination of the low-water line ("low-tide elevation") and closing lines across the mouths of inland water bodies. The baseline is defined by a series of baseline points. The baseline points are not just the low-water marks of the shore of mainland but also included islands and "low-water elevations" (*i.e.*, natural rocks). Baseline points are ambulatory, and thus, require adjustment from time-to-time by the U.S. Department of State's Baseline Committee.

Earth Station on Vessel ("ESV"). An ESV is an earth station onboard a craft designed for traveling on water receiving from and transmitting to fixed-satellite space stations.

Low-Tide Elevation. A naturally formed area of land that is surrounded by and above water at low tide but below water at high tide. Low-tide elevations serve as part of the coast line when they are within the breath of the territorial sea of the mainland (either uplands or inland waters) or an island. 1958 Convention on the Territorial Sea, Article 11.

* * * * *

8. Section 25.202 is amended by adding paragraph (a)(8) to read as follow:

§ 25.202 Frequencies, frequency tolerance and emission limitations.

* * * * *

(a)(8) The following frequencies are available for use by Earth Stations on Vessels (ESVs):

3700-4200 MHz (space-to-Earth)
5925-6425 MHz (Earth-to-space)
10.95-11.2 GHz (space-to-Earth)

11.45-11.7 GHz (space-to-Earth)
11.7-12.2 GHz (space-to-Earth)
14.0-14.5 GHz (Earth-to-space)

ESVs shall be authorized and coordinated as set forth in §§ 25.221 and 25.222 of this chapter. ESV operators, collectively, may coordinate up to 180 megahertz of spectrum in the 5925-6425 MHz (Earth-to-space) band for all ESV operations at any given location subject to coordination.

9. Section 25.203 is amended by revising paragraphs (a), (b), (d) and (k) and the introductory language in paragraph (c) to read as follow:

§ 25.203 Choice of sites and frequencies.

(a) Sites and frequencies for earth stations, other than ESVs, operating in frequency bands shared with equal rights between terrestrial and space services, shall be selected, to the extent practicable, in areas where the surrounding terrain and existing frequency usage are such as to minimize the possibility of harmful interference between the sharing services.

(b) An applicant for an earth station authorization, other than an ESV, in a frequency band shared with equal rights with terrestrial microwave services shall compute the great circle coordination distance contour(s) for the proposed station in accordance with the procedures set forth in § 25.251. The applicant shall submit with the application a map or maps drawn to appropriate scale and in a form suitable for reproduction indicating the location of the proposed station and these contours. These maps, together with the pertinent data on which the computation of these contours is based, including all relevant transmitting and/or receiving parameters of the proposed station that is necessary in assessing the likelihood of interference, an appropriately scaled plot of the elevation of the local horizon as a function of azimuth, and the electrical characteristics of the earth station antenna(s), shall be submitted by the applicant in a single exhibit to the application. The coordination distance contour plot(s), horizon elevation plot, and antenna horizon gain plot(s) required by this Section may also be submitted in tabular numerical format at 5° azimuthal increments instead of graphical format. At a minimum, this exhibit shall include the information listed in paragraph (c)(2) of this Section. An earth station applicant shall also include in the application relevant technical details (both theoretical calculations and/or actual measurements) of any special techniques, such as the use of artificial site shielding, or operating procedures or restrictions at the proposed earth station which are to be employed to reduce the likelihood of interference, or of any particular characteristics of the earth station site which could have an effect on the calculation of the coordination distance.

(c) Prior to the filing of its application, an applicant for operation of an earth station, other than an ESV, shall coordinate the proposed frequency usage with existing terrestrial users and with applicants for terrestrial station authorizations with previously filed applications in accordance with the following procedure:

* * * * *

(d) An applicant for operation of an earth station, other than an ESV, shall also ascertain whether the great circle coordination distance contours and rain scatter coordination distance contours, computed for those values of parameters indicated in § 25.251 (Appendix 7 of the ITU RR) for international coordination, cross the boundaries of another Administration. In this case, the applicant shall furnish the Commission copies of these contours on maps drawn to appropriate scale for use by the Commission in

effecting coordination of the proposed earth station with the Administration(s) affected.

