

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

In the matter of )  
)  
Amendment of Parts 2 and 25 of the )  
Commission's Rules to Allocate Spectrum )  
in the Ku and Extended Ku Bands to the ) RM 11336  
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 )

**COMMENTS OF VIASAT, INC.**

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**COMMENTS OF VIASAT, INC.**

ViaSat, Inc. (“ViaSat”) submits the following comments in support of the above-referenced petition of General Dynamics SATCOM Technologies, Inc. (“General Dynamics”) requesting that the Commission initiate a rulemaking to amend Parts 2 and 25 of its Rules to allow Land Mobile Earth Stations (“LMESs”) in the Fixed Satellite Service (“FSS”) to operate in the Ku-band on a primary basis, and in the extended Ku band on a non-protected basis, and to adopt service and licensing rules for LMES operations in the Ku band.<sup>1</sup> ViaSat has a strong interest in this proceeding because ViaSat is developing antenna and modulation technology to make high-speed data communications available to users while traveling in vehicles. The Commission should initiate General Dynamics’ requested rulemaking to promote the efficient use of spectrum, the growth of new communications services, and the widespread availability of broadband services.

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<sup>1</sup> *Petition for Rulemaking for Amendment of Parts 2 and 25 of the Commission’s Rules to Allocate Spectrum in the Ku and Extended Ku Bands to the VMES on a Shared Primary Basis and to Adopt Licensing and Service Rules for VMES Operations in the Ku and Extended Ku Bands*, RM 11336, Public Notice, Report No. 2780 (rel. July 20, 2006) (the “Petition for Rulemaking”).

## I. INTRODUCTION AND SUMMARY

Through its pending application for an aeronautical mobile satellite service (“AMSS”) network in the Ku band, ViaSat has introduced the Commission to its ArcLight<sup>®</sup> technology, which employs a spread spectrum signal and dynamic power management to maximize spectrum efficiency and to reduce the potential for interference into other systems.<sup>2</sup> ViaSat’s antenna technology makes possible a wide range of mobile applications, including LMES, using FSS frequency bands and existing FSS infrastructure. The Petition for Rulemaking provides the opportunity for the full benefits of this technology to be achieved, by amending the Part 25 rules to facilitate the routine licensing of LMES. ViaSat encourages the Commission to open a proceeding to adopt a regulatory regime that would allow LMES services to use FSS frequency bands on a primary basis and that would promote the development of new broadband alternatives through affordable terminals that are attractive to consumers. In the Petition for Rulemaking, General Dynamics focuses on the benefit of adopting such rules to promote U.S. military and governmental uses of LMES, but does not address commercial applications.<sup>3</sup> ViaSat has interests in both government and commercial applications of LMES and urges the Commission to consider the importance of broader commercial deployment of LMES technology.

Establishing a regulatory framework for LMES service, as proposed in the Petition for Rulemaking, would promote the widespread deployment of LMES service by providing operators the certainty, protection, and flexibility necessary to accommodate further development and refinement of LMES network technology. In such a proceeding, the

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<sup>2</sup> *Application of ViaSat, Inc. for Authority to Operate 1,000 Aeronautical Mobile Earth Stations in the Ku Band*, E050318, FCC File No. SES-LIC-20051028-01494 (filed Oct. 28, 2005).

<sup>3</sup> Petition for Rulemaking at 4.

Commission could expand its recent efforts in the earth stations on vessels (“ESV”) and AMSS contexts to encourage the flexible use of Ku band spectrum and to increase the broadband capabilities available to consumers. Streamlined licensing procedures for these services provide “regulatory certainty to all licensees in these bands by elevating ESV operational status from temporary to licensed authority”<sup>4</sup> and “advance [the Commission’s] continuing effort to maximize the flexible use of radiofrequency spectrum for earth station operations.”<sup>5</sup>

