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

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service	))))))	IB Docket No. 07-101

NOTICE OF PROPOSED RULE MAKING

Adopted: May 9, 2007 **Released:** May 15, 2007

Comment Date: 30 days after Federal Register publication
Reply Comment Date: 45 days after Federal Register publication

By the Commission:

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I. INTRODUCTION

1. In this Notice of Proposed Rulemaking ("*Notice*" or "NPRM"), we seek comment on whether to license Vehicle-Mounted Earth Stations ("VMES") as an application of the fixed-satellite service ("FSS") in the conventional and extended Ku-band frequencies.[1] We initiate this NPRM in response to a petition for rulemaking ("Petition") filed by General Dynamics SATCOM Technologies, Inc. ("General Dynamics").[2]

2. General Dynamics asks the Commission to amend Parts 2 and 25 of the rules to allocate spectrum for use with VMES in the FSS in the Ku-band uplink at 14.0-14.5 GHz and Ku-band downlink at 11.7-12.2 GHz on a primary basis, and in the extended Ku-band downlink at 10.95-11.2 GHz and 11.45-11.7 GHz on a non-protected basis, and to adopt Ku-band VMES licensing and service rules modeled on the Commission's rules for Ku-band Earth Stations on Vessels ("ESVs"). General Dynamics asserts that a VMES allocation and regularized service and licensing rules would facilitate the

[1] For purposes of this *Notice*, the "conventional" Ku-band refers to frequencies in the 11.7-12.2 GHz (downlink) and 14.0-14.5 GHz (uplink) bands and excludes the so-called "extended Ku-band" 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. The conventional Ku-band frequencies are allocated on a primary basis to the FSS. *See generally* 47 C.F.R. § 2.106. Co-primary systems generally are obligated to coordinate with each other on a first-come, first-served basis, whereas a system operating under a secondary allocation must not give interference to, and must accept interference from, systems operating with primary status. *See* 47 C.F.R. § 2.105(c). The FSS is a radiocommunication service between earth stations at given positions, when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which also may be operated in the inter-satellite service; the FSS also may include feeder links for other space radio-communication services. 47 C.F.R. § 2.1.

[2] Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum in the Ku- and Extended Ku-Bands to the Vehicle Mounted Earth Station Satellite Service ("VMES") on a Shared Primary Basis and to Adopt Licensing and Service Rules for VMES Operations in the Ku- and Extended Ku-Bands, Petition for Rulemaking, RM No. 11336 (filed May 24, 2006).

U.S. military's training needs with respect to advanced VMES technologies and increase the potential that advanced communications capabilities will be made available for various emergency preparedness and commercial purposes where high-bandwidth, mobile communications capabilities are beneficial.[3]

3. We seek to promote innovative and flexible use of satellite technology while ensuring avoidance of interference and efficient use of the spectrum. The primary goal of the NPRM is to develop a record on the capability of VMES terminals, or classes of VMES, to meet the interference avoidance requirements of the Ku-band FSS, such that any VMES rules for the Ku-band frequencies would protect existing FSS operators and their customers from harmful interference. We also seek to promote spectrum sharing with certain secondary operations in these frequency bands, including government space research service ("SRS") and radio astronomy service ("RAS") stations. Finally, we consider licensing methods that may simplify and speed the licensing process for VMES, while addressing our core regulatory concern with avoiding harmful interference.

4. Today, earth stations on mobile vehicles operate as land mobile satellite service ("LMSS") systems in the 14.0-14.5 GHz (Earth-to-space) and 11.7-12.2 GHz (space-to-Earth) bands.[4] LMSS licensees operate on a secondary allocation basis in the uplinks and on a non-conforming basis in the downlink frequencies. Therefore, LMSS licensees must protect primary FSS operations in the Ku-band against interference and cannot claim interference protection from primary FSS licensees. There are no specific service rules for LMSS in the Ku-band. As noted, General Dynamics asks the Commission to allocate the conventional Ku-band to VMES as an application of the FSS on a co-primary basis, similar to the allocation for ESVs that communicate with FSS satellites, and to expand the ESV rules to include VMES. General Dynamics states that its VMES terminals, Satcom-on-the Move™ ("SOTM"), can meet the relevant ESV technical requirements under both on-road and off-road conditions. The NPRM seeks the views of the satellite industry concerning the development of Ku-band FSS licensing and service rules for VMES for applications that also could be viewed as LMSS uses in a predominantly FSS frequency band.

5. Although the impetus behind the Petition is a desire to facilitate the U.S. military's training needs within the United States, the Petition suggests that non-military applications are likely to follow adoption of regularized licensing procedures for VMES.[5] Comments received on the Petition demonstrate that there also is commercial interest in even broader applications of VMES, involving use, by the general public, of ultra-small antennas on cars and trucks. The NPRM observes that these broader applications raise additional technical questions with respect to compliance with the Commission's Ku-band interference avoidance requirements. The NPRM therefore seeks comment on whether the broad commercial use, by the general public, of ultra-small antennas on vehicles traversing throughout the

[3] Petition at ii, 13.

[4] The LMSS is a mobile-satellite service ("MSS") in which mobile earth stations are located on land. 47 C.F.R. § 2.1. The MSS is a radio-communication service between mobile earth stations and one or more space stations, or between space stations used by this service, or between mobile earth stations by means of one or more space stations. 47 C.F.R. § 2.1. A mobile earth station is an earth station intended for use while in motion or during halts at unspecified points. 47 C.F.R. § 25.21. A land mobile earth station is a mobile earth station in the LMSS capable of surface movement within the geographic limits of a country or continent. 47 C.F.R. § 25.201.

[5] Petition at iii-iv, 4, 6-7. The Petition states that VMES is ideally suited for homeland defense and disaster recovery applications to supplement or replace disabled terrestrial communications systems. *Id*. at 6. The Petition also states that permitting broader VMES operations, under carefully prescribed conditions, would make the technology available for commercial uses such as satellite news gathering, weather services, mineral/fossil fuel exploration and extraction, and large-scale construction projects. *Id*. at 7.

United States raises the potential for harmful interference to other FSS licensees or Federal Government SRS and RAS operations, and, if so, whether there are technical rules that the Commission could adopt to mitigate against such harms.

6. As the Petition urges, the NPRM seeks comment on the proposed adoption of a co-primary allocation for VMES applications in the conventional Ku-band frequencies, and also seeks comment on service rules for VMES, possibly modeled on the current ESV rules. The NPRM discusses and seeks comment on rules and procedures to license VMES networks for operation only over geostationary satellite orbit ("GSO") FSS satellites in the Ku-band.

7. The record established in this proceeding will facilitate the development of allocation decisions and of any future rules. If the decision is made to go forward with VMES rules and allocations, we would seek to ensure that VMES terminals operate within the interference avoidance requirements of the Commission's two-degree satellite spacing environment for the Ku-band and not create the potential for undue interference to existing and future FSS operations in the Ku-band FSS frequencies.

II. BACKGROUND

A. Current LMSS/VMES Use

8. Earth stations on mobile vehicles currently operate as LMSS applications in the conventional Ku-band. In 1989, the Commission authorized Qualcomm, Inc. to construct and operate a two-way satellite-based narrowband data communication network of mobile and transportable transmit/receive earth stations and to operate a fixed transmit/receive earth station serving as a hub for the network communicating with FSS satellites in the 12/14 GHz frequencies bands.[6] The Commission noted that the 14.0-14.5 GHz band was allocated domestically and internationally to the LMSS on a secondary basis, and that the 11.7-12.2 GHz frequency band contained no allocation for MSS.[7] The Commission concluded that LMSS was permissible in both the uplink and downlink frequency bands, and permitted Qualcomm, Inc. to operate on a secondary basis in the uplink frequencies and as a non-conforming use in the downlink frequencies.[8] The Commission granted Qualcomm, Inc.'s request for a blanket authorization for over 20,000 technically identical very small antenna mobile earth stations operating in the 12/14 GHz band.[9] Today, the U.S. Table of Frequency Allocations ("U.S. Table" or "Table") more broadly defines the domestic U.S. secondary allocation in the 14.0-14.5 GHz frequency band as covering all MSS.[10] There are pending applications asking the Commission to authorize broadband LMSS earth stations on vehicles as a secondary MSS application in the 14.0-14.5 GHz uplink bands.[11]

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[6] *Qualcomm, Inc., Application for Blanket Authority to Construct and Operate a Network of 12/14 GHz Transmit/Receive Mobile and Transportable Earth Stations and a Hub Earth Station*, Memorandum Opinion, Order and Authorization, FCC 89-24, 4 FCC Rcd 1543 (1989) ("*OmniTracs Licensing Order*").

[7] *OmniTracs Licensing Order*, 4 FCC Rcd at 1543, ¶ 3. Since 1989, the LMSS allocation in the 14.0-14.5 GHz band has been expanded to include all MSS applications. *See* 47 C.F.R. § 2.106.

[8] *OmniTracs Licensing Order*, 4 FCC Rcd at 1544, ¶¶ 11-13.

[9] *OmniTracs Licensing Order*, 4 FCC Rcd at 1545, ¶ 20.

[10] *See* 47 C.F.R. § 2.106.

[11] *See, e.g.*, RaySat, Inc., Application for Authority to Operate 4,000 In-Motion Mobile Satellite Antennas in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, File No. SES-LIC-20060629-01083 (filed June 29, 2006) (seeking to use secondary MSS allocation in uplink and requesting waiver of section 2.106 for non-conforming use (continued….)

9. General Dynamics, a manufacturer of satellite earth station equipment, has developed its SOTM system consisting of a fixed earth station serving as one endpoint of a link and various mobile earth stations mounted on combat vehicles, each serving as the other endpoint.[12] The fixed earth station utilizes a standard 2.4 meter or larger earth station antenna that complies with the Commission's regulations and includes standard downlink and uplink equipment with a small, power-controlled transmitter.[13] Each mobile terminal contains a custom-designed, sub-meter diameter, high-performance antenna and tracking system that makes use of both active radio frequency tracking and predictive-tracking technologies that utilize sophisticated inertial navigation systems and Global Positioning Satellite ("GPS") receivers.[14] General Dynamics states that the sub-meter mobile terminals use a "stabilized" antenna mounted on a vehicle such as a military High-Mobility Multipurpose Wheeled Vehicle ("HMMWV") that is capable of both on-road and off-road travel.[15]

10. General Dynamics has been operating the SOTM system since November 24, 2004 pursuant to special temporary authority ("STA") and subsequently-granted regular experimental authority to access the Intelsat 707 satellite at 53º West Longitude ("W.L.").[16] On July 25, 2005, the Commission, on delegated authority, granted General Dynamics an STA to modify its experimental authorization to allow for domestic testing, demonstration, and training operations via six additional satellites from contiguous U.S. locations.[17] On November 21, 2005, General Dynamics received authority to further modify its experimental authorization to operate three additional 2.4 meter hub stations, and to operate smaller 0.45 and 0.50 meter (that is, 17.7 and 19.7 inch diameter, respectively) mobile earth station antennas, in place of the 0.60 meter (23.6 inch) mobile antennas originally used, from all locations in the United States, including Alaska and Hawaii.[18]

B. Petition for Rulemaking

11. The Petition asks the Commission to initiate a rulemaking to amend Parts 2 and 25 of the Commission's rules to allocate spectrum for use with VMES in the FSS in the Ku-band uplink at 14.0-14.5 GHz and Ku-band downlink at 11.7-12.2 GHz on a primary basis, and in the extended Ku-band downlink at 10.95-11.2 GHz and 11.45-11.7 GHz on a non-protected basis, and to adopt licensing and

(Continued from previous page)
in downlink, to provide two-way high-speed data communications, primarily to government and commercial enterprise customers, aboard vehicles in motion).

[12] Petition at 2.

[13] *Id*.

[14] *Id*. The system is designed to ensure a continuously stabilized mobile terminal to deal with the intense gyrations occurring as the vehicles move over rough terrain. The SOTM system uses Time-Division Multiple Access ("TDMA") technology and commercial Ku-band transponders to provide full-duplex, high data rate (tens of Mbps downlink and in excess of two Mbps uplink) communications, including voice and full-motion video, to coverage areas that are large and well defined. *Id*. at 2-3.

[15] Petition at 2-3, 5. The HMMWV is a light, highly mobile, diesel-powered, four-wheel-drive vehicle equipped with an automatic transmission. *See* http://www.army.mil/fact_files_site/hmmwv/index.html.

[16] *See* File Nos. 0640-EX-ST-2004, 0123-EX-PL-2005. *See also* Petition at 3 n.2.

[17] *See* File No. 0390-EX-ST-2005 (authorizing use, in addition to Intelsat 707 at 53º W.L., of the following satellites: AMC-9 at 83º W.L., Horizons 1 at 127º W.L., IA-5 at 97º W.L., IA-6 at 93º W.L., IA-7 at 129º W.L., and IA-8 at 89º W.L.). *See also* Petition at 3 n.3.

[18] *See* File No. 0117-EX-ML-2005. *See also* Petition at 3.

service rules for VMES operations in the Ku-band.[19] General Dynamics asserts that its current experimental authority has permitted the testing and demonstration of the VMES technology but provides insufficient authority to meet the military's requirements for domestic training with SOTM and other VMES technologies that may be acquired.[20] In seeking to expand the ESV regulatory framework to cover VMES, General Dynamics states that the Commission, in developing the rules for ESVs, engaged in a comprehensive study of mobile satellite operations in the Ku-band and adopted carefully prescribed requirements to ensure that ESV operations would adequately protect existing operators in the band from harmful interference.[21] General Dynamics asserts that its SOTM system is able to meet the operational rules applicable to ESVs.[22]

12. On July 20, 2006, the Commission placed the Petition on public notice.[23] Six parties filed comments by the August 21, 2006 comment date.[24] General Dynamics filed a reply by the September 5, 2006 reply due date.[25] Following the formal comment cycle, the Commission received additional pleadings.[26] On November 21 and December 18, 2006, General Dynamics filed responses to an information request from the International Bureau.[27]

[19] Petition at 15.

[20] Petition at ii-iii, 10-11.

[21] Petition at iii, 11.

[22] Petition at 11.

[23] Public Notice, Report No. 2780, Consumer & Governmental Affairs Bureau, Reference Information Center, Petition for Rulemakings Filed, RM No. 11336 (July 20, 2006).

[24] Comments of AvL Technologies Incorporated, RM No. 11336 (filed Aug. 21, 2006) ("AvL"); Comments of Maritime Telecommunications Network, Inc., RM No. 11336 (filed Aug. 21, 2006) ("MTN"); Comments of QUALCOMM Incorporated, RM No. 11336 (filed Aug. 21, 2006) ("Qualcomm"); Comments of the Satellite Industry Association, RM No. 11336 (filed Aug. 21, 2006) ("SIA"); Comments of SES Americom, Inc. and Americom Government Services, RM No. 11336 (Aug. 21, 2006) ("SES Americom"); Comments of ViaSat, Inc., RM No. 11336 (filed Aug. 21, 2006) ("ViaSat").

[25] Reply Comments of General Dynamics Corporation, RM No. 11336 (filed Sept. 5, 2006).

[26] Letter from Andrew D. Cotlar, Associate General Counsel, Association of Public Television Stations, to Marlene H. Dortch, Secretary, Federal Communications Commission, RM No. 11336 (filed Sept. 7, 2006) ("Request to Accept Late-Filed Comments"), attaching Letter from Lonna M. Thompson, Vice President and General Counsel, and Andrew D. Cotlar, Associate General Counsel, Association of Public Television Stations, and Katherine Lauderdale, Senior Vice President and General Counsel, Public Broadcasting Service, to Julius P. Knapp, Deputy Chief, Office of Engineering and Technology, Federal Communications Commission, RM No. 11336 (filed Sept. 7, 2006) ("APTS"); *see also* Letter from McLean Sieverding, Counsel for General Dynamics Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Nov. 14, 2006); Letter from McLean Sieverding, Counsel for General Dynamics Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Jan. 30, 2007). We grant the Request to Accept Late-Filed Comments and therefore accept the APTS pleading into the record.

[27] Letter from McLean Sieverding, Counsel for General Dynamics Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Nov. 21, 2006) ("November 21 Response to Information Request"); Letter from McLean Sieverding, Counsel for General Dynamics Corporation, to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Dec. 18, 2006) ("December 18 Response to Information Request").

C. Related Proceedings

13. The issues raised in the Petition are interrelated with four other pending proceedings, three that address service and licensing rules for earth stations in the Ku-band FSS frequencies, and one that addresses the broader question of Federal government use of non-Federal spectrum.[28] In the Discussion section, below, the NPRM seeks comment on how these proceedings might be relevant to rules for VMES.