* * * * *

(k) An applicant for operation of an earth station, other than an ESV, that will operate with a geostationary satellite or non-geostationary satellite in a shared frequency band in which the non-geostationary system is (or is proposed to be) licensed for feeder links, shall demonstrate in its applications that its proposed earth station will not cause unacceptable interference to any other satellite network that is authorized to operate in the same frequency band, or certify that the operations of its earth station shall conform to established coordination agreements between the operator(s) of the space station(s) with which the earth station is to communicate and the operator(s) of any other space station licensed to use the band.

10. Section 25.204 is amended by adding paragraph (h) and (i) to read as follows:

§ 25.204 Power limits.

* * * * *

(h) ESV transmissions in the 5925-6425 MHz (Earth-to-space) band shall not exceed an EIRP spectral density towards the radio-horizon of 17 dBW/MHz, and shall not exceed an EIRP towards the radio-horizon of 20.8 dBW. The ESV network shall shut-off the ESV transmitter if the EIRP spectral density towards the radio-horizon or EIRP towards the radio-horizon are exceeded.

(i) Within 125 km of the TDRSS sites identified in § 25.222(d) of this chapter, ESV transmissions in the 14.0-14.2 GHz (Earth-to-space) band shall not exceed an EIRP spectral density towards the horizon of 12.5 dBW/MHz, and shall not exceed an EIRP towards the horizon of 16.3 dBW.

11. Section 25.205 is revised to read as follows:

§ 25.205 Minimum angle of antenna elevation.

(a) Earth station antennas shall not normally be authorized for transmission at angles less than 5° measured from the horizontal plane to the direction of maximum radiation. However, upon a showing that the transmission path will be seaward and away from land masses or upon special showing of need for lower angles by the applicant, the Commission will consider authorizing transmissions at angles between 3° and 5° in the pertinent directions. In certain instances, it may be necessary to specify minimum angles greater than 5° because of interference considerations.

(b) ESVs making a special showing requesting angles of elevation less than 5° measured from the horizontal plane to the direction of maximum radiation pursuant to (a) of this Section must still meet the EIRP and EIRP density towards the horizon limits contained in § 25.204(h) and (i) of this chapter.

12. Part 25 is amended by adding new Section 25.221 to read as follows:

§ 25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESV) 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 Satellites in the Fixed-Satellite Service.

(a) All applications for licenses for ESVs transmitting in the 5925-6425 MHz (Earth-to-space) bands to geostationary-orbit satellites in the fixed-satellite service shall provide sufficient data to demonstrate that the ESV operations meet the following criteria, which are ongoing requirements that govern all ESV licensees and operations in these bands:

(1) The off-axis EIRP spectral density for co-polarized signals, emitted from the ESV, in the plane of the geostationary satellite orbit as it appears at the particular earth station location (*i.e.*, 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), shall not exceed the following values:

$26.3 - 25\log(\theta)$ dBW/4kHz	for	$1.0° \leq \theta \leq 7.0°$
5.3 dBW/4kHz	for	$7.0° < \theta \leq 9.2°$
$29.3 - 25\log(\theta)$ dBW/4kHz	for	$9.2° < \theta \leq 48°$
-12.7 dBW/4kH	for	$48° < \theta \leq 180°$

(2) In all other directions, the off-axis EIRP spectral density for co-polarized signals emitted from the ESV shall not exceed the following values:

$29.3 - 25\log(\theta)$ dBW/4kHz	for	$1.0° \leq \theta \leq 48°$
-12.7 dBW/4kHz	for	$48° < \theta \leq 180°$

(3) For $\theta > 7°$, the values given in paragraphs (a)(1) of this Section may be exceeded by no more than 10% of the earth station antenna sidelobes, provided no individual sidelobe exceeds the criteria given by more than 3 dB.