For the reasons discussed below, ViaSat supports General Dynamics’ request to adopt routine licensing procedures for LMES operations and to modify the table of frequency allocations for the Ku band to allow LMES operations on a primary basis. ViaSat also generally supports General Dynamics’ request that the Commission extend the ESV service and licensing rules for Ku band operations to LMESs. However, in order to promote development of LMES as a viable and attractive service to consumers and investors, the Commission should propose rules that would allow the operation of small, low-profile antennas that consumers can affordably install on standard vehicles. The Commission should examine in this proceeding certain antenna technologies that protect adjacent satellite operators without the need for stringent antenna pointing accuracy limitations and should tailor the LMES rules to accommodate the development of these technologies. Furthermore, the Commission should apply the data tracking requirements of Section 25.222(c) of the Commission’s Rules to LMES. Finally, the Commission should consider and request comment on amending its rules to allow LMES to operate at greater power densities in the non-geostationary orbit (“NGSO”) plane than are currently permitted.

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<sup>4</sup> *See Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands, Report and Order*, 20 FCC Rcd 674 at ¶ 129 (2005) (“ESV Order”).

<sup>5</sup> *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 at ¶ 10 (2005) (“NPRM for ESVs”).

## II. THE COMMISSION SHOULD PROPOSE A KU BAND ALLOCATION FOR LMES OPERATIONS CONSISTENT WITH THAT OF ESVS

ViaSat supports General Dynamics' proposal to adopt a primary designation for LMES in the Ku band uplink frequencies at 14.0-14.5 GHz and the downlink frequencies at 11.7-12.2 GHz, as well as an allocation on a non-interference basis on the extended Ku band frequencies (10.95-11.2 GHz and 11.45-11.7 GHz).<sup>6</sup> Further, the Commission's proposed rules should recognize LMES as an application of FSS networks, and therefore, should afford this service primary status to the extent that LMES is no more interfering than traditional "fixed" satellite service terminals.

As the Commission recognized in the ESV proceeding, affording primary status will ensure the ability of LMES terminals to access multiple satellites and also would facilitate interoperability among LMES, ESV, VSAT and other FSS services, because multiple services within the allocation would have primary status.<sup>7</sup> Moreover, treating LMES terminals as primary for interference protection purposes would promote efficient use of FSS spectrum and existing FSS resources. This level of interference protection is necessary to satisfy the growing demand for two-way broadband capabilities for vehicle users while in motion by offering a less restrictive operating environment with greater (*i.e.*, primary) regulatory rights, and thereby providing certainty to support needed investment.<sup>8</sup>

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<sup>6</sup> Petition for Rulemaking at 8-10. ViaSat agrees with General Dynamics' that LMES operations should be a secondary allocation in these bands and could operate most efficiently in accordance with footnote NG182 developed for ESVs in these bands.

<sup>7</sup> See *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, Report and Order, 20 FCC Rcd 674 at ¶¶ 78, 79 (2005) ("ESV Order").

<sup>8</sup> See NPRM for ESVs at ¶¶ 1, 2.

### **III. THE COMMISSION SHOULD EXTEND THE ESV SERVICE AND LICENSING RULES FOR KU BAND OPERATIONS TO LMES, WITH CERTAIN LIMITED REVISIONS**

ViaSat generally agrees with General Dynamics' proposal to extend the ESV service and licensing rules for Ku-band operations to LMES service.<sup>9</sup> With limited exceptions, ViaSat agrees that the best approach for LMES systems would be to use the off-axis EIRP density limits as formulated in the ESV context.<sup>10</sup> Adopting a "power-pattern tradeoff" will allow operators the flexibility to employ various antenna and modulation technologies and will promote broad commercial applications of LMES technologies, in addition to military uses. However, while antenna pointing accuracy requirements and the ESV power density limits may be appropriate for some LMES systems, the Commission should consider the capabilities of systems using spread spectrum modulation and aggregate power control. The Commission should recognize that LMES systems could employ a wide range of antenna and modulation technologies and should propose rules that permit the implementation and development of these technologies.

#### **A. The Antenna Pointing Accuracy Requirement Should Be Narrowly Tailored To Accommodate LMES Technologies That Can Protect Adjacent Satellites Through Other Means**

In seeking comment on antenna pointing requirements, the Commission should recognize that certain antenna technologies do not require precise antenna pointing accuracy to protect adjacent satellite systems from interference. For example, in systems using spread spectrum modulation techniques in which individual antennas operate at extremely low power densities, and in which aggregate power density is controlled centrally, antenna pointing requirements are largely unnecessary. A single mispointed antenna does not significantly impact

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<sup>9</sup> Petition for Rulemaking at 10.

