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

In the Matter of	)	
	)	
L-3 Communications Titan Corporation	)	
	)	File No. SES-LIC-20070322-00396
Application for Authority to Operate a Mobile Earth Station to Provide Land Mobile Satellite Service in the Ku-Band	)	Call Sign: E060390
	)	
	)	
	)	

MEMORANDUM OPINION, ORDER AND AUTHORIZATION

Adopted: March 13, 2009 **Released: March 16, 2009**

By the Acting Chief, International Bureau and the Chief, Office of Engineering and Technology:

I. INTRODUCTION

1. By this Order, we grant L-3 Communications Titan Corporation (L-3 Communications) authority to operate one mobile earth station terminal to be mounted on a vehicle and used in the continental United States. L-3 Communications will provide Land Mobile Satellite Service (LMSS) using the standard Ku-band frequencies of 14.0-14.5 GHz (Earth-to-space) and 11.7-12.2 GHz (space-to-Earth), and will communicate with leased transponders on currently operating U.S.-licensed satellites to provide communications support for the United States Military.[1] Grant of this authorization will promote the innovative and flexible use of satellite communications technology in the United States.

II. BACKGROUND

A. Application

2. ***Description of System.*** L-3 Communications proposes to operate a single earth station to be mounted on a vehicle and operated while the vehicle is in motion.[2] The proposed earth station will transmit to one of several currently operating Ku-band satellites while on the move and communicate via a

[1] 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. § 2.1. 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.

[2] L-3 Communications Titan Corporation, File No. SES-LIC-20070322-00396 (L-3 Communications Application). L-3 Communications intends to file another application in the future to request blanket authority for operation of multiple devices of the same kind. L-3 Communications Application – Filing Notes at 1.

hub antenna located in the continental United States.[3] L-3 Communications terminal equipment has been developed for use by the U.S. military, although it states there are possible commercial uses, such as emergency vehicles, including ambulances and paramedic rescue vehicles. L-3 Communications states that to meet the size, weight, and communications performance objectives, an antenna size of less than one-meter will be used.[4] Due to the antenna's small size, L-3 Communications concedes that it does not comply with the antenna gain limits for routinely licensed earth stations specified in Section 25.209 of the Commission's rules.[5] L-3 Communications maintains, however, that its operation may still be licensed pursuant to Section 25.220 of the Commission's rules and will cause no more interference than an earth station antenna in compliance with Section 25.209.[6]

3. L-3 Communications also requests a waiver of Section 2.106, the U.S. Table of Frequency Allocations (U.S. Table), to permit the use of the 11.7-12.2 GHz frequency band for its downlink operations.[7] L-3 Communications represents that it will not interfere with other authorized Ku-band users, and that it will accept interference into its system from any such authorized user. [8]

4. ***Procedural History***. L-3 Communications's application was placed on public notice.[9] In response to the notice, ViaSat, Inc. (ViaSat) filed comments asking the Commission to request additional information regarding L-3 Communications's stated intent to file for a blanket license in the future.[10] In response, L-3 Communications states that its application is for a single earth station, and it would address multiple earth station networking issues in a future application for blanket authority.[11] Nonetheless, L-3 Communications states that it is willing to accept a condition in the requested single earth station license that would bar operation of the terminal within a network of similarly non-

[3] L-3 Communications states that its points of communication are the SES Americom satellites at 83° W.L. (Americom 9), at 79° W.L. (AMC-5), and at 85° W.L. (AMC-2), and the U.S. -licensed Intelsat satellites at 89° W.L. (IA-8) and 129° W.L. (1A-7). L-3 Communications Application at 3. We note, however, that SES Americom recently relocated its AMC-2 satellite to the 100.95° W.L. orbital location. *See* File No. SAT-MOD-20080124-00030 (grant stamped with conditions on May 19, 2008). If L-3 Communications wishes to communicate with this satellite, it must file an application to modify its license to add the AMC-2 satellite at the 100.95° W.L. orbital location as a new point of communication.

[4] L-3 Communications Application, Technical Brief at 5.

[5] L-3 Communications also requested a waiver of 47 C.F.R. § 25.209, which applies to fixed-earth stations. Because this rule is inapplicable to L-3 Communications's proposed mobile system, the waiver request is moot.

[6] 47 C.F.R. § 25.209. L-3 Communications Application, Technical Brief at 18.

[7] L-3 Communications Application, Attachment – Waiver Request. L-3 Communications also requested a waiver of 47 C.F.R. § 25.209, which applies to fixed-earth stations.