(4) In all directions, the off-axis EIRP spectral density for cross-polarized signals emitted from the ESV shall not exceed the following values:

$16.3 - 25\log(\theta)$ dBW/4kHz	for	$1.8° \leq \theta \leq 7.0°$
-4.7 dBW/4kHz	for	$7.0° < \theta \leq 9.2°$

Where θ is the angle in degrees from the axis of the main lobe.

(5) For non-circular ESV antennas, the major axis of the antenna will be aligned with the tangent to the geostationary satellite orbital arc at the target satellite point, to the extent required to meet specified off-axis EIRP criteria.

(6) A pointing error of less than 0.2°, between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna.

(7) All emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°.

(8) There shall be a point of contact in the United States, with phone number and address included with the application, 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 U.S. has a bilateral agreement that enables such cessation of emissions.

(9) ESVs that exceed the radiation guidelines of Section 1.1310 Radiofrequency radiation exposure limits must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

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

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

(12) 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.

(b) Applications for ESV operation in the 5925-6425 MHz band to geostationary satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312, and associated Schedule B, the following data, for each earth station antenna type:

(1) A series of EIRP density charts or tables, calculated for a production earth station antenna, based on measurements taken on a calibrated antenna range at 6.0 GHz, with the off-axis EIRP envelope set forth in paragraphs (a)(1) through (a)(4) of this Section superimposed, as follows:

(i) showing off-axis co-polarized EIRP spectral density in the azimuth plane, for off-axis angles from minus 10° to plus 10°and from minus 180° to plus 180°.
(ii) showing off-axis co-polarized EIRP spectral density in the elevation plane, at off-axis angles from 0° to plus 30°.
(iii) showing off-axis cross-polarized EIRP spectral density in the azimuth plane, at off-axis angles from minus 10° to plus 10°.
(iv) showing off-axis cross-polarized EIRP spectral density in the elevation plane, at off-axis angles from minus 10° to plus 10°.

Or

(2) A series of gain charts or tables, for a production earth station antenna, measured on a calibrated antenna range at 6.0 GHz, with the Earth station antenna gain envelope set forth in § 25.209(a) and (b) superimposed, for the same planes and ranges enumerated in paragraphs (b)(1)(i) through (b)(1)(iv) of this Section, that, combined with input power density entered in schedule B, demonstrates that off-axis EIRP spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this Section will be met.

Or

(3) A certification that the antenna conforms to the gain pattern criteria of § 25.209(a) and (b), that, combined with input power density entered in schedule B, demonstrates that the off-axis EIRP spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this Section will be met.

(c) ESVs receiving and transmitting in the 3700-4200 MHz (space-to-Earth) and 5925-6425 MHz (Earth-to-space) frequency bands shall operate with the following provisions:

(1) 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 then 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.

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

(3) 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.

(4) 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.

(d) 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.

(e) ESVs operating in the 5925-6425 MHz (Earth-to-space) band, within 200 km from the baseline of the United States, or within 200 km from a fixed service offshore installation, shall complete coordination 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 to be placed on Public Notice. 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 any objections are received to the coordination prior to the end of the 30-day comment period of the Public Notice, the licensee shall immediately cease operation of that particular station until the coordination dispute is resolved and the ESV licensee informs the Commission of the resolution.

(f) ESV operators must automatically cease transmission if the ESV operates in violation of the terms of its coordination, 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 fixed service offshore installation. Transmission 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.

13. Part 25 is amended by adding new Section 25.222 to read as follows:

§ 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 Satellites in the Fixed-Satellite Service.