III. DISCUSSION

14. As noted, the Petition asks the Commission to initiate a rulemaking to amend Parts 2 and 25 of the Commission's rules to allocate spectrum for use with VMES terminals in the FSS in the Ku-band uplink at 14.0-14.5 GHz and Ku-band downlink at 11.7-12.2 GHz on a primary basis, and in the extended Ku-band downlink at 10.95-11.2 GHz and 11.45-11.7 GHz on a non-protected basis, and to adopt licensing and service rules for VMES operations in the Ku-band.[29] General Dynamics asks the Commission to add the following footnotes to the U.S. Table:

> NGXXX: In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Vehicle Mounted Earth Stations (VMESs) 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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> NGXXX: In the bands 10.95-11.2 GHz and 11.45-11.7 GHz, Vehicle Mounted Earth Stations (VMESs) 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 the Commission's Rules.[30]

15. We ask for comment on the allocations requested by General Dynamics, that is, a primary allocation in the conventional Ku-band that would be modeled on the existing primary allocation for

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[28] *See Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20, Notice of Proposed Rulemaking, FCC 05-14, 20 FCC Rcd 2906 (2005) ("*AMSS NPRM*") (proposing service rules and procedures for Aeronautical Mobile Satellite Service ("AMSS") systems communicating with FSS networks in the Ku-band); *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Report and Order, FCC 04-286, 20 FCC Rcd 674 (2005) ("*ESV Report and Order*") (petitions pending for reconsideration/clarification of ESV rules); *2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations*, IB Docket No. 00-248, Sixth Report and Order and Third Further Notice of Proposed Rulemaking, FCC 05-62, 20 FCC Rcd 5593 (2005) ("*Sixth Report and Order and Third Further Notice*") (proposing off-axis power-density envelopes for the FSS); Amendment to the National Table of Frequency Allocations to Provide Allocation Status for Federal Earth Stations Communicating with Non-Federal Satellites, Petition for Rulemaking of the National Telecommunications and Information Administration, RM-11341 (filed Aug. 4, 2006) ("NTIA Petition") (seeking primary status protection for some Federal government earth stations communicating with non-Federal satellites in several frequency bands, including the FSS Ku-bands) ; *see also* Public Notice, Consumer & Governmental Affairs Bureau, Reference Information Center, Petition for Rulemakings Filed, Report No. 2789 (Aug. 17, 2006) (placing NTIA Petition on public notice).

[29] Petition at 15. Part 2 of the rules includes the U.S. Table. *See* 47. C.F.R. § 2.106. Part 25 sets out the Commission's rules for the licensing of FSS earth and space stations. *See* 47 C.F.R. Part 25.

[30] Petition at 10.

ESVs. A primary allocation for VMES would provide protection from interference to VMES terminals, which are land-mobile and not fixed in nature, as well as give VMES equal status in coordinating emissions from VMES terminals with adjacent FSS systems, as if VMES terminals were FSS earth stations. Based on the comments received on the Petition, it is clear that certain commenters would propose to promote VMES terminals that use smaller antennas and less accurate antenna pointing systems than those that General Dynamics uses for its SOTM system. We have concerns that some classes of proposed VMES terminals would not operate compatibly in the Commission's Ku-band two-degree spacing environment for the FSS. We seek comment on how to differentiate compatible and non-compatible VMES terminals. In addition, certain applicants for systems providing earth stations on mobile vehicles may not be able to meet the VMES requirements that we would adopt, but otherwise might be able to engineer their systems to meet the Ku-band FSS interference avoidance requirements. We invite comment on whether we should, in that case, treat these as applications for LMSS systems and license them under the existing secondary LMSS allocation in the 14.0-14.5 GHz FSS uplink band and as non-conforming in the 11.7-12.2 GHz FSS downlink band, with specific license conditions to protect FSS licensees and their customers from harmful interference.[31] Should the Commission conclude that an applicant's proposal would not protect incumbent FSS operations or Federal Government SRS and RAS operations from harmful interference, the Commission may deny the application as ineligible for either primary FSS or secondary MSS.

16. We also seek comment on licensing and service rules for operating VMES terminals if they are granted primary allocation status. The Petition asks the Commission to extend the ESV Ku-band service and licensing rules to VMES by simply modifying section 25.222 to include "and [/or] VMES" after each reference to ESVs. Commenters on the Petition seek modifications to the technical requirements of section 25.222, as applied to VMES. We seek comment on the proposed set of rules set out in Appendix B to this NPRM. Additionally, we seek comment on the modifications proposed by commenters to the Petition. As discussed below, we view Appendix B as a starting point for developing VMES rules that would be designed to protect FSS systems or Federal Government SRS and RAS operations from harmful interference.

17. Authorizing VMES terminals in the Ku-band presents the challenge of protecting primary status FSS satellites from potential harmful interference. We intend that, if adopted, such a licensing program would support the deployment of VMES terminals to the benefit of the U.S. public while ensuring that existing FSS services are protected against harmful interference. At the same time, we need to ensure that providing protection to the VMES on a primary basis will not create an undue burden on existing FSS systems.[32] To that end, we seek comment from individual operators of incumbent radio

[31] This alternative assumes that the LMSS operator provides a technical study demonstrating that the proposed system could protect other FSS licensees and their customers from harmful interference through other means. We also note that the Petition seeks a proposed regulatory framework for VMES only to test and train U.S. military personnel on VMES technologies within the United States, with the intent that the U.S. military's operational use of VMES would occur outside of the United States and subject to regulations issued by the relevant administration. November 21 Response to Information Request Attachment at 4-6. We ask whether the availability of secondary status and non-conforming use licenses, STAs, or experimental licensing for domestic testing and training activities within the United States might permit General Dynamics to develop the type of record it anticipates it will need to demonstrate to other administrations, at some future point, the compatibility of VMES operations with other existing Ku-band FSS uses. *See id*. at 5-6.

[32] The use of ultra-small antennas, as proposed by some commenters, would reduce the available antenna gain isolation in the direction of other FSS satellite systems, potentially increasing the VMES interference vulnerability. Therefore, incumbent and future FSS systems would be in the position of having to provide protection to VMES antennas that are more susceptible to interference than traditional FSS antennas.

services in the Ku-band, including both Federal and non-Federal users. We request comments on the proposals addressed in this *Notice*. Further, we encourage all commenters to address any other issues concerning VMES operations in the Ku-band. The record established in this proceeding will allow the Commission to determine the impact of modifying the conventional Ku-band FSS allocations, authorizing VMES terminals, and facilitating the development of any future rules. Establishing a licensing procedure for VMES could advance our continuing effort to maximize the flexible use of the radiofrequency spectrum for earth station operations.[33]

A. Basis for VMES Operations and U.S. Table of Frequency Allocations Issues in the Ku-Band

18. Earth stations on mobile vehicles communicating with Ku-band FSS space stations historically have been licensed as LMSS systems; that is, as MSS systems with earth stations that are located on land.[34] General Dynamics proposes, instead, to treat these systems as an application of the Ku-band FSS. That is, the earth stations would communicate with Ku-band FSS satellites, receive primary protection against interference in the Ku-band, and have status allowing them to contribute to the noise received by nearby FSS satellites, as if they were traditional FSS earth stations. The Petition asks the Commission to treat VMES as co-primary in the Ku-band under the assumption that VMES terminals can meet the ESV technical rules, as applied to VMES.[35] We disagree that the ability of new mobile services to meet the ESV rules necessarily would require the Commission to grant the new mobile services the same primary status. A central question to be asked in the NPRM is whether the VMES should be granted primary status in the Ku-band FSS. As discussed below, General Dynamics asserts that VMES terminals are similar to ESVs and therefore merit primary status. However, there are significant differences between VMES (or, at least, some classes of VMES) and ESVs. At the same time, the lack of co-primary shared services in the conventional Ku-band could permit the Commission to consider associating VMES with the primary FSS service and provide VMES with the allocation status requested by General Dynamics, without the complicating requirements needed to protect primary non-

[33] *See Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium,* Policy Statement, FCC 99-354, 14 FCC Rcd 19868, 19870, ¶ 9 (1999) ("In the majority of cases," the Commission noted in 1999, "efficient spectrum markets will lead to use of spectrum for the highest value end use" and "[f]lexible allocations may result in more efficient spectrum markets."). *See also Amendment of the U.S. Table of Frequency Allocations to Designate the 2500-2520/2670-2690 MHz Frequency Bands for the Mobile-Satellite Service*, First Report and Order and Memorandum Opinion and Order, FCC 01-256, 16 FCC Rcd 17222, 17223, ¶ 2 (2001) (finding that investing incumbent licensees with more flexibility in the use of their assigned spectrum would foster the introduction of new services, promote competition, and permit market forces to determine the best use for the spectrum).

[34] 47 C.F.R. § 2.1 (defining MSS and LMSS).

[35] The Commission previously has authorized various mobile systems to operate with FSS space stations in the Ku-band. In doing so, the Commission has required that the various mobile systems meet the interference avoidance requirements applicable to the FSS, just as VSATs and other traditional FSS systems must avoid interference. For example, in 2005, the Commission authorized ESVs, establishing operational rules that are consistent with the VSAT rules and granting ESVs primary protection in the Ku-band FSS. The Commission added a footnote to the U.S. Table to recognize the allocation status of ESV systems as a mobile application of the FSS in both the 14.0-14.5 GHz uplink and 11.7-12.2 GHz downlink frequencies. 47 C.F.R. § 2.106 Footnote 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 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."). Additionally, the Commission has licensed individual AMSS and LMSS systems to operate in the Ku-band FSS. These individual systems operate with non-conforming use licenses that require them to protect primary Ku-band FSS licensees.

FSS systems. We seek comment and advice from the FSS industry on granting primary status to VMES. If VMES is granted primary status, the FSS industry will have to accept the increased noise-power from the VMES, as if VMES terminals were FSS earth stations, and will have to provide primary status protection to the VMES. At the same time, the FSS industry might benefit by supplying satellite capacity, services and equipment to VMES systems. The FSS industry therefore is in a good position to provide comment on the various tradeoffs resulting from a grant of primary status to VMES as an application of the FSS.

19. In asking for comment on whether we should grant primary status to VMES, or classes of VMES, in the conventional Ku-band, we observe that VMES, like ESV, is a mobile system, but with significant differences. We seek comment on these differences in the context of evaluating whether VMES, or classes of VMES, can operate compatibly in the FSS two-degree spacing environment. The significant identified differences include:

- Antenna Size. The Petition suggests that, although General Dynamics proposes to provide VMES for U.S. military applications, there will be commercial applications for this technology.[36] Commenters suggest that the Commission should develop rules that would permit large-scale deployment of mobile broadband systems to the public using ultra-small antennas.[37] Both military and commercial VMES applications would use antennas smaller than those typically found on VSATs or ESVs.[38] The original two-degree FSS VSAT interference rules were predicated on the use of antennas with a diameter of 1.2 meters or greater (*i.e.*, 3.9 feet or larger), operating from fixed locations. ESVs typically use antennas with a diameter on the order of 1.2 meters. General Dynamics currently is using antennas as small as 0.45 meters (17.7 inches) and supporters of the commercial applications of VMES are in favor of licensing even smaller antennas. The ultra-small antennas operating in a mobile environment envisioned for large-scale commercial deployment of VMES have a greater potential of causing interference to adjacent satellites than the antennas currently authorized for the band and would lack the interference rejection qualities of the larger antennas.

- Antenna Tracking Systems. ESV operators are required to use antenna systems that accurately track the wanted satellite as the ship moves, pitches and rolls. General Dynamics uses very precise, and very expensive, tracking systems for its military VMES antennas. Some proponents of commercial applications would lower the pointing accuracy requirements for VMES, resulting in lower-cost tracking systems and, potentially, increasing the level of interference to other FSS satellites.

- Ubiquity. ESVs are likely to be used only by relatively large vessels, capable of carrying the large ESV dishes, and are geographically limited to operating on waterways and in port. VMESs have been placed on vehicles capable of off-road travel and would have access to practically all of the United States.

[36] Petition at 6-7; November 21 Response to Information Request Attachment at 6-7.

[37] *See, e.g.,* ViaSat at 3 (urging the Commission to propose rules that would allow the operation of small, low-profile antennas that consumers affordably could install on standard vehicles) and at 9 (stating that commercial success depends in part on ability to use small, low-profile antennas mountable on standard cars and trucks).

[38] A "VSAT," or very small aperture terminal, is a two-way satellite earth station with an antenna that is smaller than 3 meters in diameter. VSATs most commonly are used to transmit credit card or other data for point-of-sale transactions and to provide satellite Internet access to remote locations.

- Tracking Accuracy. Because of the size of the vessels on which ESVs are mounted, ESVs undergo smaller accelerations than earth stations on mobile vehicles, making it easier for the ESV antenna tracking system to track the wanted satellite. In fact, General Dynamics concedes that it is impossible to construct a VMES antenna tracking system that will meet the 0.2 degree antenna pointing requirement under all possible conditions.[39]

- Quantity. If applications of VMES are permitted for use by the general public, the number of VMES terminals that potentially could be operated is significantly larger than the number of ESV systems.

We seek comment on the relevance of these differences between VMESs and ESVs to the question of whether we should grant primary status for VMES as an application of the FSS. Additionally, we ask commenters to consider other factors, not listed, that may be relevant.

20. As stated above, if the Commission grants primary status to VMES, existing FSS systems will be required to accept the increased noise-power from VMES, as if VMES terminals were traditional FSS earth stations, and will be required to provide primary status protection to VMES. At the same time, the FSS industry may benefit by supplying satellite capacity, services and equipment to VMES systems. The FSS industry therefore is in a good position to provide comment on the pros and cons of associating VMES with FSS and providing primary status to VMES, or any given class of VMES. We therefore seek comment on General Dynamics' proposal to grant VMES primary allocation status by making VMES an application of the FSS.

21. We note that there is international recognition for MSS, including LMSS, as a secondary allocation in the 14.0-14.5 GHz band, as well as international recognition for ESVs as a primary service and AMSS as a secondary service.[40] We observe that there currently is no comparable international

[39] December 21 Response to Information Request Attachment at 9 (stating that "The design of a VMES terminal that could accurately track the desired satellite under any and all conditions would result in a terminal that is both too heavy and too expensive for virtually any user." and "General Dynamics has demonstrated that it is possible for the VMES antenna to be unable to move "fast enough" to satisfy extreme environments. Fortunately, we have also demonstrated that our transmitter mute function performs well enough to eliminate potential interference effects.").

[40] The Commission adopted a primary allocation for ESVs in an order released early in 2005, by adding footnotes to the U.S. Table to recognize ESVs as an application of the FSS with primary status. *ESV Report and Order*, 20 FCC Rcd at 676, ¶ 3. In doing so, the Commission implemented, in part, the decision reached at the 2003 World Radiocommunications Conference ("WRC-03") of the International Telecommunications Union ("ITU"), which had added a footnote to the International Table of Frequency Allocations stating that, among other things, ESVs may communicate with FSS space stations in the 14.0-14.5 GHz bands. *See ESV Report and Order*, 20 FCC Rcd at 676, ¶ 3. WRC-03 also added a worldwide secondary AMSS allocation in the 14.0-14.5 GHz band used for satellite uplinks. *See Final Acts WRC-03 World Radiocommunication Conference* (Geneva, 2003) at 34-38; *see also* 47 C.F.R. § 2.106 Footnote 5.504A. AMSS is a component of the MSS. 47 C.F.R. § 2.1. In 2003, the Commission conformed the U.S. Table to the international allocation. *Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from the World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range*, ET Docket No. 02-305, Report and Order, FCC 03-269, 18 FCC Rcd 23426, 23454, ¶ 76 (2003) ("*Above 28 MHz Order*") (adopting secondary allocation for MSS, including LMSS and AMSS, in 14.0-14.5 GHz band). *See also* 47 C.F.R § 2.106 Footnotes 5.504A, 5.504B, 5.504C and 5.509A (international footnotes stating, among other things, that, in the band 14.0-14.5 GHz, aircraft earth stations in the secondary AMSS also may communicate with space stations in the FSS). In 2005, the Commission proposed to adopt a footnote to the U.S. Table to make aircraft earth stations in the AMSS an (continued….)

recognition in the conventional Ku-band for VMES as an FSS application.[41] General Dynamics states that it would be impractical to gain ITU recognition for VMES before operating such terminals within the United States under Commission regulation.[42] Further, General Dynamics states its belief that implementation of broader, international VMES rules will be easier to accomplish after other administrations recognize the compatibility of VMES with other existing FSS Ku-band users.[43] Additionally, General Dynamics states that it anticipates that VMES operations abroad, unlike ESVs operating on the high seas, will require a form of licensing pertinent to the administration with jurisdiction over the foreign soil on which the terminals would operate.[44] As General Dynamics asserts, international recognition may be less relevant for VMES operating solely within the United States than for ESV and AMSS systems, which, once licensed by the Commission, operate both domestically and internationally. In this regard, we note the current international allocation for MSS, including LMSS, at 14.0-14.5 GHz. Further, we note that, even in the absence of ITU agreement on a VMES allocation, we would design any proposed VMES rules to ensure that other countries' communications systems would not receive interference from VMES terminals operating within the United States. We seek comment on this analysis and ask for comment on the relevance, if any, of the current international recognition of LMSS, ESV, and AMSS to our consideration of a domestic allocation status for VMES.

22. The majority of commenters support General Dynamics' request to initiate a rulemaking proceeding.[45] SES Americom, a supplier of Ku-band satellite transponder capacity, states that it has been

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application of the FSS on a secondary basis in the 11.7-12.2 GHz and 14.0-14.5 GHz bands, except that reception from GSO space stations in the FSS in the 11.7-12.2 GHz band would be protected in the United States on a primary basis, provided that the aircraft earth stations operated under the same parameters as earth stations in the FSS. *See AMSS NPRM*, 20 FCC Rcd at 2924, ¶ 31. At this time, the proposal remains pending.