[8] *Id.*

[9] *Public Notice*, Satellite Communications Services, Report No. SES-00912 (March 28, 2007).

[10] L-3 Communications Application, Attachment - Filing Notes at 1.

[11] L-3 Communications Response to ViaSat, Inc. Comments, filed May 15, 2007 (L-3 Communications Response) at 2.

conforming terminals.[12]

5. ViaSat also requested that the record keeping requirements applicable to Earth Stations on Board Vessels (ESVs) be applied to L-3 Communications's operations.[13] L-3 Communications responds that the location and activities of a single earth station are not typically required by the Commission, but if such rules were adopted, then the mechanisms to ensure compliance would be added to its system.[14]

B. VMES Rule Making

6. On May 15, 2007, the Commission released a Notice of Proposed Rule Making inviting comment on proposed rules for the licensing and operation of Vehicle-Mounted Earth Stations (VMES) in the conventional and extended Ku-band frequencies (*VMES Notice*).[15] Specifically, the Commission sought comment on a proposal to allocate spectrum on a primary basis for use with VMES in the Fixed Satellite Service (FSS) in the Ku-band at 14.0-14.5 GHz (Earth-to-space) and at 11.7-12.2 GHz (space-to-Earth).[16] The Commission also proposed to adopt Ku-band VMES licensing and service rules modeled on the Commission's rules for Ku-band ESVs.[17] L-3 Communications's proposed operations are similar to the VMES operations that are the subject of the *VMES Notice.* However, L-3 Communications does not seek to operate on a primary basis in either the 11.7-12.2 GHz or 14.0-14.5 GHz bands. Thus, L-3 Communications's operations are addressed in this *Order* under existing regulatory requirements and precedent. In the event L-3 Communications seeks to operate pursuant to the modified regulatory framework under consideration in the VMES proceeding, it would need to apply for a license modification following any adoption of new or modified rules in that proceeding.

III. DISCUSSION

7. L-3 Communications proposes to operate its system as a Mobile Satellite Service (MSS) using an existing secondary MSS allocation in the 14.0-14.5 GHz frequency band and as non-conforming use in the 11.7-12.2 GHz band. As explained below, we grant L-3 Communications's

[12] L-3 Communications Response to Reply Comments of ViaSat, Inc. (June 12, 2007) (L-3 Communications Response to Reply) at 1.

[13] Pursuant to these record keeping requirements, ESV licensees must maintain, for a period of one year, records of the ship location, transmit frequency, channel bandwidth, and satellite used. 47 C.F.R. § 25.221(c)(1).

[14] L-3 Communications Response to Reply at 3.

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

[16] *VMES Notice*, 22 FCC Rcd at 9668 (para. 40) (proposing U.S. Table footnote stating VMES is an application of FSS in two bands and may be authorized to communicate with FSS space stations on a primary basis).

[17] *VMES Notice*, 22 FCC Rcd at 9650 (para. 2). Service rules for Ku-band ESVs were adopted by the Commission in 2005 and are codified at 47 C.F.R. § 25.222. *See* Procedures to Govern the Use of Satellite Earth Stations on 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 (2005) (*ESV Report and Order*).

application under the Commission's existing rules.

A. Space-to-Earth (11.7-12.2 GHz)

8. L-3 Communications proposes to receive digital data for its LMSS operations in the 11.7-12.2 GHz frequency band.[18] The 11.7-12.2 GHz frequency band is allocated domestically on a primary basis for FSS downlink transmission, including downlink transmission to ESVs.[19] It is also allocated on a secondary basis for grandfathered terrestrial radio stations.[20] This band, however, is not allocated – either domestically or internationally – for MSS.[21] Therefore, L-3 Communications requests a waiver of the U.S. Table to permit use of the 11.7-12.2 GHz frequency band on a non-interference, non-protected basis.[22] L-3 Communications states it will accept interference into its system from any authorized user of the band.[23]

9. The use of radiocommunication frequencies in the United States must be in accord with the U.S. Table contained in Section 2.106 of the Commission's rules.[24] The Commission will grant a waiver of the U.S. Table for non-conforming uses "when there is little potential interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from authorized services."[25] The Commission has also permitted spectrum allocated for FSS downlinks to be used for downlinks to mobile terminals "when a downlink transmission from a fixed-satellite appears identical regardless of whether it is being received by fixed or mobile terminals."[26]

10. We find that circumstances justify a waiver of the U.S. Table in this instance. Because L-3 Communications's earth station will communicate with existing FSS space stations, and its operations will not alter either the footprint or the power of downlink transmissions from these satellites, it will not

[18] L-3 Communications Application, Attachment – Waiver Request.