(a) All applications for licenses for 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, to Geostationary Satellites in the fixed-satellite service shall provide sufficient data to demonstrate that the ESV operations meet the following criteria, which are ongoing requirements that govern all ESV licensees and operations in these bands:

(1) The off-axis EIRP spectral density for co-polarized signals, emitted from the ESV in the plane of the geostationary satellite orbit as it appears at the particular earth station location (*i.e.*, 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), shall not exceed the following values:

$15 - 25\log(\theta)$ dBW/4kHz	for	$1.25° \le \theta \le 7.0°$
-6 dBW/4kHz	for	$7.0° < \theta \le 9.2°$
$18 - 25\log(\theta)$ dBW/4kHz	for	$9.2° < \theta \le 48°$
-24 dBW/4kHz	for	$48° < \theta \le 180°$

(2) In all other directions, the off-axis EIRP spectral density for co-polarized signals emitted from the ESV shall not exceed the following values:

$18 - 25\log(\theta)$ dBW/4kHz	for	$1.25° \le \theta \le 48°$
-24 dBW/4kHz	for	$48° < \theta \le 180°$

(3) For $\theta > 7°$, the values given in paragraphs (a)(1) of this Section may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the criteria given by more than 3 dB.

(4) In all directions, the off-axis EIRP spectral density for cross-polarized signals emitted from the ESV shall not exceed the following values:

$5 - 25\log(\theta)$ dBW/4kHz	for	$1.8° \le \theta \le 7°$
-16 dBW/4kHz	for	$7° < \theta \le 9.2°$

Where θ is the angle in degrees from the axis of the main lobe.

(5) For non-circular ESV antennas, the major axis of the antenna will be aligned with the tangent to the geostationary satellite orbital arc at the target satellite point, to the extent required to meet specified off-axis EIRP criteria.

(6) A pointing error of less than 0.2°, between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna.

(7) All emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°.

(8) There shall be a point of contact in the United States, with phone number and address

included with the application, 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 U.S. has a bilateral agreement that enables such cessation of emissions.

(9) ESVs that exceed the radiation guidelines of Section 1.1310 Radiofrequency radiation exposure limits must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

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

(b) Applications for ESV operation in the 14.0-14.5 GHz (Earth-to-space) to geostationary satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312 and associated Schedule B, the following data for each earth station antenna type:

(1) A series of EIRP density charts or tables, calculated for a production earth station antenna, based on measurements taken on a calibrated antenna range at 14.25 GHz, with the off-axis EIRP envelope set forth in paragraphs (a)(1) through (a)(4) of this Section superimposed, as follows:

(i) showing off-axis co-polarized EIRP spectral density in the azimuth plane, for off-axis angles from minus 10° to plus 10°and from minus 180° to plus 180°.
(ii) showing off-axis co-polarized EIRP spectral density in the elevation plane, at off-axis angles from 0° to plus 30°.
(iii) showing off-axis cross-polarized EIRP spectral density in the azimuth plane, at off-axis angles from minus 10° to plus 10°.
(iv) showing off-axis cross-polarized EIRP spectral density in the elevation plane, at off-axis angles from minus 10° to plus 10°.

Or

(2) A series of gain charts or tables, for a production earth station antenna, measured on a calibrated antenna range at 14.25 GHz, with the Earth station antenna gain envelope set forth in Section 25.209(a) and b superimposed, for the same planes and ranges enumerated in paragraphs (b)(1)(i) through (b)(1)(iv) of this Section, that, combined with input power density entered in schedule B, demonstrates that off-axis EIRP spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this Section will be met.

Or

(3) A certification that the ESV antenna conforms to the gain pattern criteria of 25.209(a) and (b), that, combined with input power density entered in schedule B, demonstrates that the off-axis EIRP spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this Section will be met.

(c) 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 shall operate with the following provisions:

(1) 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.

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

(3) 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.

(d) Operations of Earth Stations on Vessels (ESVs) in the 14.0-14.2 GHz (Earth-to-space) frequency band within 125 km of the NASA TDRSS facilities on Guam (located at latitude: 13° 36' 55" N, longitude 144° 51' 22" E) or White Sands, New Mexico (latitude: 32° 20' 59" N, longitude 106° 36' 31" W and latitude: 32° 32' 40" N, longitude 106° 36' 48"W) are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC). When NTIA seeks to provide similar protection to future TDRSS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission that the site is nearing operational status. Upon public notice from the Commission, all Ku-band ESV operators must cease operations in the 14.0-14.2 GHz band within 125 km of the new TDRSS site until after NTIA/IRAC coordination for the new TDRSS facility is complete. ESV operations will then again be permitted to operate in the 14.0-14.2 GHz band within 125 km of the new TDRSS site, subject to any operational constraints developed in the coordination process.