[41] Additionally, despite the general international acceptance of ESVs, several administrations currently do not recognize ESVs, much less VMES, because they have allocated the 14.0-14.5 GHz band to the Fixed Service ("FS") on a primary basis. *See* 47 C.F.R. § 2.106 Footnotes 5.505, 5.508. Other administrations treat ESVs as secondary mobile systems in the MSS. *See* 47 C.F.R. § 2.106 Footnote 5.457B.

[42] November 21 Response to Information Request Attachment at 5. General Dynamics states that its proposal is intended to urge the Commission to provide a regularized licensing mechanism and service rules for VMES operations within the territory regulated by the Commission, through technical standards that render VMES terminal transmissions no different than those of ESVs, VSATs, and other FSS Ku-band terminals. *Id*. at 5-6.

[43] *Id*. at 6.

[44] *Id.* at 4. General Dynamics states that it has supplied SOTM terminals to ND-Satcom, a German satellite communications modem and system manufacturer and integrator, which in turn has supplied these systems to the German army. It states that the German administration has licensed the terminals and that the terminals currently are in operation in Germany. November 21 Response to Information Request Attachment at 5.

[45] Some commenters offer strong support. *See, e.g*., SES Americom at 2 (strongly supporting the General Dynamics proposal); ViaSat at 1 (ViaSat has strong interest in proceeding because it is developing antenna and modulation technology for high-speed data communications in moving vehicles). Other commenters support the proposal if properly implemented. SIA, for example, supports the initiation of a rulemaking proceeding to address the orderly implementation and use of earth stations on moving land-based platforms, noting that, if properly implemented, such expanded use of the FSS will promote spectrum efficiency, improved access to spectrum by services with mutually compatible technical characteristics, and expanded broadband deployment. SIA at 3, 6. *See also* MTN at 2-3 (supporting rulemaking on implementation and use of earth stations on moving vehicles and land-based platforms; if properly implemented, expanded use of the FSS will promote spectrum efficiency, improve access to spectrum by services with mutually compatible technical characteristics, and contribute to broadband deployment); Qualcomm at 2 (as a general matter and as discussed in its comments, Qualcomm supports the Petition and believes that its adoption will promote greater flexibility in spectrum use). *See also* AvL at 1 (unpaginated) (General Dynamics' (continued….)

approached by other prospective providers of new terrestrial-based mobile satellite services, confirming "strong and growing" customer interest in the provision of terrestrial mobile communications using the FSS.[46] SES Americom says that these prospective providers recognize that satellite-based broadband service to vehicles can meet important communications requirements such as supplying mobile broadband service immediately to the public safety community in a time of crisis when terrestrial service may not be available.[47] SES Americom asserts that satellites are not likely to be an efficient solution where terrestrial mobile broadband is available.[48] At the same time, SES Americom states that the Commission should ensure that mobile service is available to governmental and commercial users where terrestrial service cannot reasonably be deployed, or where terrestrial service temporarily is unavailable due to natural disaster, terrorist attack, or other catastrophic event.[49] ViaSat adds that an allocation consistent with ESV would ensure access to multiple satellites and facilitate interoperability among ESV, VMES, VSAT and other FSS services having a primary allocation and that this primary allocation would provide the interference protection that ViaSat claims is needed to satisfy the growing demand for two-way broadband for vehicles in motion.[50]

23. Finally, as noted above, if the Commission concludes that the terminals proposed by VMES applicants (or subclasses of the proposed terminals) might not be able to meet the ESV rules, or modifications of the ESV rules, as modified for VMES, the Commission could continue to grant individual licenses to LMSS operators. Such licenses would need to contain appropriate technical conditions to ensure that the licensed systems were compliant with the FSS interference avoidance environment. The Commission could license such LMSS systems under the existing secondary MSS allocation in the 14.0-14.5 GHz uplink band. Of course, if the Commission concludes that the terminals proposed by a VMES applicant (or subclasses of the proposed terminals) would not meet the VMES rules or otherwise protect incumbent FSS operations from harmful interference, the Commission may refuse to license the proposed system as either primary FSS or secondary LMSS. We ask for comment on the regulatory treatment of VMES. We do not think it is useful or necessary to adopt Qualcomm's suggestion that we allocate the conventional Ku-bands to VMES as an MSS on a primary basis; that is, by upgrading the secondary MSS allocation in the 14.0-14.5 GHz band to primary and adding a co-primary allocation for VMES as an MSS in the 11.7-12.2 GHz band.[51] This is because, with a decision to

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request to apply ESV rules to VMES is logical, technically sound, and in best interest of satellite communications industry). *But see* APTS at 2-3 (APTS and Public Broadcasting Service voice concern that expanding limited military use of conventional and extended Ku-bands for VMES might create harmful interference that could affect their members' ability to deliver noncommercial educational programming using these bands).

[46] SES Americom at 4. *See also* ViaSat at 2 (stating that ViaSat has interests in both governmental and commercial applications and urging Commission to consider importance of commercial deployment in addition to U.S. military and governmental uses.

[47] SES Americom at 4. *See also* SIA at 5 (agreeing that potential commercial uses would include homeland security/national defense and disaster recovery to supplement or replace disabled terrestrial systems, satellite news gathering and weather services, mineral/fossil fuel exploration and extraction, and large-scale constructions projects, citing to Petition at 6-7); MTN at 3 (same).

[48] SES Americom at 4.

[49] SES Americom at 4.

[50] ViaSat at 4.

[51] *See* Qualcomm at 3, 5. With respect to the extended Ku-bands, 10.95-11.2 GHz and 11.45-11.7 GHz, Qualcomm observes that the FSS allocation currently is shared on a co-primary basis with the FS, requiring coordination among these stations. Qualcomm asserts that, as VMES is mobile, it is possible for VMES to receive interference from fixed, point-to-point microwave systems. Qualcomm at 3. Because of these difficulties, Qualcomm concurs that (continued….)

permit VMES to operate as a primary service with FSS satellites in the Ku-band, we would propose to add a footnote that, similar to that adopted for ESVs, would make VMES an application of the FSS with primary status, and thus a co-primary status for VMES as an MSS system would be unnecessary. We seek comment on this analysis.[52]

1. Ku-band Downlink: 11.7-12.2 GHz Band, and 10.95-11.2 GHz and 11.45-11.7 GHz Bands

24. The allocations and operating conditions for portions of the Ku-band downlink spectrum differ based on several factors, including the fact that non-Federal and Federal facilities currently operate in portions of the Ku-band downlink frequencies. We discuss each band separately below.

a. 11.7-12.2 GHz Band

25. The 11.7-12.2 GHz band is allocated to the FSS for downlink operations on a primary basis and is used extensively for VSAT downlinks.[53] In the *ESV Report and Order*, we added a footnote to the U.S. Table stating that ESVs are an application of the FSS in the 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space) bands.[54]

26. There is no U.S. Table allocation for MSS, including LMSS and AMSS, in the 11.7-12.2 GHz downlink band.[55] As noted, in 1989 the Commission licensed Qualcomm, Inc. to operate a

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VMES operations in the extended Ku-bands must be secondary in nature and in accordance with footnote NG182, developed for ESVs. Qualcomm at 3 (noting consistency, in this regard, with the Petition). *See also* 47 C.F.R. § 2.106 Footnote NG182. Qualcomm also believes that any rulemaking should be applied equally to both the Federal and non-Federal portions of the U.S. Table. Qualcomm at 3. Including co-primary MSS allocations, as Qualcomm suggests, in both the Federal and non-Federal portions of the U.S. Table would open the commercial Ku-band FSS frequencies to use by Federal government agencies with primary allocation status. This is a subject that is broader in scope than the General Dynamics Petition. *See, e.g.*, NTIA Petition, RM-11341, *supra* note 28.

[52] We also note that, in a recent petition, NTIA is seeking to authorize, on a primary, protected basis, some Federal government earth stations that communicate with non-Federal satellites in several frequency bands, including the FSS Ku-bands. NTIA Petition at 1-2. Because Federal earth stations operating with non-Federal satellites generally operate on a non-interference basis, and Federal policy promotes the use of commercial communication satellite systems, the NTIA Petition seeks to promote greater Federal use of non-Federal satellites. Because the Commission will address the NTIA Petition separately, we ask, for present purposes, that commenters only address those effects that they would envision that a grant of the NTIA Petition might have on the General Dynamics proposal to adopt an allocation and licensing scheme for VMES.

[53] *See* 47 C.F.R. § 2.106.

[54] *ESV Report and Order*, 20 FCC Rcd at 706, ¶ 79. In the *ESV Report and Order*, we also removed a mobile (except aeronautical mobile) allocation under which the Commission had licensed Local Television Transmission Service ("LTTS"). *ESV Report and Order*, 20 FCC Rcd at 709-710, ¶¶ 82-84. As of March 1, 2005, we no longer consider LTTS license applications for the 11.7-12.2 GHz band, although we did "grandfather" pre-existing LTTS licensees to operate as a secondary mobile service in the 11.7-12.2 GHz band with the understanding that there will be no expectation of renewal. *ESV Report and Order*, 20 FCC Rcd at 710, ¶ 84.

[55] Qualcomm notes that MSS is allocated in the 14.0-14.5 GHz FSS uplink but that the corresponding downlink, in the 11.7-12.2 GHz band, needed for two-way communications, does not contain an MSS allocation. Qualcomm at 3. The lack of an MSS allocation, according to Qualcomm, requires that applicants seek a waiver of the Commission's rules, which, Qualcomm states, adds uncertainty and risk to the launch of commercial mobile operations. Qualcomm at 3. As noted above, Qualcomm suggests that the Commission treat VMES as an MSS and add an MSS allocation to the 11.7-12.2 GHz FSS downlink band. Qualcomm at 3. Qualcomm asserts that ESV terminals and mobile earth (continued….)

narrowband land mobile service on a non-conforming basis in the 11.7-12.2 GHz FSS downlink.[56] In the *AMSS NPRM*, the Commission proposes to establish a new non-Federal footnote for the 11.7-12.2 GHz band to indicate that Aeronautical Earth Station ("AES") terminals in the AMSS may operate with FSS space stations, so that parties will be aware that mobile receivers might be operating in the band.[57] Currently, domestic downlink signals operate under ITU Radio Regulation 4.4 in the 11/12 GHz band.[58]

27. We seek comment on whether to establish a new non-Federal footnote for the 11.7-12.2 GHz band to reflect that VMES terminals may operate with FSS space stations. We believe our rules should reflect clearly the various types of operations that use a spectrum band.

b. 10.95-11.2 GHz and 11.45-11.7 GHz Bands

28. 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,[59] and FSS use of this band is reserved for international systems by footnote NG104.[60] In the United States, these bands also are used by the FS for LTTS, Microwave Business, Microwave Public Safety, and Common Carrier Fixed Point-to-Point. Our regulatory treatment of ESVs in these bands requires ESV operators to accept interference from all current and future FS operations in these bands.[61] Within the United States, we do not anticipate that unprotected receive-only operations in the extended Ku-band would interfere with or restrict other authorized operations in the band.[62] We seek comment on whether VMES operations in the 10.95-11.2 GHz and 11.45-11.7 GHz bands should be permitted on a non-protected basis with respect to the FS.

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stations are indistinguishable to satellite networks, yet ESVs are licensed expeditiously and afforded co-primary status in the U.S. Table. Qualcomm at 3. We note that the ESV footnote allocations were modeled after the international footnotes developed at WRC-03. *See* ITU-R Footnote 5.457A ("In the bands 5 925-6 425 MHz and 14-14.5 GHz, earth stations located on board vessels may communicate with space stations of the fixed-satellite service. Such use shall be in accordance with Resolution 902.").

[56] *See supra* note 6.

[57] *AMSS NPRM*, 20 FCC Rcd at 2915, ¶ 15. As noted, current AMSS operations in the 11.7-12.2 GHz FSS band are on a non-conforming use basis pursuant to grant of a rule waiver. *AMSS NPRM*, 20 FCC Rcd at 2910-11, ¶ 5.

[58] *See* ITU Radio Regulation 4.4, which permits operation in any band on a non-interference and non-protection basis. The full text of ITU Radio Regulation 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, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations."

[59] 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 propose today only would apply to extended Ku-band downlink operations at 10.95-11.2 GHz and 11.45-11.7 GHz.

[60] *See* 47 C.F.R. § 2.106 Footnote NG104, which states 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."

[61] *ESV Report and Order*, 20 FCC Rcd at 710, ¶ 86.

[62] VMESs, like ESVs, would use these portions of the Ku-band for reception only. *See ESV Report and Order*, 20 FCC Rcd at 710, ¶ 86. Because Ku-band ESV downlink operations will not interfere with current or future FS operations, and because ESVs will not receive protection from the FS in these bands, the Commission determined (continued….)

2. Ku-Band Uplink: 14.0-14.5 GHz Band

29. The U.S. Table for the 14.0-14.5 GHz band includes a primary allocation for non-Federal FSS uplink operations.[63] This band is used heavily by VSATs for uplinking to geostationary satellites. A single GSO FSS authorization can cover several thousand VSAT earth station terminals, which provide video and data communications and are widely deployed at business locations, ranging from the largest corporate headquarters to the smallest convenience stores. In 2001, the Commission also permitted non-geostationary orbit ("NGSO") FSS gateway and user terminal uplinks to operate in the 14.0-14.5 GHz band.[64] The 14.0-14.5 GHz band also is allocated for MSS uplinks on a secondary basis for non-Federal use.[65] As noted, this MSS allocation presently is used by OmniTracs, a satellite-based land mobile communications and tracking system that provides real-time messaging and position reporting between trucking fleets and their operations centers.[66] As noted above, the *ESV Report and Order* added a footnote to the U.S. Table stating that ESVs are an application of the FSS in the 14.0-14.5 GHz band (for satellite uplinks).[67] The ITU, at WRC-03, recognized that the use of the 14.0-14.5 GHz band for AMSS on a secondary basis is compatible with current FSS systems, and the *AMSS NPRM* proposes to add a footnote making AMSS an application of the FSS.[68] There are no primary FS allocations in any portion of the 14.0-14.5 GHz band.

30. A proposal to recognize VMES as a functional equivalent of conventional FSS operations in the 14.0-14.5 GHz band would rely on our two-degree spacing policy to protect existing and future FSS operations from harmful interference.[69] Accordingly, recognition of VMES as an FSS application would

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that the intent of NG104 would not be undermined by allowing ESVs to operate domestically in these bands. *Id*. at 711, ¶ 86. We would propose to make the same determination with respect to VMESs operating domestically in these bands.

[63] 47 C.F.R. § 2.106.

[64] *See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, ET Docket No. 98-206, First Report and Order and Further Notice of Proposed Rule Making, FCC 00-418, 16 FCC Rcd 4096 (2000). The Commission, on delegated authority, recently authorized an NGSO applicant to construct, but not launch or operate, a system of NGSO satellites designed to use, among other bands, the 14.0-14.5 GHz FSS uplink band, but the licensee subsequently surrendered its license. *See Application of Virtual Geosatellite, LLC for Authority to Launch and Operate a Global Fixed-Satellite Service System Employing Non-Geostationary Satellites in Sub-Geosynchronous Elliptical Orbits*, Order and Authorization, DA 06-2560, 21 FCC Rcd 14687 (Int'l Bur. 2006) ("*Virtual Geo Order*"); *see also* note 154, *infra*.

[65] *See* 47 C.F.R. § 2.106.

[66] In 2005, OmniTracs processed more than nine million transactions daily. *See* OmniTracs Keeps on Trucking, Dec. 1, 2005 at http://www.wirelessweek.com/article/CA6287997.html?spacedesc=Features (visited Jan. 26, 2007).

[67] *ESV Report and Order*, 20 FCC Rcd at 706-07, ¶ 79.

[68] *See AMSS NPRM* at 2924, ¶ 31.

[69] 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) ("*Two-Degree Spacing Order*"); *summary printed in Licensing Space Stations in the Domestic Fixed-Satellite Service*, 48 Fed. Reg. 40233 (Sept. 6, 1983), *on recon.*, *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, Memorandum Opinion and Order, FCC 84-487, 99 FCC 2d 737 (continued….)

allow VMES terminals to communicate with FSS space stations in the 14.0-14.5 GHz band on a primary basis.

a. 14.0-14.2 GHz Band

31. The 14.0-14.2 GHz portion of the Ku-band is allocated on a primary basis in the United States to FSS for non-Federal operations.[70] Space research services (for both Federal and non-Federal use) are allocated to the 14.0-14.2 GHz sub-band on a secondary basis.[71] 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 in White Sands, New Mexico), which operate with frequency assignments in the 14.0-14.05 GHz band.[72] We note that the filtering associated with the existing TDRSS facilities leaves them vulnerable to interference to varying degrees. The White Sands facility, for example, has some filtering across the entire 14.0-14.5 GHz band, while the Guam facility is somewhat better protected above 14.2 GHz.[73] We also note that NASA plans to establish another TDRSS receive facility on the east coast of the United States, with several mid-Atlantic region sites under consideration. As discussed in the *ESV Report and Order*, we would expect NASA to equip any future facilities operating in this band with state-of-the-art interference filtering.[74]

32. We recognize the importance of protecting these space research facilities from receiving harmful interference. With this is in mind, if we should adopt primary status for VMES in the 14.0-14.5 GHz bands, we seek comment on the feasibility of allowing VMES operations within a 125 kilometer protection zone around operational NASA TDRSS sites, particularly if the Commission were to allow large numbers of VMES to be operated under a blanket license. We propose, as a condition of the license, to prohibit VMES operators from operations in the 14.0-14.2 GHz band within 125 kilometers of the NASA TDRSS sites at Guam or White Sands. However, we solicit comment on whether we should allow VMES operators that wish to operate in the 14.0-14.2 GHz band and plan to travel within 125 kilometers of the NASA TDRSS sites at Guam or White Sands to coordinate their proposed operations to resolve any potential harmful interference concerns regarding space research facilities. Such coordination would be a condition to licensing, as opposed to a prerequisite to licensing and, thus, we

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(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.