[19] *See* 47 C.F.R § 2.106, Footnotes NG145 and NG183, and Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands, *Report and Order*, IB Docket No. 02-10, 20 FCC Rcd 674, 706-07 (para. 79) (2005) (*ESV Order*).

[20] 47 C.F.R § 2.106, Footnote NG184.

[21] The Commission has proposed adding an allocation for aeronautical mobile satellite service (AMSS) downlinks in the 11.7-12.2 GHz band. Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service, *Notice of Proposed Rulemaking*, IB Docket No. 05-20, 20 FCC Rcd 2906, 2915 (para. 15) (2005).

[22] *See* 47 C.F.R § 2.102(a).

[23] L-3 Communications Application, Attachment – Waiver Request.

[24] 47 C.F.R. § 2.106. *See* 47 C.F.R. § 2.102(a) (stating that assignment of frequencies to radio stations shall be in accordance with the U.S. Table with certain enumerated exceptions).

[25] *See* Fugro-Chance, Inc., *Order and Authorization*, 10 FCC Rcd 2860 (Int'l Bur. 1995) (*Furgo-Chance Order*) (authorizing operations of receive-only mobile earth terminals in the 11.7-12.2 GHz band on a non-interference basis).

[26] *Fugro-Chance Order*, 10 FCC Rcd at 2860 (para.2).

cause interference to other licensed users of the band. Moreover, the Commission has previously permitted mobile earth stations to receive communications in the Ku-band assigned to FSS downlinks under similar circumstances.[27] Accordingly, we conclude that a waiver of Section 2.106 of the U.S. Table serves the public interest. However, such operations are on a non-interference basis to all other services - both primary and secondary - allocated to use the 11.7-12.2 GHz band. As agreed in its application, L-3 Communications must accept interference from any such services.

B. Earth-to-Space (14.0-14.5 GHz)

11. L-3 Communications proposes to use the 14.0-14.5 GHz frequency band for uplink transmissions. This band is allocated on a primary basis for non-Federal Government uplink operations in the FSS.[28] It also contains an allocation for MSS Earth-to-space communications on a secondary basis for non-Federal government use. Because L-3 Communications proposes to operate its earth terminal on a secondary basis in the 14.0-14.5 GHz band, we conclude that such use is consistent with the U.S. Table and grant authority for such operations subject to the conditions set forth below.

12. L-3 Communications must operate its Earth-to-space communications on a secondary basis in the 14.0-14.5 GHz band and must protect other services with allocations on a primary basis in this band and must coordinate with other services operating on a secondary basis. Other services in the band include (1) FSS networks – both in the GSO and non-geostationary satellite orbit (NGSO) – operating on a primary basis in the 14.0-14.5 GHz band, (2) space research services operating in the 14.0-14.5 GHz band on a secondary basis,[29] (3) Federal government terrestrial fixed and mobile stations operating on a secondary basis in the 14.4-14.5 GHz segment, (4) the radio astronomy service operating on a secondary basis in the 14.47-14.5 GHz band, and (5) grandfathered Non-Federal land mobile stations licensed on a secondary basis in the 14.2 – 14.4 GHz segment. We discuss each of these services below.

1. Protection of FSS in the 14.0-14.5 GHz Band

a. GSO FSS

13. *Non-Routine Licensing*. L-3 Communications's proposed system does not meet the Commission's technical criteria for two-degree spacing. The Commission routinely licenses Ku-band earth station facilities that meet its two-degree orbital spacing technical requirements set forth in Part 25 of the Commission's rules.[30] These technical requirements ensure that the earth stations' operations do

[27] Qualcomm, Inc., *Memorandum Opinion*, *Order and Authorization*, 4 FCC Rcd 1543, 1544 (paras. 10-12) (1989) (*Qualcomm Order*); RaySat Antenna Systems, LLC, Application to Operate 4000 In-Motion Mobile Satellite Antennas in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, *Order and Authorization*, 23 FCC Rcd 1985 (Int'l Bur. and OET, 2008) (petition for reconsideration or clarification pending).

[28] 47 C.F.R. § 2.106.

[29] The secondary space research allocation is limited in the U.S. Table to the 14.0-14.2 GHz band. 47 C.F.R. § 2.106. However, the Table of Frequency Allocations in Article 5 of the International Telecommunication Union Regulations includes a secondary space research allocation in the 14.2-14.3 GHz frequency band, and in the 14.4-14.47 (uplink) frequency band.