<sup>10</sup> See Petition for Rulemaking at 11.

the potential for interference because, even when mispointed, it operates using a wide bandwidth at power density levels that are likely undetectable to adjacent satellites. Further, in a network using spread spectrum modulation techniques coupled with a multiple access scheme, such as a code division multiple access method (“CDMA”), random antenna pointing errors average out across the user population and have little impact on the network aggregate off-axis EIRP density. Additionally, using central power control to manage the aggregate power density ensures that the power density of the network does not exceed the off-axis EIRP density limit, thereby protecting adjacent satellite systems. In the context of such a system, imposing an antenna pointing accuracy requirement would unnecessarily add costs that could make LMESs prohibitively expensive for broad commercial deployment.

However, ViaSat does not suggest that the Commission mandate any particular technology for LMES systems. The Commission’s antenna pointing accuracy requirements should accommodate a wide range of LMES systems and should reflect technical differences in LMES technologies. Thus, the rules should not be so broad as to apply unnecessarily to LMES systems, such as that described above. While ViaSat believes the Commission should not impose a pointing requirement for all LMES terminals, such requirements may be necessary for certain LMES antenna technologies that cannot otherwise protect adjacent satellite networks from interference from mispointed terminals. In the event interference cannot be controlled using spread spectrum and/or power control technology, ViaSat supports reasonable pointing accuracy limits that are a function of antenna beamwidth, rather than a specific fixed angular limit applied equally to all antennas regardless of size. By adopting an antenna pointing accuracy limit that is a function of antenna beamwidth, the Commission could promote the use of

spread spectrum technologies, while also maintaining protection from interference from mispointed antennas that use narrow bandwidths and relatively high power densities.

**B. The Power Density Limits for LMESs Should Permit Systems Using Spread Spectrum Modulation Techniques**

ViaSat generally supports General Dynamics' proposal to adopt the same off-axis EIRP emission limits applicable to ESVs for LMES systems.<sup>11</sup> However, ViaSat recommends that the Commission consider certain revisions to these proposed power density limits to accommodate LMES networks employing aggregate system power control. In LMES networks with a central control system, a network operator can control the power to all transmitters so that each transmitter uses the minimum power necessary to communicate with the satellite at the desired quality of service. To allow LMES operators to use the available network capacity in the most efficient manner, the power density limit for a single LMES terminal as applied to a network of LMES terminals employing this technology should account for variations in power density among transmitters in the network resulting from differences in LMES terminal design, data rates, satellite performance contours and spreading factors.

The current limits adopted for ESV networks do not address these issues. Specifically, the Commission should consider and seek comment on revising the  $10 \cdot \log(N)$  limit for individual LMES antennas because it is overly simplistic and assumes that the network is made up of homogeneous transmitters, each operating on the same channel, at the same data rate, with the same antenna size, transmitting in the same satellite performance contour, and at the same time. Such an approach would require an inefficient distribution of power among the terminals in the network and severely reduce the broadband traffic capacity of the LMES network as a whole.

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<sup>11</sup> Petition for Rulemaking at 11.

Moreover, the Commission should seek comment on the desirability of adopting in the LMES context the type of contention table that it proposed for VSATs in the Earth Station Licensing Sixth Report and Order.<sup>12</sup> Earth stations using spread spectrum technology with central control are designed to adjust aggregate power levels to take into account statistical variations in the off-axis EIRP density. The Commission thus should make its rules clear that such variations are anticipated and permitted in the LMES context.<sup>13</sup> Although the Commission proposed adopting the table in the VSAT context to deal with multiple access techniques, the contention table would also allow flexibility for LMES networks using dynamic power control mechanisms to exceed the limits for short periods as a result of other factors, such as antenna pointing and lags in dynamic power control.