[70] *See* 47 C.F.R. § 2.106. In WT Docket No. 01-289, the Commission removed a secondary non-Federal radionavigation allocation from the 14.0-14.2 GHz band because the record demonstrated no existing or anticipated need to use Ku-band spectrum for radionavigation. *See Review of Part 87 of the Commission's Rules Concerning the Aviation Radio Service*, WT Docket No. 01-289, Second Report and Order and Further Notice of Proposed Rule Making, FCC 06-148, 21 FCC Rcd 11582, 11595-96, ¶ 19 (2006).

[71] *See* 47 C.F.R. § 2.106.

[72] *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, ¶ 42 n.74 (2004).

[73] For information on the filtering capabilities at the White Sands and Guam facilities, 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 ESV Report and Order*, 20 FCC Rcd at 712 n.233.

[74] *See ESV Report and Order*, 20 FCC Rcd at 712, ¶ 89.

would not require a Ku-band VMES operator to complete this coordination prior to receiving a Commission VMES license.[75] Should NASA seek to provide similar protection to future TDRSS sites, the National Telecommunications and Information Administration ("NTIA") should notify the International Bureau that the TDRSS site was nearing operational status. The Bureau then would issue a notice requiring all Ku-band VMES operators to cease operations in the 14.0-14.2 GHz band within 125 kilometers of the new TDRSS site until they have coordinated with the new site. After coordination, VMES operators again would be permitted to operate within 125 kilometers of the new TDRSS site, subject to any operational constraints developed in the coordination process.[76] Additionally, we solicit comment on what technical measures should be incorporated into terminals to assist VMES operators in meeting any coordination obligations, such as GPS-related software technology.

33. We seek comment on how the coordination process should work, as this would be different from the more traditional Federal Government pre-licensing coordination process between the Commission and NTIA.[77] Specifically, should VMES licensees go directly to NASA or should they work through the Commission? If the former, Ku-band VMES operators would be required to notify the International Bureau once they had completed this coordination, and, upon receipt of such notification, the Bureau would release a public notice stating that operations within the new coordination zone might commence in 30 days if no party had opposed such operations.[78] Even if we accord VMES primary status, in deference to the U.S. assets operated by NASA, we would expect the coordination to be conducted on an equal basis between NASA and the VMES operator, even though the SRS is a secondary allocation in the 14.0-14.2 GHz portion of the 14.0-14.5 GHz FSS uplink band.[79]

34. As NASA will have a limited number of space research earth stations that will be receiving from the government data relay satellites, we believe that coordination between VMES and TDRSS operations is possible and will not prove to be a burden for VMES operators. In addition, the TDRSS sites provide an important service, we do not anticipate that the number of TDRSS sites will increase significantly, and, in any event, future expansion of the SRS could be severely curtailed if VMES operators have no obligation to protect future TDRSS sites. For these reasons, we believe that protection of future sites is warranted. This is the general approach the Commission adopted for ESVs accorded primary status in this band. We seek comment on applying this approach to VMES, should we accord VMES similar primary status in this band.

[75] This is the same approach the Commission took for ESVs. *ESV Report and Order*, 20 FCC Rcd at 712-13, ¶ 90.

[76] If necessary, the Commission might be required to invoke section 316 of the Communications Act to modify an authorization in order to protect TDRSS stations. *See* 47 U.S.C. § 316.

[77] NTIA is responsible for managing the Federal portion of the U.S. Table. In bands shared between Federal and non-Federal services, the Commission and NTIA operate under a long-standing coordination agreement. *See* NTIA Manual, Basic Coordination Arrangement Between IRAC and the FCC, *available at* http://www.ntia.doc.gov/osmhome/redbook/8.pdf, at Chapter 8.3.1 (visited Mar. 16, 2007).

[78] This comports with the Commission's treatment of ESVs in this band. *ESV Report and Order*, 20 FCC Rcd at 713, ¶ 91.

[79] *See ESV Report and Order*, 20 FCC Rcd at 713, ¶ 91.

b. 14.2-14.4 GHz Band

35. The 14.2-14.4 GHz segment is an exclusive non-Federal use band that is allocated on a primary basis to FSS for uplink operations and on a secondary basis to the MSS.[80] We seek comment on whether to allow VMES operations to communicate with FSS space stations in the 14.2-14.4 GHz band on a primary basis.

c. 14.4-14.5 GHz Band

36. In addition to the non-Federal primary FSS and secondary MSS allocations in the 14.4-14.5 GHz segment, the Federal government has secondary fixed and mobile allocations in the band. Our records indicate that there are several fixed point-to-point operations and a limited number of fixed stations used by the Federal government for terrestrial telecommand. There also are several Federal government aeronautical mobile stations, land-based aeronautical mobile stations, and land mobile stations in the band. Furthermore, there are several Federal government surface telemetering mobile stations in the band that are used to send telemetry information to other stations on the ground. The 14.4-14.5 GHz band appears to be used predominantly by fixed, mobile, and transportable telemetry microwave systems. The band also is used to transmit air traffic control video links, closed circuit television, and range test data (including airborne downlink data transmissions). We seek comment on how the VMES operators would propose to protect the Federal fixed and mobile operations in the band.[81]

37. RAS operations in the 14.47-14.5 GHz band, although important, are carried out at a relatively small number of geographic locations and require limited exclusion zones to protect them from interference. We note that in the past, radio observations in the 14.47-14.5 GHz band were not performed on a continuous basis and usually were scheduled in advance.[82] As telescope time becomes more valuable due to costs and oversubscription, and switching feeds for observing various bands becomes easier, radio telescopes are increasingly scheduled dynamically, particularly for observations above 10 GHz. As a result, current observations can be scheduled with only a few hours lead time. Therefore, coordination between VMES and RAS sites could possibly be based on a combined time and distance basis. If we should adopt primary status for VMES in the 14.0-14.5 GHz bands, we seek comment on the feasibility of coordination between VMES and RAS operations to preclude harmful interference to the RAS as observations currently are performed, and particularly if the Commission were to allow large numbers of VMES to be operated under a blanket license. Specifically, we seek comment on requiring VMES operators proposing operations in the 14.47-14.5 GHz band and planning to travel in the vicinity of the radio observatories listed in US203 and of Arecibo, Puerto Rico, Mauna Kea, Hawaii, and St. Croix, Virgin Islands to coordinate their proposed operations to resolve any potential interference concerns. Such coordination would be a condition to licensing, as opposed to a prerequisite to licensing,

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[80] Similar to the 11.7-12.2 GHz band, the 14.2-14.4 GHz band had, until recently**,** a secondary mobile allocation for LTTS for television pickup and television non-broadcast pickup stations under Part 101 of our rules. *See ESV Report and Order*, 20 FCC Rcd at 713-14, ¶ 93; *see also* 47 C.F.R. § 101.147, note (24). As of March 1, 2005, no new LTTS applications will be considered for this band, although pre-existing licensees have been grandfathered to operate as a secondary mobile service in the 14.2-14.4 GHz band with the understanding that there will be no expectation of renewal. *See ESV Report and Order*, 20 FCC Rcd at 714, ¶ 94.

[81] In the *ESV Report and Order*, the Commission noted that it had received no comment on secondary Federal mobile, fixed and transportable use of the 14.4-14.5 GHz band, and concluded that the standard primary/secondary sharing environment applies. *See ESV Report and Order*, 20 FCC Rcd at 714-15, ¶ 95.

[82] *See ESV Report and Order*, 20 FCC Rcd at 715, ¶ 97.

and thus, we would not require a Ku-band VMES operator to complete this coordination prior to receiving a Commission VMES license.[83]

38. We seek comment on how the coordination process should work, as this would be different from the more traditional Federal Government pre-licensing coordination process between the Commission and NTIA.[84] Specifically, should VMES licensees go directly to the National Science Foundation ("NSF") or should they work through the Commission? If the former, Ku-band VMES operators would be required to notify the International Bureau once they had completed coordination. Upon receipt of such notification, the Bureau would release a public notice stating that operations within the new coordination zone might commence in 30 days if no party had opposed such operations.[85] We also seek comment on what technical measures should be incorporated into terminals to assist VMES operators in ensuring that the results of the coordination agreements can be implements, *e.g.*, GPS-related software technology or a VMES control center. Lastly, we seek comment if unwanted emissions from VMES terminals need to be regulated to protect RAS stations.

3. Proposed Footnotes

39. If we permit VMES terminals in the 10.95-11.2 GHz and 11.45-11.7 GHz bands, we propose to add the following non-Federal footnote **NGxxx** to the U.S. Table for those bands:

> **NGxxx** In the bands 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-Earth), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 may be authorized to communicate with space stations of the fixed-satellite service but must accept interference from stations of the fixed service operating in accordance with the Commission's Rules.

40. If we permit VMES terminals in the 11.7-12.2 GHz and 14.0-14.5 GHz bands to communicate with space stations of the FSS on a primary basis, we propose to add the following non-Federal footnote **NGyyy** to the U.S. Table for these bands:

> **NGyyy** In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 are an application of the fixed-satellite service and may be authorized to communicate with space stations of the fixed-satellite service on a primary basis.

We seek comment on the footnotes proposed above.

B. Technical and Operational Requirements for VMES in the Band 14.0-14.5 GHz (Earth-to-Space)

41. The Communications Act mandates that transmitting radiocommunication facilities must be licensed before they can operate.[86] The rules governing transmit-only and transmit/receive earth stations are contained in Part 25 of the Commission's rules. The rules primarily are intended to ensure that satellite networks of space and earth stations can operate without harmful interference with respect to

[83] This is the same approach the Commission took for ESVs. *ESV Report and Order*, 20 FCC Rcd at 715, ¶ 96.

[84] *See supra* note 77.

[85] This comports with the Commission's treatment of ESVs in this band. *ESV Report and Order*, 20 FCC Rcd at 715, ¶ 96.

[86] 47 U.S.C. § 301.

each other and to other telecommunications services. The regulatory framework of the Commission's two-degree satellite spacing environment established technical rules to govern earth stations communicating with Ku-band satellites, to ensure that the earth stations' operations do not cause unacceptable interference to adjacent satellite systems.[87] Primarily, earth station technical requirements for routine licensing consist of an antenna diameter of minimum size and maximum power level limits.

42. The antenna diameter is important because it affects the antenna gain.[88] The antenna gain at various off-axis angles, combined with the power-density fed to the antenna, provides a measure of the interference potential of that earth station to other in-orbit satellites. The combination of power-density and gain is the equivalent isotropically radiated power-density ("E.I.R.P.-density"), which is at its maximum in the direction of the antenna main beam. In directions other than the main beam, the E.I.R.P.-density is directly related to the antenna gain pattern. For example, the antenna gain in the vicinity of two degrees off-axis, or two degrees measured from the main beam of the antenna, provides a measure of the potential of that earth station to cause interference to satellites located two degrees away in orbit from the satellite with which the earth station is communicating. The emission of any earth station antenna must fall within the limits defined by equations in the Commission's rules. Because decreasing the antenna diameter produces wider main beams and higher side lobes, the allowable antenna gain pattern envelope effectively creates a minimum earth station antenna diameter because at some point the main beam will become wide enough to cause unacceptable interference to adjacent satellites.

43. The Commission "routinely" licenses Ku-band earth station facilities that meet the two-degree orbital spacing technical requirements set forth in Part 25 of the Commission's rules. The Commission's routine earth station standards include minimum antenna sizes. Those sizes are related to the Commission's antenna gain pattern requirements. The smallest antenna routinely licensed in the Ku-band is 1.2 meters (3.9 feet) in diameter.

44. In the *ESV Report and Order*, the Commission combined the antenna performance and input power density rules in Part 25 to adopt off-axis E.I.R.P.-density rules for ESV earth station transmitters.[89] In adopting ESV rules, as set out in section 25.222 for Ku-band ESV use, the Commission combined the ESV mobile environment with the FSS and provided ESV operators with the option of using smaller antennas that may not meet the two-degree spacing antenna pattern specified in section 25.209 of the

[87] *See generally Two-Degree Spacing Order*, 54 Rad Reg. 2d (P&F) 577 (adopting 2º orbital spacing policy to maximize the number of in-orbit satellites operating in the Ku- and C-bands).

[88] Antenna gain is the ratio of the power required at the input of a loss-free reference antenna to the power supplied to the input of a given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. 47 C.F.R. § 2.1 (Gain of an Antenna). In other words, gain refers to an antenna's ability to collect, concentrate, and direct energy in a particular fashion, *i.e.*, a beam. Many antennas are shaped like parabolas, or large curved bowls. The "axis," or boresight, is the line running through the center of the bowl and perpendicular to the plane of the edge of the bowl. The majority of the energy is transmitted along the boresight in what is called the main beam of the antenna. The "off-axis" angle is the angle formed by the axis and any other line running through the center of the bowl. The energy transmitted from an antenna forms "ripples," alternately increasing and decreasing in magnitude as the off-axis angle increases. These ripples are called "side lobes."

[89] *ESV Report and Order*, 20 FCC Rcd at 682, ¶¶ 13-14, 716, ¶ 99.

rules, as long as the power-density into the antenna is reduced to the point that the off-axis E.I.R.P.-density limits set out in section 25.222 are met.[90]

1. Use of ESV Rules as Model for VMES

45. General Dynamics urges the Commission to expand the ESV regulatory framework to cover VMES.[91] General Dynamics states that the Commission, in developing the rules for ESVs, engaged in a comprehensive study of mobile satellite operations in the Ku-band and adopted carefully prescribed requirements to ensure that ESV operations adequately would protect existing operators in the band from harmful interference.[92] General Dynamics states that its SOTM system is able to meet the off-axis E.I.R.P.-density limits and other operational rules applicable to ESVs.[93] Therefore, General Dynamics asserts that the Commission can be confident in adopting regularized service and licensing rules for VMES operations in the Ku-band.[94]

46. Of course, the operation of VMES will differ significantly from the operation of ESVs because of the potential ubiquity of VMES terminals. ESVs, by their very nature, are restricted to operation within navigable waters and associated ports, whereas VMES terminals are capable of traveling just about anywhere in the land area of the United States. In addition, the accelerations experienced by a ship will tend to be significantly less than the accelerations of an off-road vehicle, making the antenna tracking mechanism of the VMES more complex than that on the ESV.[95] Still, we concur with General Dynamics and the majority of commenters that the ESV rules are the appropriate starting point for developing VMES rules that would be designed to protect adjacent FSS systems from harmful interference.

47. We therefore seek comment on whether, given the significant differences between ESVs and VMES, the ESV rules, as applied to VMES, would provide sufficient protection to the FSS. In Appendix B, we have included what we think are the appropriate portions of the Ku-band ESV rules, as a starting point for our analysis. Principally, these requirements are set out in section 25.222 of the Commission's rules.[96] Section 25.222 includes three principal types of rules pertaining to interference protection of adjacent FSS satellites: (1) off-axis E.I.R.P.-density limits and associated conditions; (2) antenna

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[90] *ESV Report and Order*, 20 FCC Rcd at 682, ¶ 14. *See also* 47 C.F.R. §§ 25.222 (Ku-band ESV rules), 25.209(a)-(b) (antenna gain patterns).

[91] Petition at 10-12. In this regard, General Dynamics proposes that the Commission include the text "and[/or] VMES" after most references to ESVs in section 25.222. *Id. See also* 47 C.F.R. § 25.222.

[92] Petition at iii, 11. *See also* November 21 Response to Information Request Attachment at 7 (asserting that adoption of the Petition would permit increased efficiency in the use of FSS Ku-band spectrum because it would encourage the use of somewhat larger antennas than those previously licensed for use on land mobile and air mobile platforms, and would mandate that they be pointed and tracked effectively).

[93] Petition at 11.

[94] Petition at 11-12.

[95] *See, e.g.*, December 18 Response to Information Request Attachment at 1 (stating that, as compared to ships and aircraft, the ground vehicle environment is considered the most challenging from a pointing accuracy viewpoint).

[96] 47 C.F.R. § 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.

pointing accuracy requirements; and (3) a requirement to cease, or mute, transmission if the antenna strays from its intended satellite.[97] These rules are intended to control possible interference from ESV terminals to FSS satellites stationed near the intended satellite.[98]

48. We seek comment on applying section 25.222 and related rules to VMES terminals communicating with FSS networks. As stated by SIA, a decision to adopt rules to expand access to Ku-band and extended Ku-band FSS spectrum for this new service will need to be designed to ensure that VMES systems will access FSS satellites under conditions that apply to the U.S. two-degree spacing environment and account for and prevent the occurrence of any potential mispointing of antennas that could produce interference in excess of that defined in the existing Ku-band FSS rules.[99] The commenters generally support using section 25.222 of the rules as a starting point for deliberations.[100]

49. Currently, the smallest antenna routinely licensed in the Ku-band is 1.2 meters (3.9 feet) in diameter.[101] VMES terminals employ stabilized antennas that are small enough to mount on wheeled vehicles. General Dynamics describes the use of antennas as small as 0.45 meters (17.7 inches) in diameter on military vehicles.[102] Commenters advocating other commercial applications of VMES would

[97] 47 C.F.R. § 25.222(a)(1)-(5), (6), (7)-(8). In addition, the ESV service rules for Ku-band contain provisions that provide for protection of certain Federal stations operating in the Ku-band. *See* 47 C.F.R. § 25.222(d)-(e).