[30] 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, *Report and* (continued….)

not cause harmful interference to adjacent satellite systems.[31] In part, these technical rules consist of a minimum antenna diameter[32] and maximum power level limits which are set forth in Sections 25.209 and 25.212 of the Commission's rules.[33] L-3 Communications states that meeting size, weight, and communication performance objectives requires an antenna diameter of less than one meter. The antenna proposed by L-3 Communications is an elliptical antenna that has an effective equivalent diameter of a circular antenna measuring 0.36 meters. The antenna is non-compliant with the off-axis antenna-gain limits in Section 25.209 in the region from 1.0 to 7.0 degrees off axis from the direction of maximum gain, by as much as 6.9 dB. L-3 Communications contends, however, that by managing the transmitted power spectral density it can comply with the underlying objective of the off-axis gain limits.[34]

14. Although L-3 Communications's proposed system does not meet the criteria for routine licensing, it may still be authorized under the criteria of Section 25.220 of the Commission's rules, which govern the licensing of non-routine transmit/receive earth station operations that do not meet the criteria of Sections 25.209 and 25.212.[35] Pursuant to Section 25.220, an applicant can seek authorization for non-routine transmit/receive earth stations under one of two procedural options to demonstrate that it will not cause interference to satellites adjacent to the target satellites.[36] Section 25.220(c)(1) provides that a non-routine earth station may be authorized if the applicant proposes to limit the maximum power density of the signal input into the earth station's antenna to a certain level. This level is determined by reducing the maximum permissible input power density for a routinely-licensed station by the number of decibels that the non-compliant antenna exceeds the applicable gain limits in Section 25.209.[37]

(Continued from previous page)
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, *Memorandum Opinion and Order*, 99 FCC 2d 737 (1985). At that time, the Commission began assigning adjacent in-orbit satellites to orbital locations two degrees apart in longitude, rather than the three to four degrees longitude previously used.

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

[32] The antenna diameter is important because decreasing the antenna diameter produces wider main beams and higher side lobes. As a result, 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. *See VMES Notice*, 22 FCC Rcd at 9669 (para. 42) and n.88.

[33] 47 C.F.R. §§ 25.209 and 25.212.

[34] L-3 Communications Application, Attachment – Affidavit.

[35] 47 C.F.R. § 25.220. The provisions of Section 25.220 were adopted in 2005 as part of the Commission's space station reform proceeding. *See* 2000 Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing of, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations, *Fifth Report and Order in IB Docket No. 00-248, and Third Report and Order in CC Docket 86-496*, 20 FCC Rcd 5666 (2005) (*Fifth Report and Order*).

[36] *See Fifth Report and Order*, 20 FCC Rcd at 5669 (para. 3); 47 C.F.R. § 25.202(a)(2).

[37] Alternatively, Section 25.220(c)(2) provides that a non-routine Ku-band earth station that does not meet the input-power limit prescribed in Section 25.220(c)(1) may be authorized if the applicant files a statement from the operator of the target satellite certifying that it has coordinated the proposed operation of the non-routine earth station with (continued….)

15. We find that L-3 Communications antenna, if it were for fixed use, would satisfy the criteria of Section 25.220(c)(1). L-3 Communications represents that the power delivered to the LMSS terminal's antenna will be limited to the extent necessary to ensure that the power density of off-axis emissions radiated by the antenna will be no greater than a routinely-licensed earth station would generate.[38]

16. ***Pointing Accuracy***. Because the LMSS terminal is designed for operation on a vehicle, L-3 Communications proposes to incorporate additional safeguards to ensure that transmissions do not cause interference to GSO FSS systems while the vehicle is in motion. First, the antenna will be equipped with an automatic tracking system with a pointing accuracy of +/- 0.2 degrees or better.[39] The tracking system will automatically stop uplink transmission when the pointing error exceeds +/- 0.2 degrees. L-3 Communications reports that the antenna met or exceeded the pointing-accuracy objective while subjected to an extreme rugged terrain test course, asserting that the device will typically be subject to a substantially less severe environment and therefore the antenna pointing system will typically maintain pointing to tighter tolerances.[40] We are satisfied that the pointing accuracy of L-3 Communications's system, along with the other interference-limiting measures required by the terms of this authorization, are sufficient to protect adjacent GSO FSS satellites from interference.

b. NGSO FSS

17. In 2001, the Commission adopted rules that provide for the operation of NGSO FSS gateway and user terminal uplinks in the 14.0-14.5 GHz band as a primary service.[41] L-3 Communications has an obligation to protect NGSO FSS operations from interference from secondary-status LMSS operation in this band. Currently, however, there are no NGSO FSS stations authorized to operate in the Ku-band, and no pending applications for such systems.

