

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

In the Matter of

RAYSAT ANTENNA SYSTEMS, LLC

Application for Authority to Operate 400 Land Mobile-Satellite Service ("LMSS") Earth Stations in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands

)	IBFS File Nos:	SES-LIC-20060629-01083;
)		SES-LIC-20060629-02248;
)		SES-LIC-20060629-02249;
)		SES-LIC-20060629-02250;
)		SES-LIC-20060629-02251;
)		SES-LIC-20060629-02252;
)		SES-AMD-20070620-00839

)	Call Signs:	E060101; E060447;
)		E060448; E060449;
)		E060450; E060451

ORDER AND AUTHORIZATION

Adopted: February 15, 2008

Released: February 15, 2008

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

I. INTRODUCTION

1. By this Order, we grant Raysat Antenna Systems, LLC (Raysat) authority to operate up to four hundred technically identical mobile earth terminals (METs) that will be mounted on vehicles and used while in motion throughout the continental United States.¹ These METs will provide Land Mobile-Satellite Service (LMSS), using the standard Ku-band frequency ranges of 14.0-14.5 GHz (Earth-to-space) and 11.7-12.2 GHz (space-to-Earth), and will communicate with Fixed-Satellite Service (FSS) satellites in geostationary satellite orbit (GSO).² The Raysat METs will provide data communications to end users in vehicles, including emergency responder and military vehicles, trucks, cars, trains, and other in-motion platforms. Grant of this authorization will enhance competition in an important sector of the mobile telecommunications market in the United States.

¹ As discussed below in Part III.C.1, we are licensing the earth stations as six separate earth station call signs due to the manner in which Raysat has proposed to operate its network.

² 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 specific areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the FSS also may include feeder links for other space radio-communication services. See 47 C.F.R. § 2.1.

II. BACKGROUND

A. Application and Amendment

2. Raysat's application originally sought authority to operate a Ku-band mobile satellite network consisting of up to four thousand in-motion METs to be mounted on vehicles operating throughout the United States.³ Raysat subsequently amended this application on June 20, 2007, to reduce the requested number of remote METs from 4000 to 400 and to provide additional information with respect to certain operational characteristics of its proposed network.⁴

3. *Description of System.* Raysat's proposed network will offer two-way communication data capabilities to moving vehicles, including high-speed Internet access, Voice over Internet Protocol (VoIP), access to government and corporate intranets, virtual private networks, streaming video and audio, file sharing, and other services.⁵ Raysat anticipates that the greatest demand for its proposed network will come from local, state, and federal government agencies.⁶ Raysat also expects demand from commercial enterprise customers.⁷

4. The space segment of Raysat's network will use FSS space stations and associated hub earth station facilities that the Commission has already authorized to provide FSS in the United States.⁸ In order to permit both transmission and reception while the METs are in motion, the proposed network utilizes a phased array antenna developed by Raysat that is mounted on the tops of vehicles.⁹ Each MET consists of an outdoor antenna unit, an indoor controller, and a satellite communication modem.¹⁰

5. According to Raysat, its system employs antenna pointing systems to ensure that antennas will transmit only when correctly pointed towards the intended satellite. Raysat has designed its METs to use Global Positioning System (GPS) signals to determine each MET's location and calculate the pointing direction to the target satellite.¹¹ The METs are designed to employ a three-axis gyroscope as

³ 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, IBFS File No. SES-LIC-20060629-01083 (Application). The Raysat application was originally filed on June 29, 2006, by an affiliated company, Raysat, Inc. Raysat, Inc. is a developer and manufacturer of phased array antennas for use in satellite communications and is one of four members of the Raysat limited liability corporation. *Id.* at 3.

⁴ Raysat Antenna Systems, LLC, Application for Authority to Operate 400 Land Mobile-Satellite Service ("LMSS") Earth Stations in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, IBFS File No. SES-AMD-20070620-00839 (Amendment).

⁵ Application at 4. Raysat estimates that the forward channel of its proposed service will offer speeds of 1 to 14 megabits per second (Mbps), with a return channel of 128 to 512 kilobits per second (kbps). *Id.*

⁶ Application at 4-5.

⁷ Application at 5. Because of the size and cost of the antenna and the cost of the service, Raysat does not view this service as a consumer product. *Id.* at 3.

⁸ Application at 2. The proposed FSS space stations are as follows: Intelsat-Americas 7 at 129° W.L.; Intelsat-Americas 8 at 89° W.L.; AMC-4 at 101° W.L.; AMC-5 at 79° W.L.; AMC-6 at 72° W.L.; SBS-6 at 74° W.L.; and Horizons-1 at 127° W.L. *Id.* The proposed earth station hubs are in the following locations: (1) McLean, VA (Call Sign E860326); (2) Hagerstown, MD (Call Signs E040140, E040141, E04014, E040475); (3) Silver Spring, MD (Call Sign KA416); (4) Englewood, CO (Call Sign E950149); (5) Woodbine, MD (Call Sign E920698); and (6) Charlotte, NC (Call Sign E050007). *Id.*

⁹ Application at 2.