[98] ESVs are mobile transmitters operating in spectrum allocated for the FSS. To protect adjacent satellites from interference, the rules require that the off-axis power emitted by any single ESV antenna fall within a specified E.I.R.P.-density envelope pattern. The E.I.R.P.-density envelope pattern defines the level of power-density that is permitted to be emitted from an ESV antenna as a function of the angle measured from the main axis of the antenna. The ESV envelope patterns set out in section 25.222 of the rules are the same as those used generally for VSATs that operate in conjunction with the Commission's two-degree satellite spacing. These off-axis E.I.R.P-density limits are combined with the two other main requirements (the antenna pointing error allowance and the requirement to cease transmissions if an ESV antenna strays from its intended target) to keep the power emitted from the ESV transmitter at or below a level that will prevent harmful interference.

[99] *See* SIA at; *see also Two-Degree Spacing Order*, 54 Rad. Reg. 2d (P&F) 577 (1983), *on recon.*, 99 FCC 2d 737 (1985).

[100] *See* SES Americom at 5 (ESV rules the "logical framework" and "with limited exceptions, ESV rules make sense as template for VMES rules because of operational similarities between land mobile and maritime mobile systems); ViaSat at 5 (generally agreeing with proposal to extend ESV service and licensing rules to VMES); MTN at 2 (ESV rules "excellent starting point"); SIA at 3-4, 5 (ESV rules "useful starting point" as they include requirements for off-axis E.I.R.P. spectral density and antenna pointing accuracy designed to protect rest of FSS; rules are "appropriate starting point"). *But se*e SES Americom at 5 (cautioning that it may be difficult for VMES to meet the ESV antenna pointing and cessation requirements due to terrain variations encountered by vehicles, particularly during off-road operations); Qualcomm at 2 (supporting ESV rules as basis for technology-neutral VMES service rules, but stating that Commission should be vigilant in developing rules that control off-axis emissions because uplink interference from small antennas is a significant source of degraded quality of service).

[101] *See generally* 47 C.F.R. § 25.209. In the *Sixth Report and Order and Third Further Notice*, the Commission invited comment on replacing the current Part 25 earth station licensing regime for "routinely" licensed Ku-band earth stations with an off-axis E.I.R.P.-density approach. *Sixth Report and Order and Third Further Notice*, 20 FCC Rcd at 5597, ¶ 8. If adopted, this change could result in the routine licensing of antennas smaller than 1.2 meters. Routinely licensed earth stations are those that can be licensed without a case-by-case review. *Id*. at 5597, ¶ 6 n.18.

[102] Petition at 5 (stating that, after extensive testing, Ku-band antennas with apertures of as small as 0.45 meters have demonstrated no greater deviation from the Part 25 ESV radiation pattern requirements than have the 0.6 meter terminals that have met and exceeded the Part 25 requirements).

use even smaller antennas.[103] The use of ultra-small antennas implies the use of FSS earth stations with wide beam widths and reduced side-lobe isolation that, in turn, raises the potential for increased interference power being received by other FSS satellites.[104] Preventing the possibility of interference to adjacent FSS satellites is of major concern to the Commission. We seek comment on whether VMES systems are sufficiently similar in operation to ESV systems to support adoption of the ESV rules, without modification, to VMES, without weakening the Commission's two-degree spacing environment.

50. In this regard, we note that General Dynamics states that the VMES antenna pointing system that it has developed has been tested to meet Commission service rules while the vehicle travels over a selected road-course, specifically, the Churchville B course at the U.S. Army Aberdeen Proving Grounds.[105] General Dynamics states that the antenna transmit-control system mutes the transmitter when the antenna mispoints by more than 0.5 degrees in the GSO orbital plane, thereby preventing interference to neighboring FSS satellites.[106] Whatever the design specifications of a VMES antenna tracking mechanism, the possibility exists that prevailing off-road conditions will cause design specifications to be exceeded. This situation does not exist for Ku-band ESV systems except under unusual circumstances. We ask if it is reasonable to structure service rules for VMES that use an E.I.R.P.-density envelope that is lower than that used for VSATs and ESVs.[107] In this regard, we note that the authorizations for certain Ku-band AMSS systems limit the aggregate E.I.R.P.-density to one-dB less than the E.I.R.P.-density envelope that is defined for routinely-authorized VSATs.[108] Would a similar rule requiring a one-dB reduction in the E.I.R.P.-density envelope, or a certification from adjacent satellite operators,[109] be reasonable for VMES applications? Is there a reason to use a larger or smaller reduction than one-dB in E.I.R.P.-density to protect FSS neighboring satellites, or is the ESV E.I.R.P.-density envelope sufficient?

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[103] *See, e.g.*, ViaSat at 3 (urging rules that would allow the operation of small, low-profile antennas that consumers could afford to install on standard vehicles). *See also* November 21 Response to Information Request Attachment at 7 (typical parabolic antenna on order of 0.40 meter might be employed in VMES). *But see* November 21 Response to Information Request Attachment at 11 (proposed VMES antenna pointing requirements will require additional level of design and production complexity that likely will keep VMES terminals above the range of consumer products).

[104] *See, e.g.,* December 18 Response to Information Request Attachment at 1 (stating that beam width of smaller-than-one-meter antennas is broad enough to disperse significant amount of energy onto an adjacent satellite).

[105] December 18 Response to Information Request Attachment at 6-7. General Dynamics describes driving conditions that are worse than those at the Aberdeen test course to provide an example of the interaction of the antenna pointing and transmit-control function in this situation. *Id*. at 7.

[106] December 18 Response to Information Request Attachment at 6**.**

[107] The E.I.R.P.-density envelope for ESV transmitters is consistent with the off-axis E.I.R.P.-density limits for routinely-licensed VSAT transmitters for co-polarized signals transmitted toward the GSO. *See ESV Report and Order*, 20 FCC Rcd at 716, ¶ 99. The off-axis E.I.R.P.-density limits for ESV transmitters are set out in 47 C.F.R. § 25.222(a)(1)-(5).

[108] *See* The Boeing Company, Radio Station Authorization, E000723, File No. SES-MFS-20050701-00853, Special Provision 5411 (granted Dec. 20, 2005); *ARINC Incorporated, Application for Blanket Authority for Operation of Up to One Thousand Technically Identical Ku-band Transmit/Receive Airborne Mobile Stations Aboard Aircraft Operating in the United States and Adjacent Waters*, Order and Authorization, DA 05-1016, 20 FCC Rcd 7553, 7573, ¶ 58(k) (Int'l Bur. and OET 2005).

[109] This rule would be similar to the requirement set forth in section 25.220(e)(2) for VSAT transmitters. 47 C.F.R. § 25.220(e)(2).

2. Proposed Modifications to ESV Model

51. Certain commenters suggest that the VMES service rules should deviate from the ESV model contained principally in section 25.222 of the Commission's rules. In particular, they propose changes to the interference protection rules set out in paragraphs (a)(1)-(7) of section 25.222.

a. Pointing Accuracy Requirements

52. SES Americom states that, because of terrain variations, VMES operators may find it difficult to comply with section 25.222(a)(6)-(7) of the Commission's rules, which requires antenna pointing accuracy and cessation of transmissions that exceed spectral limits.[110] SES Americom states that an applicant may be able to demonstrate that momentary deviations from the nominal antenna pointing by a VMES terminal with a very low transmit power-density would not cause harmful interference to adjacent satellites.[111] Accordingly, SES Americom proposes adopting, for VMES, an exception to section 25.222(a)(6)-(7) that would be based on two conditions. The first condition would require the VMES applicant to demonstrate that its proposed system complied with the off-axis E.I.R.P.-density limits set out in section 25.222(a), notwithstanding its failure to comply with specified antenna pointing accuracy requirements. The second proposed condition would require the applicant to obtain and submit affidavits from potentially affected satellite operators agreeing to the applicant's proposed operations.[112] We seek comment on whether adoption of this proposal would provide sufficient protection to adjacent FSS systems.

53. ViaSat states that systems using spread spectrum modulation techniques in which individual antennas operate at extremely low E.I.R.P.-densities, and in which there is central control of aggregate power density, generally do not require pointing accuracy rules.[113] In the event that certain antennas cannot control interference through spread spectrum and/or power control technology, ViaSat supports pointing accuracy limits that are a function of antenna beam width rather than a specific fixed angular limit applied equally to all sizes of antennas.[114] Similarly, Qualcomm proposes that the Commission look at alternative ways to specify the pointing accuracy, such as a "fraction of the antenna beam width" instead of a fixed value.[115] General Dynamics, on the other hand, would prefer that the Commission not reduce existing antenna pointing accuracy requirements.[116]

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[110] SES Americom at 5. *See also* 47 C.F.R. § 25.222(a)(6)-(7).

[111] SES Americom at 5.

[112] SES Americom at 5-6.

[113] ViaSat at 5-6. *See also* SES Americom at 5 (departure from ESV pointing accuracy requirement may be warranted where low power-density Code Division Multiple Access, or "CDMA," or similar technology is used for network transmission).

[114] ViaSat at 6.

[115] Qualcomm at 4.

[116] November 21 Response to Information Request Attachment at 13-14 (stating that General Dynamics would prefer that the Commission not reduce the antenna pointing accuracy requirements and then have to compensate by reducing the permitted E.I.R.P.-density levels below those in the ESV regulations, and stating that such changes would tend to require VMES terminals to use additional spectral spreading to compensate for the reduced E.I.R.P.-density required by a lower pointing accuracy and therefore would make the terminals less spectrum efficient and less likely to be interoperable with other FSS Ku-band earth stations).

54. Adopting a "fraction of the antenna beam width" alternative instead of a fixed value to specify pointing accuracy would lower the required pointing accuracy for small antennas. That is, as an antenna becomes smaller, the beam becomes wider. Thus, if we were to define the required pointing accuracy as a fraction of the beam width, the permitted pointing inaccuracy would be allowed to grow along with the growth in the beam width as the antenna becomes smaller. Presumably, as the beam width grew and the antenna gain decreased, the operator would need to resort to spectrum spreading techniques to complete the link to the VMES hub receiver. We ask if adopting a "fraction of the antenna beam width" approach seems reasonable and, if so, how we should determine the fraction that would apply. Further, should adoption of this approach be limited to peak E.I.R.P.-densities from a single terminal or to the aggregate emissions from multiple, co-frequency terminals? If so, what should that value be? We ask commenters to include technical descriptions and typical link-budgets to indicate the types of modulation and random access techniques, and the types and quality of services, that might be expected to be supplied by very low-gain, broad-beam antennas.

55. ViaSat asks the Commission to tailor its rules to accommodate the development of technologies that would protect adjacent satellites without the need for stringent antenna pointing accuracy, but without mandating any specific technology.[117] ViaSat urges the Commission to propose rules that allow the use of small, low-profile antennas that consumers affordably might install on standard vehicles.[118] We seek technical comments on antenna technologies that would protect adjacent satellites without the need for stringent antenna pointing accuracies. Commenters should submit such information in sufficient technical detail for the Commission to verify the radiation patterns of these antennas and should include suggested rules to ensure the protection of nearby satellite systems. Commenters also should include a typical link-budget to indicate the types of modulation, random access techniques, and types and quality of services that could be expected to be supplied by small, low-profile antennas.

b. Aggregate Power-Density Limits and the 10*log(N) Rule

56. Various parties seek revisions to the ESV power-density limits, as applied to VMES, in order to accommodate VMES networks employing aggregate system power control.[119] For example, Qualcomm states that it supports the proposal by General Dynamics to extend the ESV off-axis emissions rules to cover VMES operations, but urges the Commission to review and revise the 10*log(N) factor.[120]

57. The technical rules adopted in the *ESV Report and Order*, including the off-axis E.I.R.P.-density limits, were based, in general, on single channel per carrier ("SCPC") ESV systems that have operated pursuant to STA for several years. The Commission, in its *Sixth Report and Order and Third Further Notice* in its proceeding to streamline the Part 25 rules, modified the E.I.R.P.-density envelope adopted in the *ESV Report and Order* to accommodate CDMA systems by adding the 10*log(N) term to

[117] ViaSat at 3, 5-7.

[118] ViaSat at 3. *See also* ViaSat at 6 (imposing antenna pointing accuracy requirements for systems using spread spectrum/multiple access and central power control would add costs that could make antennas too expensive for broad commercial deployment).

[119] ViaSat at 7; Qualcomm at 4.

[120] Qualcomm at 4. As discussed below, the 10*log(N) limit represents the value of ten times the logarithm of the maximum expected number of simultaneous co-frequency, co-transponder transmitters.

section 25.222.[121] Section 25.222 requires CDMA systems to reduce the E.I.R.P.-density of co-frequency earth stations simultaneously transmitting to the same satellite, in order to ensure that the overall system meets, in the aggregate, the E.I.R.P-density limits established for a single VSAT.[122] If each of the CDMA transmitters has the same E.I.R.P.-density, each transmitter will radiate the maximum VSAT E.I.R.P.-density reduced by a factor of 10*log(N), in dB, where "N" represents the peak number of co-frequency CDMA earth stations simultaneously transmitting in the same satellite receiving beam.[123] ViaSat and Qualcomm state that the section 25.222 10*log(N) limit for individual VMES terminals assumes a network of homogeneous transmitters.[124] Qualcomm asserts that requiring each antenna to reduce its input power density equally by a fixed factor of 10*log(N) prevents variable data rates (and thus variable power-density systems) from being accommodated unless the system operates with a significant loss of capacity, thereby favoring other techniques, such as Frequency Division Multiple Access ("FMDA").[125] Thus, as noted, they urge the Commission to change the 10*log(N) rule, as it would be applied to VMES.[126] The Commission seeks comment on the desirability of adopting rules for variable data rates, and thus variable power-density, spread-spectrum VMES systems. Commenters should address the specific changes to the rules that would be required to allow the efficient use of variable power-density spread-spectrum systems while still ensuring that the systems meet the E.I.R.P.-density envelope in the aggregate. Comments also should address the pros and cons of adopting such rule changes.

c. Contention Table

58. ViaSat suggests that the Commission seek comment on the desirability of adopting, for VMES, the type of "contention table" proposed for VSATs in the *Sixth Report and Order and Third Further Notice* on Part 25 streamlining.[127] Noting that the *Sixth Report and Order and Third Further Notice* proposes adopting a contention table to deal with multiple access techniques that involve contention protocols, ViaSat suggests that use of a contention table also would allow flexibility for

[121] *See Sixth Report and Order and Third Further Notice*, 20 FCC Rcd at ¶ 63 n.177 (incorporating 10*log(N) limit into section 25.222).

[122] *See* 47 C.F.R. §§ 25.222(a)(1) (applicable to Ku-band ESV CDMA systems), 25.134(g) (applicable to VSAT CDMA systems).

[123] *See* 47 C.F.R. § 25.222(a)(1).

[124] ViaSat at 7; Qualcomm at 4.

[125] Qualcomm at 4. Qualcomm states that the Commission has licensed networks of technically identical earth stations that are controlled by a single VSAT hub and common access method so long as the aggregate off-axis emissions from such a network do not exceed that which would be produced by a single antenna conforming to section 25.209(a) of the rules. *Id.* Qualcomm observes that, for access methods with emissions that overlap in frequency and time, the Commission's rules require that the input power-density to each antenna be reduced equally by a fixed factor of 10*log(N), where N is the number of simultaneous emissions. *Id*. Qualcomm asserts that the rule is contrary to the Commission's objective of developing rules that are technology neutral. *Id*.

[126] ViaSat at 7; Qualcomm at 4.

[127] ViaSat at 8, citing *Sixth Report and Order and Third Further Notice*, 20 FCC Rcd at 5635-36, ¶ 119. The proposed contention protocol rule for VSATs would apply an aggregate limit on off-axis E.I.R.P.-density for VSAT networks using a contention protocol. *Id*. at 5635. The rule would require VSAT network operators using a contention protocol not to exceed the envelope by more than the allowable increase in aggregate E.I.R.P. set forth in the proposed contention table. *Id*. at 5635-36.

networks using dynamic power control to exceed the E.I.R.P.-density limits for short periods of time as a result of other factors, such as antenna pointing inaccuracies and lags in dynamic power control.[128]

59. Certain multiple access techniques permit users to transmit on a random or near-random basis. As a result, the transmissions from one or more users can overlap, causing "collisions." These multiple access techniques are termed "contention protocols."[129] For these contention protocols, the probability of collisions is determined by the length of the user transmission, the number of transmissions per unit of time, and the number of users transmitting on the same frequency. When collisions occur, the E.I.R.P.-density at the GSO exceeds the E.I.R.P.-density that would be created by a single user. The *Sixth Report and Order and Third Further Notice* proposes that the collisions within a VSAT system be controlled so that the probability of higher levels of E.I.R.P.-density will occur for only brief periods of time.[130]

60. Rather than seeking additional comment on the use of contention tables at this particular time, we propose to await the results of a decision in the Part 25 streamlining proceeding before considering the use of contention tables for VMES operations.