18. If the Commission authorizes a Ku-band NGSO FSS system in the future, or if there is a lawfully operating system authorized by another administration, L-3 Communications must coordinate its operations with the NGSO FSS system and obtain an affidavit from the NGSO FSS licensee that L-3 Communications's proposed operations are acceptable. In the absence of such an affidavit, L-3 Communications's LMSS system must cease operation immediately upon the commencement of operation of the first satellite of the Ku-band NGSO FSS system, or demonstrate that it will not cause

(Continued from previous page)
the operators of all adjacent GSO satellites within six degrees of separation. L-3 Communications included in its application an affidavit from the operator of the satellites its system will be communicating with – SES Americom and Intelsat. Although the affidavit states that use of the non-conforming antenna will not cause unacceptable interference into adjacent satellites in accordance with the Commission's two degree spacing policy, it does not state whether there are GSO satellites six degrees from the target satellites, and if so, whether the proposed operations have been coordinated with these satellites.

[38] L-3 Communications Application, Attachment – Affidavit at 3.

[39] L-3 Communications Application, Technical Brief at 18.

[40] L-3 Communications Application, Technical Brief at 10.

[41] 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, *First Report and Order and Further Notice of Proposed Rulemaking*, ET Docket No. 98-206, 16 FCC Rcd 4096 (2000).

unacceptable interference to the new system.

2. Protection of Space Research in the 14.0-14.2 GHz Band

19. The 14.0-14.2 GHz portion of the Ku-band is domestically allocated for secondary status Federal government operation in the Space Research Service (SRS).[42] The National Aeronautics and Space Administration (NASA) currently operates several SRS Tracking and Data Relay Satellite System (TDRSS) stations. These stations, located in White Sands, New Mexico, and Guam, receive signals from GSO satellites in the 14.0-14.5 GHz segment of the SRS band. L-3 Communications states that it will not transmit within 125 km of White Sands, New Mexico to avoid interference with government operations in that area.[43] Because the L-3 Communications's LMSS terminal is authorized herein only for operation within the continental United States, its operations will not impact the TDRSS station in Guam. The National Telecommunications and Information Administration (NTIA) recently informed the Commission that a site in Blossom Point, Maryland has been selected for a new TDRSS earth station.[44] The new earth station is expected to have similar technical characteristics to that of the White Sands, New Mexico station, and NTIA expects the Blossom Point facility to become operational within the next three years.[45] As a condition of its authorization, L-3 Communications will be required to cease operations in the 14.0-14.2 GHz band within 125 km of the new earth station upon the commencement of TDRSS operations, unless and until an agreement for protection of the new TDRSS station is reached between L-3 Communications and NASA, and approved by the Commission and NTIA.

3. Protection of U.S. Government Fixed and Mobile Stations in the 14.4-14.5 GHz Band

20. 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.[46] 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.[47] 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).[48] Because the 14.4-14.5

[42] 47 C.F.R. § 2.106.

[43] L-3 Communications Application, Filing Notes at 1.

[44] Public Notice, International Bureau Announces New NASA TDRSS Earth Station Site, Report No. SPB-221, DA 07-4028 (released September 25, 2007) (*NASA Public Notice*).

[45] *NASA Public Notice*.

[46] *VMES Notice*, 22 FCC Rcd at 9667 (para. 35). *See also* 47 C.F.R. § 2.106.

[47] *VMES Notice*, 22 FCC Rcd at 9667 (para 36).

[48] *Id.*

GHz band is shared with the U.S. government, we have coordinated L-3 Communications's application with National Telecommunications and Information Administration (NTIA), which administers authorizations for federal stations. NTIA has stated no objections with L-3 Communications's proposed frequencies and operations.

4. Protection of Radio Astronomy in the 14.47-14.5 GHz Band

21. The National Science Foundation (NSF) supports radio-astronomy observation in the 14.47-14.5 GHz band at National Radio Astronomy Observatories in New Mexico and West Virginia. The use of the band for radio-astronomy observation at those sites is recognized in Footnote US203 to the U.S. Table of Allocations, which requires steps to be taken to minimize interference with such operations from terrestrial radio transmitters.[49] The NSF also supports radio-astronomy observation in the same band at various other sites in the continental United States, Hawaii, Puerto Rico, and the U.S. Virgin Islands.