#### **IV. THE COMMISSION SHOULD APPLY THE ESV DATA TRACKING REQUIREMENTS TO LMES SYSTEMS**

The Commission should propose a rule that applies the data tracking requirements of Section 25.222(c) of the Commission's rules to LMESs. ViaSat disagrees with General Dynamics' assertion that location logging requirements are unnecessary for LMES systems,<sup>14</sup> and instead generally supports a requirement that an operator track terminal locations to enforce interference protections. In the ESV context, the Commission requires Ku band ESV hub

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<sup>12</sup> *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 at ¶ 119 (rel. Mar. 15, 2005) (“Earth Station Licensing Sixth Report and Order”).

<sup>13</sup> See ViaSat, Inc. Comments, *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 at 22 (filed July 5, 2005) (ViaSat AMSS Comments”); ViaSat, Inc. Reply Comments, *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 at 13 (filed Aug. 3, 2005) (“ViaSat AMSS Reply Comments”).

<sup>14</sup> Petition for Rulemaking at 12-13.

operators to have the capability to track and maintain certain data, including terminal locations, for potential review in the event interference issues arise.<sup>15</sup> Tracking capabilities would serve the same purpose in the LMES context.<sup>16</sup> LMES operators should maintain their own tracking data and make available any information that is relevant to resolving specific instances of interference through a point of contact in the U.S.<sup>17</sup>

**V. THE COMMISSION SHOULD SEEK COMMENT ON PROPOSED RULES THAT WOULD ALLOW GREATER OFF-AXIS POWER DENSITY IN THE NGSO PLANE**

Commercial success and wide deployment of LMES service depend in part upon the ability to use small, low-profile antennas that can be mounted on standard cars and trucks. These antennas typically perform comparably to larger, circular antennas in the horizontal plane, and can adequately protect adjacent GSO satellites. However, these antennas are likely to emit at higher off-axis power density levels in the NGSO elevation plane (*i.e.*, North and South of the GSO arc). There are no commercial NGSO Ku-band systems in operation, and none are planned to be deployed in the foreseeable future. ViaSat urges the Commission to explore the trade-off between relaxing off-axis density limits in the NGSO plane and constraining the types, sizes and costs of antenna technology that can be used to provide LMES over today's in-orbit GSO spacecraft.

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<sup>15</sup> *Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, Report and Order, 20 FCC Rcd 674, ¶ 112 (rel. Jan. 6, 2005).

<sup>16</sup> See ViaSat AMSS Reply Comments at 19-21.

<sup>17</sup> Although ViaSat is in favor of a requirement to track terminal locations to enforce interference protections, ViaSat does not support a publicly accessible database containing tracked data or public disclosure of aircraft locations. Additionally, ViaSat does not support a requirement to track exact antenna pointing angles.

Indeed, without an increased allowance for off-axis power density in the NGSO elevation plane, LMES service and technology, which exists today, maybe unduly constrained in favor of NGSO systems that may never be deployed. Although LMES operators using low-profile antennas can reduce the input power density of these antennas to meet the proposed off-axis EIRP density limits in the elevation plane, constraining the input power density could severely limit the capacity of the individual antenna or conversely the aggregate network capacity. The Commission therefore should consider an amendment to the rules to allow greater off-axis power density in the elevation plane in order to allow low-profile terminals to be deployed. Such a rule amendment would provide the certainty necessary to allow LMES operators to use efficiently the bandwidth in the network and promote investment in broadband deployment for ground in-motion use.

## VI. CONCLUSION

For the foregoing reasons, ViaSat respectfully requests that the Commission grant the Petition for Rulemaking and initiate a proceeding to amend the table of frequency allocations for the Ku band to allow LMES operations and to adopt service rules and routine licensing procedures for LMES systems.

Respectfully submitted,

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August 21, 2006

**ENGINEERING INFORMATION CERTIFICATION**

I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.



*Daryl T. Hunter*

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Dated: August 21, 2006

**CERTIFICATE OF SERVICE**

I, Stefanie Alfonso-Frank, hereby certify that on this 21<sup>st</sup> day of August, 2006, served a true copy of the foregoing Comments of ViaSat, Inc. by first class mail, postage pre-paid upon the following:

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