3. Data Logging Requirements

61. In the *ESV Report and Order*, the Commission adopted a requirement that ESV operators maintain data logs on the operation of each ESV terminal, to protect FS operations in the C-band.[131] The Commission also placed this requirement on Ku-band ESV operators because of the existence of Federal government receive facilities in portions of the Ku-band and because of the possibility, although unlikely, that an interference situation could occur to other Ku-band systems from Ku-band ESV operations.[132]

62. Under the Commission's rules, Ku-band ESV network operators must maintain information on the satellites that each vessel uses, the operating frequencies and bandwidths used, the time of day, the vessel location in longitude and latitude, the country of registry of each vessel, and a point of contact within the United States with the authority and capability to mute the ESV transmitters.[133] The geo-location information must be recorded at time intervals of no greater than every twenty minutes while the ESV is transmitting.[134] The ESV operator must maintain the information for a year and make it available to appropriate entities within twenty-four hours of request.[135]

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[128] ViaSat at 8.

[129] Contention protocols differ from "reservation protocols" such as TDMA, FDMA, and CDMA, which "reserve" a time slot, frequency or digital code for each transmission in the network. In contention protocols, transmissions from different terminals compete, or "contend," for the same resource, which might be a time slot, frequency or hub receiver.

[130] *See Sixth Report and Order and Third Further Notice*, 20 FCC Rcd at 5635-36, ¶ 119.

[131] *ESV Report and Order*, 20 FCC Rcd at 695-96, ¶ 48.

[132] *Id*. at 721, ¶ 112.

[133] 47 C.F.R. § 25.222(c)(1)-(3).

[134] 47 C.F.R. § 25.222(c)(1).

[135] 47 C.F.R. § 25.222(c)(1).

63. General Dynamics asks the Commission not to apply the ESV data logging requirements to VMES systems.[136] General Dynamics asserts that VMES terminals are less likely to cause interference than existing blanket-licensed VSAT terminals, which General Dynamics characterizes as having less antenna pointing control than VMES and greater likelihood of becoming sources of potential interference.[137] General Dynamics asserts that the remote satellite geo-location capabilities of existing FSS spacecraft operators provide another reason not to ask for detailed logging of VMES operating locations.[138] SES Americom supports not applying the rule to VMES, stating that military applications are likely to be the predominant use of VMES and thus data logging requirements could raise national security concerns.[139] Several commenters, however, oppose eliminating the rule at this time. Qualcomm opposes excluding location logging unless proponents can demonstrate that geo-location tools in general use today reliably can locate earth stations that are in motion.[140] SIA states that it is premature to take a position on the Petition's proposal on data logging, and ViaSat supports the application of the data logging rule to VMES systems.[141]

64. In response to the Petition's suggestion that data logging would not be necessary for VMES, we observe that the existing data logging requirements for ESVs are intended to permit a licensee experiencing any unexpected interference from ESVs to obtain information on the locations of the mobile transmitters that may have been near, or may have transited in the vicinity of, the licensee's facility.[142] The ESV rules apply to both the C-band and Ku-band ESV operations, whereas VMES is proposed solely in the Ku-band. Although the C-band presents greater potential for interference from mobile terminals because of the large number of FS operations, there also exists the potential for interference to Federal government facilities in the conventional and extended Ku-bands. We seek comment on General Dynamics' proposal not to apply data logging requirements to VMES. We observe that, to the extent that Federal government operations are authorized by NTIA consistent with section 305 of the Communications Act, the terms and conditions of that authorization would be the subject of coordination between NTIA and the Commission, and would not necessarily be governed by data logging requirements in the Commission's rules. We also seek comment on how, if at all, the use of VMES terminals in the Ku-band might suggest a different approach from the data logging rule applied to ESV terminals in the Ku-bands.

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[136] Petition at 12-13.

[137] Petition at 12. General Dynamics states that FSS Ku-band transportable satellite news gathering terminals are not subject to data logging requirements, although General Dynamics asserts they have much higher power levels and are much larger potential sources of interference than either VSATs or VMES terminals. Petition at 12-13; November 21 Response to Information Request Attachment at 12.

[138] Petition at 12. *See also* November 21 Response to Information Request Attachment at 12 (discussing geo-location systems, GPS position logging information, and uplink signal unique identification codes).

[139] SES Americom at 5.

[140] Qualcomm at 6. Qualcomm proposes waiving the requirement for good cause, rather than eliminating the general rule. *Id*. at 6.

[141] SIA at 4-5 (observing that the rule is designed to facilitate the rapid rectification of interference concerns, however unlikely); ViaSat at 8-9 (generally supporting requirement that operator track terminal locations to enforce interference protections).

[142] *See ESV Report and Order*, 20 FCC Rcd at 721, ¶¶ 112-13.

4. Other Operational Requirements

a. Section 25.209 Antenna Size Threshold

65. The primary source of interference to earth stations in the conventional Ku-band is downlink interference from the FSS. The ability to avoid interference is based on the antenna beam width and bore-sight alignment with the intended satellite.[143] Thus, small antennas, with their wider main lobes, may be more vulnerable to adjacent satellite interference.[144] Qualcomm asserts that, for a system that employs ultra-small antennas, the operator's acceptance of the risk of adjacent satellite interference should be reflected in a license condition.[145] Qualcomm suggests an amendment to section 25.209 of the Commission's rules that would set a threshold on antenna size, possibly 55 centimeters, above which the allocation would be primary and receive the appropriate interference protection and below which it would be secondary and thus less protected.[146] Qualcomm proposes that the Commission apply this threshold to all categories of service that employ earth stations (FSS, MSS, AMSS, and ESV) in the 11.7-12.2 GHz band.[147]

66. Section 25.209(c) provides that earth station antennas licensed for reception of radio transmissions from a space station in the FSS service are protected from radio interference caused by other space stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the relevant antenna performance standards set out in section 25.209.[148] We are concerned that, because of the reduced side-lobe isolation, the use of small antennas could make a VMES receiver more sensitive to interference from other FSS satellites. If we grant primary status to the VMES, this lack of side-lobe isolation could place an undue burden on FSS satellites coordinating at a later time, when compared with receivers using the more traditional FSS antennas. To determine whether a system of small VMES antennas would receive interference protection, Qualcomm asks the Commission to set a threshold size above which the VMES antennas would receive the same kind of protection as earth stations that operate in a service with primary status, and below which the antennas would be required to accept interference. If we adopt a primary status for VMES and apply section 25.209(c), there may be no need for such a rule for VMES earth stations.[149] Additionally, we observe that Qualcomm proposes that the Commission adopt an antenna threshold rule for all categories of service that employ earth stations, including FSS, MSS, AMSS, and ESV stations, in the 11.7-12.2 GHz band. We seek comment on Qualcomm's proposal to amend section 25.209 of the Commission's rules to set a threshold on antenna size, in the 11.7-12.2 GHz band, above which a VMES

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[143] *See, e.g.,* Qualcomm at 5.

[144] *See, e.g.,* Qualcomm at 5.

[145] Qualcomm asserts that, independent of whether an antenna is in-motion or stationary, it is the beam width of the antenna that affects the level of interference received from adjacent satellites within the band. Qualcomm at 5.

[146] Qualcomm at 5.

[147] Qualcomm at 5.

[148] 47 C.F.R. § 25.209(a), (c). *See also* 47 C.F.R. § 25.222((b)(3) (requiring ESV operator certification that antenna conforms to the criteria of § 25.209); proposed § 25.XXX(b)(1)(ii)(same).

[149] In this regard, we seek comment on section 25.XXX(a)(14), which, if adopted, would grant VMES terminals primary receive antenna protection from FSS space stations only to the extent that the receive antenna complies with the receive antenna protection levels set forth in section 25.209(a)-(b) of the Commission's rules. *See* Appendix B, section 25.XXX(a)(14). *See also* 47 C.F.R. § 25.209(a)-(b).

allocation would be primary and receive the appropriate interference protection and below which it would be secondary and thus less protected. What would be an appropriate threshold size and how would this threshold compare with the existing condition in section 25.209(c)? In other respects, Qualcomm's proposal is overly broad for this particular proceeding, in that it proposes that the Commission adopt an antenna threshold rule for all categories of service that employ earth stations, including, in addition to VMES, FSS, MSS, AMSS, and ESV stations, in the 11.7-12.2 GHz band.

b. Power Densities in Directions Other Than the GSO Plane

67. ViaSat urges the Commission to seek comment on permitting VMES terminals to operate at greater power densities than the rules currently permit in the NGSO plane.[150] ViaSat states that the commercial success of VMES will depend on using small, low-profile antennas on cars or trucks and that these antennas will emit at higher off-axis power-density levels in the NGSO elevation plane.[151] ViaSat urges the Commission to explore the tradeoffs between relaxing off-axis density limits in the NGSO plane and constraining the types, sizes and costs of antenna technology that might be used to provide VMES.[152]

68. Section 25.222(a)(1) describes the principal ESV E.I.R.P.-density envelope as applying in the plane of the GSO as it appears at the particular earth station location (that is, the plane determined by the focal point of the antenna and the line tangent to the arc of the GSO at the position of the target satellite). VMES antennas, of course, will radiate in all directions, with the majority of the power directed along the antenna main beam. ViaSat's reference to the E.I.R.P.-density limits in "NGSO plane" refers to section 25.222(a)(2) and (a)(4) of the rules, which describes an E.I.R.P.-density envelope "in all other directions" than the GSO orbit.[153] ViaSat states that "[t]here are no commercial NGSO Ku-band systems in operation, and none are planned to be deployed in the foreseeable future."[154]

69. The ESV E.I.R.P. envelope in all directions other than along the GSO starts at an angle of 1.25 degrees from the antenna main lobe.[155] In the *Sixth Report and Order and Third Further Notice*, the Commission revised the start of the antenna gain pattern envelope to three degrees off-axis outside the GSO orbital plane for earth stations operating in the conventional Ku-band. The Commission made this revision to facilitate the development of more advanced elliptical antennas without creating any

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[150] ViaSat at 3, 9-10. *See also* 47 C.F.R. § 25.222(a)(2), (a)(4).

[151] ViaSat at 9.

[152] ViaSat at 9. ViaSat asserts that, without an increased allowance for off-axis power-densities in the NGSO elevation plane, VMES service may be unduly constrained in favor of NGSO systems that never may be deployed. ViaSat at 10.

[153] 47 C.F.R. § 25.222(a)(2), (a)(4).

[154] ViaSat at 9. We note that, on December 21, 2006, the International Bureau authorized Virtual Geosatellite, LLC ("Virtual Geo") to construct a system of eighteen NGSO FSS satellites to operate in a number of frequency bands, including the Ku-band. The Virtual Geo satellites would have operated in highly elliptical inclined orbits. *See Virtual Geo Order* at ¶ 10. In the operational portion of the orbits, the satellites would have had angular separation from the equator of greater than 45 degrees and, therefore, would have had a geographical separation from the GSO satellite orbit. *See Virtual Geo Order* at ¶ 10. On February 5, 2007, Virtual Geo surrendered its NGSO FSS license. *See* Virtual Geosatellite LLC, SAT-LOA-19990108-00007, Public Notice, Policy Division Information, Actions Taken, Report No. SAT-00420, DA 07-617 (Int'l Bur. Feb. 9, 2007).

[155] *See* 47 C.F.R. § 25.222(a)(2).

additional interference issues.[156] We seek comment on adopting this same three-degree starting angle for VMES antennas. We request comment on the possibility of modifying the current ESV non-GSO plane E.I.R.P.-density envelopes to accommodate small VMES antennas. Commenters should address the potential for interference to and from possible NGSO FSS systems as well as the possible trade-offs between relaxing off-axis E.I.R.P.-density limits in directions away from the GSO plane, and the types, sizes and costs of antenna technology that might be used to provide VMES services under existing versus relaxed power-density limits.

c. Radiation Hazard Requirements

70. Section 25.222(a)(9) of the rules requires ESVs that exceed the radiation guidelines of section 1.1310 to provide an environmental assessment and a plan for mitigation of radiation exposure to the extent required to meet those guidelines.[157] The mounting of earth stations on vehicles may pose the possibility of human exposure to radiofrequency ("RF") radiation. We ask commenters to describe what radiation hazard concerns may exist, and what steps should be taken to resolve any potential concerns. We ask commenters to discuss how exposure concerns and necessary rules for military applications may differ from VMES use as a general commercial application. We note that General Dynamics proposes that the immediate application for VMES operations would be to serve U.S. military communications test and training needs. We expect that trained personnel operating VMES would take reasonable steps to avoid accidental RF exposure for VMES, as they would for other small aperture antennas, and the nature of the military operations described in the Petition raises little likelihood of exposure of third parties. Nevertheless, the Petition discusses the use of these technologies for commercial markets as well. We direct commenters to section 1.1310 of our rules, which describes the different exposure limits for "general population" and "occupational/controlled" conditions, and we ask commenters to discuss how these rules should be applied to the proposed military and other potential uses for VMES. We seek comment as to whether we should require cautionary labeling for all VMES terminals and whether we should recommend professional installation for subscriber transceiver antennas. In this regard, we direct commenters to section 1.1307(b) of our rules, which requires licensees to perform routine exposure evaluation for all Part 25 transmitters, and to the references to our rules that describe the limits for RF exposure.[158]

d. Equipment Certification

71. The Communications Act authorizes the Commission to make regulations to ensure that, before an RF device enters the stream of commerce, it complies with the appropriate technical rules to ensure that it will not cause harmful interference.[159] Pursuant to that authority, the Commission has adopted rules to establish the current device authorization policy that is commonly known as our "certification" or "marketing" rules.[160] The rules and requirements vary by device, but today the majority of radio transmitters that "intentionally radiate" radio waves must be certified as compliant with governing rules before being marketed, sold, or imported into the United States. In general, we require

[156] *Sixth Report and Order and Third Further Notice*, 20 FCC Rcd at 5610, ¶¶ 37-38.

[157] 47 C.F.R. §§ 25.222(a)(9), 1.1310.

[158] *See* 47 C.F.R. §§ 1.1307(b), 1.1310.

[159] 47 U.S.C. § 302.

[160] *See* 47 C.F.R. §§ 2.1201-2.1207, 2.801 *et seq*.

certification of "portable earth station transceivers" and certain other small-aperture terminals.[161] The Petition and the record to date would seem to suggest that commenters seek to deploy VMES using mobile and/or portable VMES terminals. We would propose to certify VMES terminals pursuant to our Part 2 rules to ensure that they comply with the technical rules adopted for the service. We would make this proposal because of our past use of certification for earth station terminals and because the record to date suggests that VMES, or certain classes or sizes of VMES terminals, may be widely deployed for general public use and potentially might cause interference to space stations. We seek comment on this analysis and on other procedures that commenters may consider warranted. We ask commenters to describe such procedures and explain why they would serve the public interest better than certification.

5. Limitations on Use of VMES

72. The comments suggest that the allocation and service rules proposed by General Dynamics potentially could result in terminals small enough, and inexpensive enough, to allow broad commercial use by the general public.[162] This could result in a large number of ultra-small antenna terminals mounted on private vehicles traversing throughout the United States. We are concerned about whether the aggregation of the emissions from these ultra-small terminals may increase the risk of harmful interference to other FSS users. We are concerned that aggregate emissions from a VMES system using ultra-small antennas pointed with an accuracy that is some fraction of the antenna beam width could raise the potential for harmful interference to adjacent satellites, including those farther than six degrees from the target satellite. In this section, we discuss and seek comment on this concern. We also discuss and seek comment on possible rules that would be designed to prevent such potential interference concerns.

73. The Commission's two-degree FSS spacing rules require earth stations to take steps to prevent interference to FSS satellites within six degrees of the target satellite. The use of ultra-small mobile antennas by the general public potentially could expose FSS satellites farther away than six degrees to interference and raises a question about the applicability of the current technical rules to a system using ultra-small mobile antennas.[163] If systems using this size of mobile antenna potentially could expose FSS satellites farther away from the target satellite to the same or higher level of

[161] Portable earth station transceivers are transceivers that are likely to be used within 20 centimeters of the operator's body. *See* 47 C.F.R. §§ 25.129, 25.149(c) (requiring certification for portable device earth station transceivers and small ancillary terrestrial component handheld terminals).

[162] General Dynamics identifies possible non-military applications for VMES systems, including "satellite news gathering, weather services, mineral/fossil fuel exploration and extraction and large-scale construction projects." Petition at 7. *See also* November 21 Response to Information Request Attachment at 6 (stating that, following adoption of regulations, General Dynamics envisions that it and other manufacturers will be able to develop new versions of VMES terminals designed for use in less demanding environments than a military off-road environment). ViaSat suggests an even broader application, with the possible use of VMES on cars and trucks using ultra-small antennas. ViaSat at 9. ViaSat states that commercial success depends in part upon the ability to use small, low-profile antennas that can be mounted on standard cars and trucks. ViaSat at 9.

[163] The two-degree FSS spacing rules, initially designed for systems using relatively large earth station antennas that were fixed in place, were not concerned about the accuracy of antenna tracking systems mounted on moving cars or trucks. *See generally Two-Degree Spacing Order*, 54 Rad. Reg. 2d (P&F) 577 (1983), *on recon.*, 99 FCC 2d 737 (1985). The initial two-degree rules, as successfully modified to account for VSATs, ESVs, and AMSS applications, generally have been concerned with the protection of FSS satellites within six degrees of the target satellite. The current two-degree spacing rules limit the E.I.R.P.-density radiated from an FSS earth station antenna to the E.I.R.P.-density envelope and, with relatively large antennas, this limit will occur somewhere within a degree or two of the main beam of the earth station antenna. For a very small antenna, the limiting E.I.R.P-density may occur farther than six degrees away from the antenna main beam.

interference power than the satellites directly adjacent to the target satellite, this situation would represent a departure from the long-standing assumptions underlying the two-degree spacing environment.