(e) Operations of Earth Stations on Vessels (ESVs) in the 14.47-14.5 GHz (Earth-to-space) frequency band within a) 45 km of the radio observatory on St. Croix, Virgin Islands (latitude 17° 46' N, longitude 64° 35' W); b) 125 km of the radio observatory on Mauna Kea, Hawaii (at latitude 19° 48' N, longitude 155° 28' W); and c) 90 km of the Arecibo Observatory on Puerto Rico (latitude 18° 20' 46" W, longitude 66° 45' 11" N) are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC).

(f) 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.

14. Section 25.271 is amended by revising paragraphs (b) and (c) and adding a new paragraph (f), to read as follows:

§ 25.271 Control of transmitting stations.

* * * * *

(b) The licensee of a transmitting earth station, other than an ESV, licensed under this part shall ensure that a trained operator is present on the earth station site, or at a designated remote control point for the earth station, at all times that transmissions are being conducted. No operator's license is required for a person to operate or perform maintenance on facilities authorized under this part.

(c) Authority will be granted to operate a transmitting earth station, other than an ESV, by remote control only on the conditions that:

* * * * *

(f) Rules for control of transmitting ESVs are provided in §§ 25.221 and 25.222.

15. Section 25.277 is amended by revising paragraph (b) and the introductory language of paragraph (c), to read as follows:

§ 25.277 Temporary fixed earth stations.

* * * * *

(b) When a station, other than an ESV, authorized as a temporary fixed earth station, is to remain at a single location for more than six months, application for a regular station authorization at that location shall be filed at least 30 days prior to the expiration of the six-month period.

(c) The licensee of an earth station, other than an ESV, which is authorized to conduct temporary fixed operations in bands shared co-equally with terrestrial fixed stations shall provide the following information to the Director of the Columbia Operations Center at 9200 Farmhouse Lane, Columbia, Maryland 21046, and to the licensees of all terrestrial facilities lying within the coordination contour of the proposed temporary fixed earth station site before beginning transmissions:

* * * * *

PART 101 -- FIXED MICROWAVE SERVICES

16. The authority citation for Part 25 continues to read as follows: Authority: 47 U.S.C. 154, 303.

17. Section 101.101 is amended by deleting rows 11,700-12,200 and 14,200-14,400 of the table.

18. Section 101.107 is amended by modifying footnote 1 to read as follow:

§ 101.107 Frequency tolerance.

(1) Applicable only to common carrier LTTS stations. Tolerance for 2450-2500 MHz is 0.005%. Beginning Aug. 9, 1975, this tolerance will govern the marketing of LTTS equipment and the issuance of all such authorizations for new radio equipment. Until that date new equipment may be authorized with a frequency tolerance of .03% in the frequency range 2,200 to 10,500 MHz and .05% in the range 10,500 MHz to 12,200 MHz, and equipment so authorized may continue to be used for its life provided that it does not cause interference to the operation of any other licensee. Beginning March 1, 2005, new LTTS operators will not be licensed and existing LTTS licensees will not be renewed in the 11.7-12.2 GHz band.

* * * * *

19. Section 101.113 is amended by adding a reference to footnote 12 in the table on the line that starts with 14,200-14,400, and adding new text for footnote 12 to read as follows:

(12) Beginning March 1, 2005, no new LTTS operators will be licensed and no existing LTTS licensees will be renewed in the 14.2-14.4 GHz band.

20. Section 101.147(a) is amended by modifying footnote 24 to read as follows:

§ 101.147 Frequency assignments.

* * * * *

(24) Frequencies in these bands are available for assignment to television pickup and television non-broadcast pickup stations. The maximum power for the local television transmission service in the 14.2-14.4 GHz band is +45 dBW except that operations are not permitted within 1.5 degrees of the geostationary orbit. Beginning March 1, 2005, no new LTTS operators will be licensed and no existing LTTS licenses shall be issued in the 11.7-12.2 and 14.2-14.4 GHz bands.