22. L-3 Communications has not coordinated its operations with NSF. Consequently, we require L-3 Communications to refrain from operating in the 14.47-14.5 GHz band unless and until it enters into an agreement with NSF. L-3 Communications's authorization is conditioned on its adherence with the terms of the coordination agreement with NSF.[50] L-3 Communications must file a copy of the agreement with the Commission.

5. Protection of Non-Federal Land Mobile Stations in the 14.2-14.4 GHz Band

23. Prior to March 2, 2005, the Table of Allocations contained an allocation for mobile services in the 14.2-14.4 GHz band. These operations were authorized under Part 101, Subpart J of the Commission's Rules. Footnote 184 to the Table of Allocations provides that land mobile stations that were authorized prior to March 1, 2005 are allowed to continue operating on a secondary basis until their license expires. Our records indicate that there are approximately twenty-five licenses that authorize stations in the 14.2-14.4 GHz band. We also note, however, that these twenty-five licenses authorize operations in other bands as well, providing an alternative to operations in the 14.2-14.4 GHz band. Given the transient nature of any such operations, the limited number of such stations authorized in the band, and the fact that they are also authorized to operate in alternate bands, we believe that L-3 Communications's operation is unlikely to interfere with these grandfathered licenses.

6. Other Matters

a. Data Logging Requirements

24. As a condition of its authorization, L-3 Communications must maintain logs on the operation of its earth station terminal. ViaSat argues that record keeping requirements should apply to L-3 Communications's proposed operations in order to identify and correct interference issues, should they arise.[51] L-3 Communications's proposed operations are transitory in nature and will use bands where

[49] 47 C.F.R. § 2.106, Footnote US203.

[50] *See* RaySat Antenna Systems, LLC, Order and Authorization, *Order and Authorization*, 23 FCC Rcd 1985, 1998 (para. 31)(Int'l Bur. and OET 2008).

[51] ViaSat Comments at 3.

regularly licensed spectrum operators have equal or superior rights. Therefore, we agree with ViaSat that such recording keeping requirements will help identify and resolve any interference concerns raised by other operators. The Commission has imposed such record-keeping requirements on LMSS operations in the Ku-band in the past, and these requirements are part of the rules governing analogous ESV operations.[52] We also note that the Commission is considering similar record keeping requirements for VMES in the Ku-band.[53]

25. We will impose the data logging and point of contact requirements on L-3 Communications similar to those imposed on previous Ku-band LMSS and ESV licensees. Accordingly, L-3 Communications must maintain a point of contact within the United States with the authority and capability to mute its earth station, if necessary. L-3 Communications must submit a letter to be included in its license file with the name and telephone number of the contact prior to commencing operation. L-3 Communications must also maintain records of the location of its system in longitude and latitude; transmit frequency, channel bandwidth and satellite used. The location information must be recorded at time intervals no greater than every 20 minutes while the mobile earth station terminal is transmitting. L-3 Communications must maintain these records for one year and make them available to all appropriate entities within 24 hours of request. L-3 Communications must also maintain logs of all alleged incidences of interference and the outcome of the incident.

b. Network Operations

26. L-3 Communications states that the earth station will operate in conjunction with a hub station.[54] The mobile earth station cannot transmit until it receives the signaling channel from the hub station.[55] We note that L-3 Communications stated it "anticipate[s] filing for a blanket license in the future."[56] In response to ViaSat's comments that L-3 Communications has not demonstrated that the proposed terminal would not cause harmful interference to other operators if operated within a network of identical mobile terminals, L-3 Communications stated it would accept a condition precluding network operations until additional filings were submitted to the Commission.[57] Accordingly, we limit this authorization to cover a single terminal only. The interference potential of a network of non-conforming antennas may indeed be different from the operation of a single antenna, and this authorization is granted without prejudice to any future filing of L-3 Communications.

c. Radiation Hazard Requirements

27. The Commission has observed that the mounting of earth stations on vehicles may create

[52] *Qualcomm Order*, 4 FCC Rcd at 1546; *see* 47 C.F.R. § 25.222(c) and *ESV Order*, 20 FCC Rcd at 695 (para. 68).

[53] *VMES Notice*, 22 FCC Rcd at 9676 (para. 61).

[54] The hub station is located in San Diego, CA.

[55] L-3 Communications Application, Technical Brief at 5.

[56] L-3 Communications Application, Attachment - FCC Filing Notes.