74. We seek comment on whether this scenario is likely and, if so, we ask whether we should adopt rules designed to prevent such potential interference concerns. Should we propose, for example, an E.I.R.P.-density envelope for VMES, or a class of VMES, that is different from the envelope for ESVs that is set out in section 25.222 of the rules? If the VMES pointing restrictions are based upon some fraction of the antenna beam width, as suggested by ViaSat and Qualcomm, should a different E.I.R.P. envelope be applied?[164] Are there other methods by which we might ensure that VMES use of the 14.0-14.5 GHz band would not cause harmful interference to adjacent FSS satellites, including those farther than six degrees from the target satellite?

75. For example, we ask whether we should propose limitations that would allow only government use, such as military testing/training, homeland security, and civil emergency applications, under the assumption that such applications likely would involve somewhat larger and better tracking antennas as well as operator training to mitigate against interference to neighboring satellites, as opposed to those terminals designed for general public use. One means of restricting the use of the band while at the same time granting General Dynamics' proposal would be to limit the use of VMES only to commercial contracts for government uses such as military testing/training, homeland security, and civil emergency applications. The General Dynamics proposal is directed primarily to military testing and training. Including other government applications such as homeland security and civil emergency would add significant utility to Ku-band land mobile applications, while maintaining the population of VMES terminals. We ask for comment on the effects and usefulness of such a limitation.

76. Currently, the FSS Ku-band is used heavily by commercial entities for commercial purposes and is used by the general public to some extent for broadband Internet access. Opening this band to larger numbers of small low-cost systems could make specific interference sources difficult to identify and control. If ultra-small antenna VMES systems with low-cost tracking mechanisms should come into widespread use, it could become difficult, if not impossible, to identify any single source of interference, and correspondingly difficult to ensure an interference-controlled environment for commercial interests using the Ku-band. We observe that, since 1991, the Commission has required satellite uplink transmissions carrying broadband video information to use an automatic transmitter identification system ("ATIS").[165] Under this requirement, parties transmitting video signals to satellites must include information in the transmissions that identifies the source. The Commission adopted this requirement in response to an increase in harmful interference, including intentional interference, to satellite facilities. We ask whether a similar type of identification system should be used with VMES systems. If so, what should the characteristics of the identifying signal be in terms of format, information and structure?

C. VMES Licensing Considerations

77. In establishing a regulatory framework for VMES, we endeavor to craft rules that will minimize licensees' regulatory burden. Therefore, we invite commenters to identify, either generally or

[164] ViaSat at 6; Qualcomm at 4. *See also, supra*, ¶¶ 52-55.

[165] ATIS transmits an encoded subcarrier message including, at a minimum, the earth station's call sign, a telephone number providing immediate access to someone capable of resolving interference problems, and a unique ten-digit serial number. *See An Automatic Transmitter Identification System for Radio Transmitting Equipment*, First Report and Order, GEN Docket No. 86-337, 5 FCC Rcd 3256 (1990); 47 C.F.R. § 25.281.

in connection with specific proposals, any licensing methods that may simplify and speed the licensing process for VMES, while still addressing our core regulatory concern with avoiding harmful interference.

78. *Blanket licensing*. In connection with ESV and AMSS networks, the Commission has looked to blanket licensing methods to address situations in which a larger number of technically identical user terminals will be deployed.[166] Similarly, if we adopt VMES service and licensing rules, we would propose to provide applicants with the option of seeking a VMES system license (consisting of a hub, located in the United States, and/or blanket earth station license). Whether or not an applicant requests hub authority, we would propose that the system license also would require that the licensee maintain in the United States both a network control and monitoring center and a twenty-four-hours-per-day, seven-days-per-week point of contact. We believe that, by making the VMES system licensee responsible for meeting whatever operational considerations we propose, we would be designing rules intended to enhance the protection of other in-band and out-of-band licensees.

79. We consider blanket licensing for VMES terminals because the number and mobility of VMES locations may make it impractical in many cases to license VMES terminals on a unit-by-unit basis. Under a blanket licensing approach, applicants would be required to file a narrative describing the overall system operations as well as specific information on the antennas, power density, and emission characteristics of each class of earth station comprising the network. We would propose requiring a point of contact to maintain information about the frequencies that the individual vehicles use. After the applicant submits point of contact and other relevant information, the Commission then could issue a blanket authorization for the system.

80. We also seek comment on whether we should provide for the licensing of individual earth stations, using the same technical criteria that are applied to the antennas in a blanket-licensed VMES network. We seek comment on whether there are specific rule provisions that might be required to address such cases.[167] In addition, we invite comment regarding necessary modifications to FCC Form 312 to accommodate applications for VMES systems.[168]

81. *ALSAT authority*. We also seek comment on whether we should authorize Ku-band VMES operators to operate with any U.S.-licensed satellite and non-U.S. satellites on the Permitted Space Station List using the parameters consistent with earth stations, specifically that the VMES terminals comply with the proposed off-axis E.I.R.P power-density requirements proposed herein (that is, grant VMES operators ALSAT authority).[169] Or, for reasons relating to potential interference to two-degree spaced satellites, should VMES operators be granted authority to access individual satellites only?

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[166] *ESV Report and Order*, 20 FCC Rcd 674, 722-23, ¶¶ 114-15; *AMSS NPRM*, 20 FCC Rcd 2906, 2932, ¶¶ 48-49.

[167] Specifically, we seek comment on whether to license VMES terminals on an individual basis pursuant to the proposed off-axis E.I.R.P. requirements discussed above.

[168] Applications for new or modified transmitting and/or receiving earth stations must be filed on FCC Form 312. *See* 47 C.F.R. §§ 25.130, 25.131.

[169] "ALSAT" means "all U.S.-licensed space stations." It permits an earth station operator providing FSS in the Ku-band to access any U.S. satellite, and any foreign satellite on the Permitted Space Station List, without additional Commission action, provided that those communications are in accordance with the same technical parameters and conditions established in the earth stations' licenses. *See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, Report and Order, IB Docket No. 96-111, FCC 99-325, 15 FCC Rcd 7207, 7210-11, ¶ 6, 7215-16, ¶ 19 (1996).

Because ALSAT authority is not available to FSS earth station applicants if their operations must be coordinated with adjacent satellite operators, we would propose that ALSAT authority would not be available to those VMES applicants if their operations must be coordinated with adjacent satellite operators, especially if the VMES terminals exceed the proposed off-axis E.I.R.P.-density requirements. We seek comment on this analysis.

82. *License term*. We seek comment on licensing VMES operations for a term of fifteen years. Other licensed networks of earth stations have fifteen-year license terms.[170] We seek comment on whether there is any reason to diverge from the fifteen-year license terms.

IV. CONCLUSION

83. In this NPRM, we seek comment on General Dynamics' proposal that we allocate the conventional Ku-band for use with VMES terminals in the FSS on a primary basis. We also seek comment on service and licensing rules for VMES, possibly modeled on the current ESV rules. The proposed allocation and licensing procedures for Ku-band VMES reflect our interest in providing regulatory certainty to both new and incumbent operators in the Ku-band. The proposals set forth in this *Notice* are designed to: (1) promote efficient use of the spectrum by permitting new uses of the band by VMES terminals, thereby enabling important new communications services to be provided to consumers on board vehicles in motion; (2) protect existing and future FSS licensees and their customers from harmful interference; (3) propose procedures for coordination with existing and future SRS and RAS uses that may be affected by VMES terminals; and (4) establish rules and a regulatory framework that minimize the regulatory burden on VMES licensees to the extent possible. We seek comment on each of the matters set forth above.

V. PROCEDURAL MATTERS

A. Ex Parte Presentations

84. This proceeding shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's ex parte rules.[171] Persons making oral ex parte presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and arguments presented is generally required.[172] Other rules pertaining to oral and written presentations are set forth in section 1.1206(b) of the Commission's rules as well.

B. Initial Regulatory Flexibility Analysis

85. Pursuant to the Regulatory Flexibility Act ("RFA"),[173] the Commission has prepared an Initial Regulatory Flexibility Analysis ("IRFA") of the possible significant economic impact on small entities by the policies and actions considered in this *Notice*. The text of the IRFA is set forth in

[170] *See* 47 C.F.R. § 25.121.

[171] 47 C.F.R. §§ 1.1200, 1.1206; *Amendment of 47 C.F.R. § 1.1200 et seq. Concerning Ex Parte Presentations in Commission Proceedings*, GC Docket No. 95-21, Report and Order, FCC 97-92, 12 FCC Rcd 7348 (1997).

[172] 47 C.F.R. § 1.1206(b)(2).

[173] *See* 5 U.S.C. § 603. The RFA, *see* U.S.C. §601 *et seq*., has been amended by the Contract with America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) ("CWAAA"). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 ("Small Business Act").

Appendix C. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *Notice* as provided in paragraph 88 below. The Commission will send a copy of the *Notice*, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.[174]

C. Initial Paperwork Reduction Act of 1995 Analysis

86. *Paperwork Reduction Act*. This *Notice* contains proposed new and modified information collection(s). The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget ("OMB") to comment on the information collection(s) contained in this *Notice*, as required by the Paperwork Reduction Act of 1995, Public Law No. 104-13. Public and agency comments are due 60 days from date of publication of the *Notice* in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law No. 107-198, *see* 44 U.S.C. § 3506(c)(4), we seek specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees."

87. A copy of any comments on the information collections contained herein should be submitted to Judy Boley Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to jbHerman@fcc.gov and to Kristy L. LaLonde, OMB Desk Officer, Room 10234 NEOB, 725 17th Street, N.W., Washington, DC 20503, via the Internet to Kristy_L. LaLonde@omb.eop.gov, or via fax at 202-395-5167.

D. Comment Filing Procedures

88. Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments in response to this Notice no later than on or before **30** days after Federal Register publication. Reply comments to these comments may be filed no later than on or before **45** days after Federal Register publication. All pleadings are to reference IB Docket No. 07-101. Comments may be filed using the Commission's Electronic Comment Filing System ("ECFS") or by filing paper copies. Parties are strongly encouraged to file electronically. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 24121 (1998).

89. Comments filed through the ECFS can be sent as an electronic file via the Internet to http://www.fcc.gov/cgb/ecfs/. Parties should transmit one copy of their comments to the docket in the caption of this rulemaking. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov and should include the following words in the body of the message, "get form <your e-mail address>." A sample form and directions will be sent in reply.

90. Parties choosing to file by paper must file an original and four copies of each filing in IB Docket No. 07-101. Filings can be sent by hand or messenger delivery, by commercial overnight courier,

[174] 5 U.S.C. § 603(a).

or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). If more than one docket or rulemaking number appears in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. The Commission's mail contractor, Vistronix, Inc., will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, S.W., Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

91. Comments submitted on diskette should be on a 3.5 inch diskette formatted in an IBM-compatible format using Word for Windows or compatible software. The diskette should be clearly labeled with the commenter's name, proceeding (including the docket number, in this case, IB Docket No. 07-101), type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy - Not an Original." Each diskette should contain only one party's pleadings, preferably in a single electronic file.

92. All parties must file one copy of each pleading electronically or by paper to each of the following: (1) The Commission's duplicating contractor, Best Copy and Printing, Inc., 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, telephone (202) 488-5300, facsimile (202) 488-5563, or via e-mail at FCC@BCPIWEB.COM; (2) Howard Griboff, International Bureau, 445 12th Street, S.W., Washington, D.C. 20554, e-mail Howard.Griboff@fcc.gov; (3) Paul Locke, International Bureau, 445 12th Street, S.W., Washington, D.C. 20554, email Paul.Locke@fcc.gov; (4) Kathleen Collins, International Bureau, 445 12th Street, S.W., Washington, D.C. 20554, email Kathleen.Collins@fcc.gov.

93. Comments and reply comments and any other filed documents in this matter may be obtained from Best Copy and Printing, Inc., in person at 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, via telephone at (202) 488-5300, via facsimile (202) 488-5563, or via e-mail at FCC@BCPIWEB.COM. The pleadings also will be available for public inspection and copying during regular business hours in the FCC Reference Information Center, Room CY-A257, 445 Twelfth Street, S.W., Washington, D.C. 20554 and through the ECFS, accessible on the Commission's World Wide Website, www.fcc.gov.

94. Comments and reply comments must include a short and concise summary of the substantive arguments raised in the pleading. Comments and reply comments also must comply with section 1.49 and all other applicable sections of the Commission's rules.[175] All parties are encouraged to utilize a table of contents, and to include the name of the filing party and the date of the filing on each page of their submission. We also strongly encourage that parties track the organization set forth in this Notice in order to facilitate our internal review process.

95. Commenters who file information that they believe is proprietary may request confidential treatment pursuant to section 0.459 of the Commission's rules. Commenters should file both their original comments for which they request confidentiality and redacted comments, along with their request for confidential treatment. Commenters should not file proprietary information electronically. *See*

[175] 47 C.F.R. § 1.49.

Examination of Current Policy Concerning the Treatment of Confidential Information Submitted to the Commission, Report and Order, 13 FCC Rcd 24816 (1998), Order on Reconsideration, FCC 99-262, 14 FCC Rcd 20128 (1999). Even if the Commission grants confidential treatment, information that does not fall within a specific exemption pursuant to the Freedom of Information Act ("FOIA") must be publicly disclosed pursuant to an appropriate request. *See* 47 C.F.R. § 0.461; 5 U.S.C. § 552. We note that the Commission may grant requests for confidential treatment either conditionally or unconditionally. As such, we note that the Commission has the discretion to release information on public interest grounds that does fall within the scope of a FOIA exemption.

E. Further Information

96. For further information regarding this proceeding, contact Paul Locke, Policy Division, International Bureau at (202) 418-0756. Information regarding this proceeding and others may also be found on the Commission's website at www.fcc.gov.

VI. ORDERING CLAUSES

97. Accordingly, IT IS ORDERED that, pursuant to the authority contained in sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 154(j), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308, this Notice of Proposed Rulemaking IS ADOPTED.

98. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center SHALL SEND a copy of this Notice of Proposed Rulemaking, including the initial regulatory flexibility analysis, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with section 603(a) of the Regulatory Flexibility Act, 5 U.S.C. § 601, et seq. (1981).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Petition For Rulemaking Commenters

Parties Filing Comments
(7 Commenters)

Name of Party

Association of Public Television Stations/Public Broadcasting Service
AvL Technologies Incorporation
Maritime Telecommunications Network, Inc.
QUALCOMM Incorporated
Satellite Industry Association
SES Americom, Inc./Americom Government Services
ViaSat, Inc.

Parties Filing Reply Comments
(1 Reply Commenter)

Name of Party

General Dynamics SATCOM Technologies, Inc.

Parties Filing *Ex Parte* Comments
(1 *ex parte*)

General Dynamics SATCOM Technologies, Inc.

APPENDIX B

Proposed Rules

For the reasons discussed above, the Federal Communications Commission proposes to amend 47 C.F.R. Parts 2 and 25, as follows:

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

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

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

2. Section 2.106, the Table of Frequency Allocations, 47 C.F.R. § 2.106, is amended as follows:

a. Revise pages 45, 46 and 47.

b. In the list of non-Federal Government footnotes, add footnotes NGxxx and NGyyy in numerical order.

§ 2.106 Table of Frequency Allocations.