* * * * *

21. Section 101.803 is amended by modifying Section (d) and footnotes (a)(3) and (a)(8) and (d)(3) to read as follows:

§ 101.803 Frequencies.

(a) * * *

Notes * * *

(3) This frequency band is shared, on a secondary basis, with stations in the broadcasting-satellite and fixed-satellite services. As of March 1, 2005, no new LTTS operators will be licensed in the 11.7-12.2 GHz band. LTTS operators authorized prior to March 1, 2005 may continue to operate in 11.7-12.2 GHz band until their license expires; no existing LTTS licenses will be renewed in the 11.7-12.2 GHz band.

(8) The maximum power for the local television transmission service in the 14.2–14.4 GHz band is +45 dBW except that operations are not permitted within 1.5 degrees of the geostationary orbit. As of March 1, 2005, no new LTTS operators will be licensed in the 14.2-14.4 GHz band. LTTS operators authorized prior to March 1, 2005 may continue to operate in 14.2-14.4 GHz band until their license expires; no existing LTTS licenses will be renewed in the 11.7-12.2 GHz band.

* * * * *

(d) Frequencies in the following bands are available for assignment to television STL stations in this service:

3,700 to 4,200 MHz (1)
5,925 to 6,425 MHz (1),(5)
10,700 to 11,700 MHz (1),(6)
11,700 to 12,100 MHz (3)

13,200 to 13,250 MHz (2)
21,200 to 22,000 MHz (2),(4),(7),(8)
22,000 to 23,600 MHz (2),(6),(8)
31,000 to 31,300 MHz (9)

Notes * * *

(3) This frequency band is shared with space stations (space to earth) in the fixed-satellite service. As of March 1, 2005, no new LTTS operators will be licensed in the 11.7-12.2 GHz band. LTTS operators authorized prior to March 1, 2005 may continue to operate in 11.7-12.2 GHz band until their license expires; no existing LTTS licenses will be renewed in the 11.7-12.2 GHz band.

* * * * *

22. Section 101.809(d) is amended by adding footnote /2/ to the line of the table that starts 10,700 to 12,200 and adding a footnote number 2 to the table as follows:

§ 101.809 Bandwidth and emission limitations.

* * * * *

(d) * * *

/2/ As of March 1, 2005, no new LTTS operators will be licensed in the 11.7-12.2 GHz band. LTTS operators authorized prior to March 1, 2005 may continue to operate in 11.7-12.2 GHz band until their license expires; no existing LTTS licenses will be renewed in the 11.7-12.2 GHz band.

* * * * *

STATEMENT OF
CHAIRMAN MICHAEL K. POWELL

Re: 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 the 14.0-14.5 GHz/11.7-12.2 GHz Bands (Adopted December 15, 2004).

Today we open another frontier for broadband – the world's oceans. We expect to be connected wherever we are, even if that means in the middle of the ocean. Whether for vacationers on a cruise ship, students taking academic courses at sea, or merchant ships communicating to their coastal headquarters – Earth Stations on Vessels (ESVs) help to provide telecommunications services and internet access for any marine craft large enough for a satellite dish.

Today we establish licensing and service rules for ESVs in the C- and Ku-bands. It is our goal to strike the appropriate balance between the interests of ESV and incumbent users in the bands. Thus, today's order allows ESVs to continue operating in the C-and Ku-bands, but requires ESV operators to protect fixed terrestrial and fixed-satellite service incumbents from interference and requires operators in both bands to collect and maintain vessel tracking data to assist in identifying and resolving sources of interference.

As broadband technologies continue to expand and become an increasingly vital component of modern communications, the market for broadband via satellite continues to grow. Thus, by continuing to support licenses for ESV operations, we are today, advancing the Commission's goals and objectives for market-driven deployment of broadband technologies. I thank the International Bureau and my fellow Commissioners for all of their hard work on this item.