[57] ViaSat Comments at 2; L-3 Communications Response at 1.

the possibility of human exposure to radiofrequency (RF) radiation.[58] L-3 Communications stresses that the antenna will be mounted on a military vehicle with high profiles. In addition, the antenna will have a 20° degree elevation transmit limit while the vehicle is stopped and a 10° elevation angle while the vehicle is in motion.[59] Nonetheless the radiation analysis report that L-3 Communications filed in support of its application states that personnel entering and exiting the vehicle are within the power of the main beam and lower adjacent sidelobes of the antenna.[60] The report recommends that the antenna and its housing be marked with standard radiation hazard warnings which include the area in the vicinity of the earth station during testing to inform persons present or in close proximity of the antenna. It also recommends visual inspections of the area around the vehicle to ensure personnel are either below the antenna base or removed from the station area during operations. When the vehicle is not in motion, a temporary fence is recommended if personnel could be above the level of the base of the antenna.[61]

28. We expect that trained military personnel and other personnel of state or U.S. Government agencies will impose these restrictions and take reasonable steps to avoid accidental RF exposure from the mobile earth station's operations. Accordingly, we condition this authorization to require that a label or labels be permanently placed on the earth station terminal and its housing, warning about the radiation hazard and including a diagram showing the regions around the earth station where the levels could exceed 1.0 mW/cm^2. Individuals will need to be prevented from straying within this region by means of signs, caution tape, verbal warnings, placement of the earth station or other appropriate means so as to minimize access to the hazardous region. As a precaution, we also require L-3 Communications to implement a feature that will mute the transmitter on loss of the downlink signal, and will not enable the transmit signal until the downlink signal is received and the operator is able to verify that the antenna is properly pointed at the target satellite and the link is unobstructed.[62] This will prevent exposure to high levels of RF radiation in event a person inadvertently enters the path of the antenna main beam. Because the limit of 0.1 mW/cm^2 can be tolerated for several minutes, the transmitter muting must occur within 3 seconds of the loss of downlink signal. This enabling feature must also be employed at the time the antenna is powered on.

IV. CONCLUSION

29. We conclude that L-3 Communications's application may be granted under existing Commission rules and policies for the licensing of non-routine earth stations. Accordingly, we grant L-3 Communications authority to operate a single land mobile earth station to be mounted on a vehicle and operated in the continental United States, subject to the conditions specified herein.

V. ORDERING CLAUSES

30. Accordingly, it is ordered, that the Application of L-3 Communications Titan

[58] *VMES Notice*, 22 FCC Rcd at 9680 (para.70)

[59] L-3 Communications Application, Exhibit A at 8.

[60] L-3 Communications Application, Exhibit A at 7.

[61] L-3 Communications Application, Exhibit A at 13.

[62] This requirement is similar to a precaution that other recent LMSS applicants have included in their applications. *See*, *e.g.*, RaySat Antenna Systems, LLC, File No. SES-AMD-20070620-00839 at 6-7.

Corporation, File No. SES-LIC-20070322-00396, is GRANTED and L-3 Communications Titan Corporation is authorized to operate one land mobile earth station, to be mounted on a vehicle and used in the continental United States, according to the terms in its application, the Commission's rules, and the conditions set forth below.

a) The L-3 Communications Titan Corporation earth station authorized herein is limited to communications with the following satellites specified in the above-captioned application: SES Americom satellites - AMC-5 at 79° W.L. and AMC 9 at 83° W.L., and Intelsat satellites - IA-8 at 89° W.L., and IA-7 at 129° W.L. L-3 Communications must seek Commission approval to modify its authorization in the event any of the satellites changes orbit location, or if L-3 Communications Titan Corporation seeks to add other satellites as a point of communication.

b) L-3 Communications Titan Corporation's earth station must accept interference from the lawful operation of any station in the 11.7-12.2 GHz band in accordance with the U.S. Table of Frequency Allocations (47 C.F.R. § 2.106) and shall immediately terminate space-to-Earth operations upon notification that such operations are causing harmful interference, not permitted under the terms of the pertinent coordination agreement, with lawful operation of any radio system in the 11.7-12.2 GHz band in conformance with the U.S. Table of Frequency Allocations.

c) L-3 Communications must coordinate its operations with any lawfully operating Ku-band NGSO FSS system, and obtain an affidavit from the Ku-band NGSO FSS system that L-3 Communications's operations are acceptable. In the absence of such an affidavit, L-3 Communications's system must cease service immediately upon launch and operation of the first satellite of the Ku-band NGSO FSS system, or demonstrate that it will not cause harmful interference to the new NGSO FSS system. Failure to make such a demonstration may subject L-3 Communications to further conditions by the Commission designed to address potential harmful interference.