The revisions and additions read as follows:

* * * * *

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.45 RADIOLOCATION Amateur 5.479 5.480	10-10.45 FIXED MOBILE RADIOLOCATION Amateur 5.479	10-10.45 RADIOLOCATION G32 5.479 US58 US108	10-10.45 Radiolocation Amateur 5.479 US58 US108 NG42	Private Land Mobile (90) Amateur (97)
10.45-10.5 RADIOLOCATION Amateur Amateur-satellite 5.481			10.45-10.5 RADIOLOCATION G32 US58 US108	10.45-10.5 Radiolocation Amateur Amateur-satellite US58 US108 NG42 NG134	
10.5-10.55 FIXED MOBILE Radiolocation	10.5-10.55 FIXED MOBILE RADIOLOCATION		10.5-10.55 RADIOLOCATION US59		Private Land Mobile (90)
10.55-10.6 FIXED MOBILE except aeronautical mobile Radiolocation			10.55-10.6	10.55-10.6 FIXED	Fixed Microwave (101)
10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) Radiolocation 5.149 5.482			10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US265 US277	10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED US265 SPACE RESEARCH (passive) US277	
10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.483			10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246 US355		
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 NGxxx	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 12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.485 5.488 5.489	11.7-12.2 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.487 5.487A 5.492	11.7-12.2	11.7-12.2 FIXED-SATELLITE (space-to-Earth) NG143 NG145 NG183 NGyyy 5.488 NG184	Satellite Communications (25)

	FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile BROADCASTING		FIXED BROADCASTING-SATELLITE	Satellite Communications (25) Fixed Microwave (101)
5.487 5.487A 5.492	5.487A 5.488 5.490 5.492	5.484A 5.487		5.487A 5.488 5.490	
12.5-12.75 FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.494 5.495 5.496	12.7-12.75 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	12.5-12.75 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.493		12.7-12.75 FIXED NG118 FIXED-SATELLITE (Earth-to-space) MOBILE	Satellite Communications (25) Auxiliary Broadcasting (74) Cable TV Relay (78) Fixed Microwave (101)
12.75-13.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.441 MOBILE Space research (deep space) (space-to-Earth)			12.75-13.25 US251	12.75-13.25 FIXED NG118 FIXED-SATELLITE (Earth-to-space) 5.441 NG104 MOBILE US251 NG53	
13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A 5.499			13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A	13.25-13.4 AERONAUTICAL RADIONAVIGATION 5.497 Earth exploration-satellite (active) Space research (active)	Aviation (87)
13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.499 5.500 5.501 5.501B			13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G59 SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.501B	13.4-13.75 Earth exploration-satellite (active) Radiolocation Space research Standard frequency and time signal-satellite (Earth-to-space)	Private Land Mobile (90)
13.75-14 FIXED-SATELLITE (Earth-to-space) 5.484A RADIOLOCATION Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research 5.499 5.500 5.501 5.502 5.503			13.75-14 RADIOLOCATION G59 Standard frequency and time signal-satellite (Earth-to-space) Space research US337 US356 US357	13.75-14 FIXED-SATELLITE (Earth-to-space) US337 Radiolocation Standard frequency and time signal-satellite (Earth-to-space) Space research US356 US357	Satellite Communications (25) Private Land Mobile (90)
14-14.25 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504C 5.506A Space research 5.504A 5.505			14-14.2 Space research	14-14.2 FIXED-SATELLITE (Earth-to-space) NG183 NGyyy Mobile-satellite (Earth-to-space) Space research	Satellite Communications (25)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			14.2-14.4	14.2-14.47	
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				FIXED-SATELLITE (Earth-to-space) NG183 NGyyy 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 NGyyy Mobile-satellite (Earth-to-space) US203 US342	
14.5-14.8 FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research			14.5-14.7145 FIXED Mobile Space research 14.7145-14.8 MOBILE Fixed Space research	14.5-14.8	
14.8-15.35 FIXED MOBILE Space research 5.339			14.8-15.1365 MOBILE SPACE RESEARCH Fixed US310 15.1365-15.35 FIXED SPACE RESEARCH Mobile 5.339 US211	14.8-15.1365 US310 15.1365-15.35 5.339 US211	

* * * * *

NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NGxxx In the bands 10.95-11.2 GHz and 11.45-11.7 GHz (space-to-Earth), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 may be authorized to communicate with space stations of the fixed-satellite service but must accept interference from stations of the fixed service operating in accordance with the Commission's Rules.

NGyyy In the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Vehicle-Mounted Earth Stations (VMES) as regulated under 47 CFR part 25 are an application of the fixed-satellite service and may be authorized to communicate with space stations of the fixed-satellite service on a primary basis.

* * * * *

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. §§ 154, 301, 302, 303, 307, 309, and 332, unless otherwise noted.

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

* * * * *

§ 25.XXX Blanket Licensing provisions for Vehicle-Mounted Earth Stations (VMESs) receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), and 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 revising 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 or a VMES.

*****

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. Additional filing requirements for Vehicle-Mounted Earth Stations are described in § 25.XXX of this part. In addition, applicants not required to submit applications on Form 312EZ, other than ESV or VMES applicants, must submit the following information to be used as an "informative" in the public notice issued under § 25.151 as an attachment to their application:

* * * * *

7. Section 25.132 is amended by revising paragraph (b)(3) to read as follows:

§ 25.132 Verification of earth station antenna performance standards.

* * * * *

(b)(3) Applicants seeking authority to use an antenna that does not meet the standards set forth in §25.209(a) and (b), pursuant to the procedure set forth in § 25.220 or subject to rules in § 25.XXX, are required to submit a copy of the manufacturer's range test plots of the antenna gain patterns specified in paragraph (b)(1) of this section.

* * * * *

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

§ 25.201 Definitions.

* * * * *

Vehicle-Mounted Earth Station (VMES). A VMES is an earth station, operating from a motorized vehicle that travels primarily on land, that receives from and transmits to fixed-satellite space stations and operates pursuant to the requirements set out § 25.XXX of this part.

* * * * *

9. Section 25.202 is amended by adding paragraph (a)(9**)** to read as follows:

§ 25.202 Frequencies, frequency tolerance and emission limitations.

* * * * *

(a)(9) The following frequencies are available for use by Vehicle-Mounted Earth Stations (VMESs):

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)

VMESs shall be authorized as set forth in § 25.XXX of this chapter.

* * * * *

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

§ 25.203 Choice of sites and frequencies.

(a) Sites and frequencies for earth stations, other than ESVs or VMESs, 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 or a VMES, 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 are necessary to assess 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 or a VMES, 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 or a VMES, 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 or a VMES, 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.

11. Section 25.204 is amended by modifying the introduction to paragraph (a) and adding paragraph (j) to read as follows:

§ 25.204 Power limits.

(a) In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV or a VMES, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

* * * * *

(j) Within 125 km of the Tracking and Data Relay System Satellite (TDRSS) sites identified in § 25.XXX(a)(11) of this chapter, VMES 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.

12. Section 25.205 is amended by adding paragraph (c) to read as follows:

§ 25.205 Minimum angle of antenna elevation.

* * * * *

(c) VMESs 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(j) of this chapter.

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

§ 25.XXX Blanket Licensing provisions for Vehicle-Mounted Earth Stations (VMESs) 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 VMESs receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), and 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 VMES operations meet the following criteria, which are ongoing requirements that govern all VMES licensees and operations in these bands:

(1) The off-axis EIRP spectral density for co-polarized signals, emitted from the VMES 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:

$15 - 25\log(\theta) - 10*\log(N)$ dBW/4kHz	for	$1.25° \leq \theta \leq 7.0°$
$-6 - 10*\log(N)$ dBW/4kHz	for	$7.0° < \theta \leq 9.2°$
$18 - 25\log(\theta) - 10*\log(N)$ dBW/4kHz	for	$9.2° < \theta \leq 48°$
$-24 - 10*\log(N)$ dBW/4kHz	for	$48° < \theta \leq 180°$

where (θ) is the angle in degrees from the axis of the main lobe. For a VMES network using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For a VMES network using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

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

$18 - 25\log(\theta) - 10*\log(N)$ dBW/4kHz	for	$1.25° \leq \theta \leq 48.0°$
$-24 - 10*\log(N)$ dBW/4kHz	for	$48.0° < \theta \leq 180°$

where θ and N are defined as set forth in paragraph (a)(1) of this section.

(3) For $\theta > 7.0°$, 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 VMES shall not exceed the following values:

$5 - 25\log(\theta) - 10*\log(N)$ dBW/4kHz	for	$1.8° \leq \theta \leq 7.0°$
$-16 - 10*\log(N)$ dBW/4kHz	for	$7.0° < \theta \leq 9.2°$

where (θ) and N are defined as set forth in paragraph (a)(1) of this section.

(5) For non-circular VMES 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 VMES antenna.

(7) All emissions from the VMES 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 VMES 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, 7 days a week, with authority and ability to cease all emissions from the VMES.

(9) A VMES that exceeds the radiation guidelines of section 1.1310 of this chapter, Radiofrequency radiation exposure limits, must provide, with its environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

(10) A VMES 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:

(i) For each VMES transmitter a record of the vehicle 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 one year. Records will be recorded at time intervals no greater than every 20 minutes while the VMES is transmitting. The VMES operator will make this data available upon request to a coordinator, fixed-satellite system operator, NTIA, or the Commission within 24 hours of the request.

(ii) VMES operators shall control all VMESs by a Hub earth station located in the United States.

(11) Operations of VMESs in the 14.0-14.2 GHz (Earth-to-space) frequency band within 125 km of the NASA TDRSS facilities on Guam (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 with NASA. When NASA seeks to provide similar protection to future TDRSS sites that have been coordinated through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (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 VMES operators must cease operations in the 14.0-14.2 GHz band within 125 km of the new TDRSS site until they have coordinated with the new site. After coordination, VMES 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.

(12) Operations of VMESs in the 14.47-14.5 GHz (Earth-to-space) frequency band within (1) 45 km of the radio observatory on St. Croix, Virgin Islands (latitude 17° 46' N, longitude 64° 35' W); (2) 125 km of the radio observatory on Mauna Kea, Hawaii (latitude 19° 48' N, longitude 155° 28' W); (3) 90 km of the Arecibo Observatory on Puerto Rico (latitude 18° 20' 46" N, longitude 66° 45' 11" W); and (4) 160 km of the radio observatories listed in US203 as observing in the 14.47-14.5 GHz band are subject to coordination with the National Science Foundation (NSF).

(13) In the 10.95-11.2 GHz (space-to-Earth) and 11.45-11.7 GHz (space-to-Earth) frequency bands a VMES 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) VMES antennas licensed for reception of radio transmissions from space stations in the fixed-satellite service in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth) and 11.7-12.2 GHz (space-to-Earth) bands for which they have equal status with respect to other fixed-satellite service applications are protected from harmful interference caused by other space stations only to the degree to which an earth station employing an antenna conforming to the referenced patterns defined in § 25.209(a) and (b) of the rules is protected from radio interference.

(b) Applications for VMES 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)(i) A series of EIRP density charts or tables at the maximum EIRP density listed in Schedule B, 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, at 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

(1)(ii) A certification, in Schedule B, that the VMES antenna conforms to the gain pattern criteria of § 25.209(a) and (b), that, combined with the maximum input power density calculated from the EIRP density less the antenna gain, which is 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.

(2) The Multiple Access technique being employed and the value of N.

(3) A certification from the antenna manufacturer countersigned by the applicant that the antenna complies with the requirements in paragraphs (a)(6) and (a)(7) of this section.

(4) The contact information pursuant to paragraph (a)(8) of this section.

(5) The mitigation plan pursuant to paragraph (a)(9) of this section.

(6) Indication of whether the VMES will operate in the regions indicated in paragraph (a)(11) or (a)(12) of this section.

(7) For the hub station, as required pursuant to paragraph (a)(10)(ii) of this section, the call sign for a previously authorized earth station, the call sign of a pending earth station application, or the technical information in Schedule B, pursuant to § 25.115, if the earth station is to be licensed concurrently with the VMES terminals. The call sign of hub station is to be listed in the remote control section of the Form 312 Schedule B.

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

§ 25.271 Control of transmitting stations.

* * * * *

(b) The licensee of a transmitting earth station, other than an ESV or a VMES, 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 or a VMES, by remote control only on the conditions that:

* * * * *

(f) Rules for control of transmitting ESVs are provided in §§ 25.221 and 25.222 and rules for control of transmitting VMESs are provided in § 25.XXX.

APPENDIX C

Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended ("RFA"),[176] the Commission has prepared this present Initial Regulatory Flexibility Analysis ("IRFA") of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this *Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed Satellite Service*, Notice of Proposed Rulemaking ("*Notice*").[177] Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *Notice* provided in paragraph 88 of the *Notice*. The Commission will send a copy of the *Notice*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration ("SBA").[178] In addition, the *Notice* and IRFA (or summaries thereof) will be published in the Federal Register.[179]

A. Need for, and Objectives of, the Proposed Rules

In this *Notice* the Commission makes proposals and seeks information on measures to provide a level of regulatory certainty to government, space research, radio astronomy, and fixed satellite service operators regarding operations of Vehicle-Mounted Earth Stations ("VMES"). As discussed in greater detail below, the Commission seeks comment on rules and procedures to license VMES for operation in the Ku-band similar to the Commission's current licensing rules for Earth Stations on Vessels ("ESVs") that operate in the Ku-band, with appropriate modifications. The record established in the proceeding will allow the Commission to determine the effect of authorizing VMES terminals and will facilitate the development of any future rules for VMES. Any future rules would be designed to support the deployment of VMES terminals to the benefit of the American public without adversely affecting the operation and continued growth of incumbent radio services. In this regard, the objective is to create a licensing program that ensures incumbent radio services protection against harmful interference.

B. Legal Basis

The *Notice* is adopted pursuant to Sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 154(j), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308.

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[176] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 ("Small Business Act"), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[177] *See Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 07-101.

[178] *See* 5 U.S.C. § 603(a).

[179] *See* 5 U.S.C. § 603(a).

C. Description and Estimate of the Number of Small Entities to Which the Proposals Will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[180] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[181] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[182] A small business concern is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.[183] Below, we further describe and estimate the number of small entity licensees that may be affected by the adopted rules.

Satellite Telecommunications. The SBA has developed a small business size standard for Satellite Telecommunications Carriers. This category "comprises establishments primarily engaged in providing point-to-point telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications."[184] According to Census Bureau data for 2002, there were 371 firms in the category that operated for the entire year.[185] Of this total, 307 firms had annual receipts of under $10 million, 26 firms had annual receipts of $10 million to $24,999,990, and 38 firms had annual receipts of $25 million or more.[186] Thus, under this size standard, the majority of firms can be considered small.

A second category for international service providers, called "Other Telecommunications," "comprises establishments primarily engaged in (1) providing specialized telecommunications applications, such as satellite tracking, communications telemetry, and radar station operations; or (2) providing satellite terminal stations and associated facilities operationally connected with one or more terrestrial communications systems and capable of transmitting telecommunications to or receiving telecommunications from satellite systems."[187] For this category, Census Bureau data for 2002 show that

[180] 5 U.S.C. § 603(b)(3).

[181] *Id.* § 601(6).

[182] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after the 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." 5 U.S.C. § 601(3).

[183] Small Business Act, 15 U.S.C. § 632 (1996).

[184] U.S. Census Bureau, 2002 North American Industry Classification System (NAICS) Definitions, "517410 Satellite Telecommunications"; htpp://www.census.gov/epcd/naics02/def/NDEF517.HTM.

[185] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 4, NAICS code 517410 (issued Nov.. 2005).

[186] *Id*.

[187] U.S. Census Bureau, 2002 NAICS Definitions, "517910 Other Telecommunications"; http://www.census.gov/epcd/naics02/def/NDEF517.HTM.

there were a total of 332 firms that operated for the entire year.[188] Of this total, 303 firms had annual receipts of under $10 million, 15 firms had annual receipts of $10 million to $24,999,999, and 14 firms had annual receipts of $25 million or more.[189] Consequently, we estimate that the majority of Other Telecommunications firms are small entities that might be affected by our action.

Space Stations (Geostationary). Commission records reveal that there are approximately 15 space station licensees authorized for use in the Ku-band. We do not request nor collect annual revenue information, and thus are unable to estimate of the number of geostationary space stations that would constitute a small business under the SBA definition cited above, or apply any rules providing special consideration for Space Station (Geostationary) licensees that are small businesses.

Fixed Satellite Transmit/Receive Earth Stations. Currently there are approximately 2,532 operational fixed-satellite transmit/receive earth stations authorized for use in the Ku-band. 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.

Cellular Licensees. The SBA has developed a small business size standard for wireless firms within the two broad economic census categories of "Paging"[190] and "Cellular and Other Wireless Telecommunications."[191] Under both categories, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. For the census category of Paging, Census Bureau data for 2002 show that there were 807 firms in this category that operated for the entire year.[192] Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.[193] Thus, under this category and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.[194] Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.[195] Thus, under this second category and size standard, the majority of firms can, again, be considered small.

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[188] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 4, NAICS code 517910 (issued Nov. 2005).

[189] *Id*.

[190] 13 C.F.R. § 121.201, NAICS code 517211.

[191] 13 C.F.R. § 121.201, NAICS code 517212.

[192] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 517211 (issued Nov. 2005).

[193] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[194] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization," Table 5, NAICS code 517212 (issued Nov. 2005).

[195] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

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

The *Notice* seeks comment on whether to expand the applicability of the current ESV rules to VMES. The proposed VMES rules, if adopted, would require satellite telecommunications operators to establish a database for tracking the location of VMES remote earth stations. This database would assist investigations of interference claims. The *Notice* seeks comment on this proposal, including the effectiveness and utility of the proposal, and seeks comment regarding possible alternatives. The proposed rules, if adopted, also would require VMES operators to name a point of contact to maintain information about location and frequencies used by VMES terminals. Such information would assist in investigating interference claims. The Commission does not expect significant costs associated with these proposals, if adopted. Therefore, we do not anticipate that the burden of compliance would be greater for smaller entities.

The *Notice* seeks comment on possible methods for coordinating VMES operations with space research service and radio astronomy operations.

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

The RFA requires that, to the extent consistent with the objectives of applicable statutes, the analysis shall discuss significant alternatives such as: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage or the rule, or any part thereof, for small entities.[196]

This *Notice* solicits comment on alternatives for more efficient processing of VMES applications and simplification of VMES procedures, for example, by migrating from non-conforming use licensing to a licensing method that would provide for licenses with terms of fifteen years. The *Notice* also seeks comment on streamlining the application process for VMES operations by permitting blanket licensing of multiple VMES terminals in a single application, as an alternative to requiring all VMES terminals to be licensed individually. Adoption of some of these proposals would simplify the application process for VMES and establish licensing terms consistent with other satellite-based services, such as ESV. Thus, adoption of the proposed rules should reduce the costs associated with obtaining and maintaining authority to operate a VMES network.

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

None.

[196] 5 U.S.C. § 603(c)(1)-(c)(4).