d) The operation of L-3 Communications's mobile earth station shall immediately terminate upon notification that its operation is causing harmful interference with 1) the lawful operation of any radio system in the 14.0-14.5 GHz band authorized on a primary basis in conformance with the U.S. Table of Frequency Allocations or authorized on a secondary basis prior to the effective date of this Order, or 2) the operation of any TDRSS earth station in the 14 -14.2 GHz band, or 3) radio astronomy observations in the 14.47-14.5 GHz band.

e) L-3 Communications must specify a person as a point of contact for discussing interference concerns with other licensees or U.S. Government agencies and must submit, within 30 days of the release of this authorization, a letter to the Commission to be included in its license file with the name and telephone number(s) of the contact.

f) L-3 Communications must maintain records of the location of its mobile earth station in longitude and latitude; transmit frequency, channel bandwidth, and satellite used for a period of not less than one year. Records will be recorded at time intervals no greater than every 20 minutes while the mobile earth station is transmitting. The

earth station operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, NTIA, or the Commission within 24 hours of the request. L-3 Communications must also maintain logs of all alleged incidences of interference, the stations involved, and the outcome of the incident.

g) L-3 Communications's mobile earth station must be able to receive "enable transmission" and "disable transmission" commands from the network control center and must cease transmission immediately after receiving any "parameter change" command until it receives an "enable transmission" command from the network control center. The network control center will monitor operation of the L-3 Communications's mobile earth station to determine if it is malfunctioning, and the L-3 Communications's mobile earth station will self-monitor and automatically cease transmission upon detecting an operational fault that could cause harmful interference to the fixed-satellite service network.

h) L-3 Communications's operation in the 11.7-12.2 GHz and 14.0-14.5 GHz band shall be in accordance with the space station authorization for the satellites with which L-3 Communications's mobile earth station will communicate.

i) L-3 Communications shall not operate in the 14.47-14.5 GHz band unless and until L-3 Communications enters into an agreement with the National Science Foundation. L-3 Communications must conform its operations to the terms of any coordination agreement with the National Science Foundation and must file a copy of the agreement with the Commission within 30 days of execution.

j) L-3 Communications must cease operations in the 14.0-14.2 GHz band within 125 km of White Sands, New Mexico and within 125 km of the new earth station in Blossom Point, Maryland once it commences TDRSS operations, unless and until an agreement is reached between L-3 Communications and NASA, and approved by the Commission and NTIA.

k) The LMSS terminal authorized herein may not be operated within a network of similarly non-conforming terminals without further authorization from the Commission.

l) L-3 Communications shall take all reasonable and customary measures to ensure that the mobile earth station does not create a potential for harmful non-ionizing radiation to persons who may be in the vicinity of the earth station when it is in operation. At a minimum, permanent warning labels shall be fixed to the earth station and its housing warning of the radiation hazard and including a diagram showing the regions around the earth station where radiation levels could exceed 1.0mW/cm^2. The earth station operator shall be responsible for assuring that individuals do not stray into the regions around the earth station where there is a potential for exceeding the maximum permissible exposure limits required by 47 C.F.R. § 1.1310. This shall be accomplished by means of signs, caution tape, verbal warnings, placement of the earth station so as to minimize access to the hazardous region, and/or other appropriate means, including muting the transmitter upon loss of the downlink signal and an enabling feature that only permits transmissions after the downlink signal is

received, the operator is able to verify that the antenna is properly pointed at the target satellite, and the link is unobstructed.

31. It is FURTHER ORDERED, that 47 C.F.R. § 2.102 is WAIVED with respect to L-3 Communications's operation of its mobile earth station in the 11.7-12.2 GHz downlink band, consistent with the terms of this authorization.

32. It is FURTHER ORDERED, that L-3 Communications may decline this authorization as conditioned within 30 days from the release date of this Order and Authorization. Failure to decline within this period will constitute formal acceptance of the authorization as conditioned.

33. This Order and Authorization is issued on delegated authority pursuant to Sections 0.241 and 0.261 of the Commission's rules, 47 C.F.R. §§ 0.241 and 0.261, and is effective upon release.

FEDERAL COMMUNICATIONS COMMISSION

John V. Guisti
Acting Chief,
International Bureau

Julius Knapp
Chief,
Office of Engineering and Technology