¹⁰ Application at 6.

¹¹ Application at 6.

well as receive power measurements to maintain the antenna pointing to within close tolerances.¹² Raysat also indicates that each MET automatically searches for and acquires the target satellite and maintains pointing accuracy by means of automatic control of the azimuth, elevation, and polarization angles while the antenna is in motion.¹³ According to Raysat, the received signal from the target satellite is constantly sampled, and if the received power exceeds a specific level, the MET will track that satellite signal.¹⁴ Raysat indicates that the MET will transmit only if there is a signal lock, *i.e.*, the MET verifies the radiofrequency characteristics of the received signal, network identification, and other parameters. When signal lock is lost, the MET stops transmitting and searches for a new downlink signal, and, according to Raysat, until the MET finds the correct downlink signal and is properly pointed, it is not permitted to transmit.¹⁵

6. The Raysat system also incorporates automatic muting capabilities designed to protect adjacent satellites from interference in case of pointing errors. Specifically, in the event a MET mechanically mispoints by more than 0.5 degrees, it will mute the transmit carrier.¹⁶ Such muting will occur in less than 100 milliseconds (ms).¹⁷ In addition, if the downlink signal from the satellite is lost for any reason, the MET will sense this loss of signal and will mute transmissions.¹⁸ Once muted, the MET may not re-commence transmissions until the pointing error is corrected, or the intended satellite receive signal is re-acquired.¹⁹ Raysat has been testing its system since August 2005 under an experimental license pursuant to Part 5 of the Commission's rules.²⁰

7. *Procedural History.* Raysat's application was placed on public notice on July 5, 2006.²¹ Parsons Transportation Group Inc. filed comments in support of the application.²² ViaSat, Inc. (ViaSat) filed comments requesting that the Commission not grant Raysat's application unless Raysat corrects alleged technical deficiencies in its application and resolves potential interference issues identified by ViaSat.²³ Raysat's amendment was subsequently placed on public notice on June 27, 2007. No comments were filed in response.²⁴

B. VMES Rule Making

8. 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)

¹² Application at 6.

¹³ The initial acquisition time is less than 60 seconds, and the antenna is capable of tracking through the horizontal plane at tracking speed of 60 degrees per second. Application at 5-6.

¹⁴ Amendment at 7.

¹⁵ Amendment at 7.

¹⁶ Application at 6.

¹⁷ Amendment at 8.

¹⁸ Amendment at 8. This muting will be accomplished in less than 100 milliseconds. *Id.*

¹⁹ Amendment at 8.

²⁰ File Number 0135-EX-ML-2005, Call Sign WD2XTB (granted Jan. 23, 2006).

²¹ Report No. SES-00834, Satellite Radio Applications Accepted for Filing (July 5, 2006).

²² Comments of Parsons Transportation Group Inc. (filed Aug. 4, 2006) (Parsons Comments).

²³ Comments of ViaSat, Inc. (filed Aug. 4, 2006) (ViaSat Comments). Raysat replied to ViaSat's comments. See Reply of Raysat, Inc. (filed Aug. 17, 2006) (Raysat Reply). ViaSat responded to Raysat's reply comments. See Response of ViaSat, Inc. (filed Aug. 29, 2006) (ViaSat Response).

²⁴ Report No. SES-00939, Satellite Radio Applications Accepted for Filing (June 27, 2007).

as an application of the FSS in the conventional and extended Ku-band frequencies (*VMES Notice*).²⁵ Specifically, the Commission sought comment on a proposal to allocate spectrum for use with VMES in the FSS in the Ku-band at 14.0-14.5 GHz (Earth-to-space) on a co-primary basis and at 11.7-12.2 GHz (space-to-Earth). The Commission also proposed to adopt Ku-band VMES licensing and service rules modeled on the Commission's rules for Ku-band Earth Stations on Vessels (ESVs).²⁶ Raysat's proposed operations are similar to the VMES operations that are the subject of the *VMES Notice*, although, unlike the operations under discussion in the VMES proceeding, Raysat 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, Raysat's operations are addressed in this *Order* under existing regulatory requirements and precedent. In the event Raysat 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

9. Raysat 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 a non-conforming use in the 11.7-12.2 GHz band. As explained below, we grant Raysat's application under the Commission's existing rules.

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

10. Raysat proposes to receive communications in the 11.7-12.2 GHz band from GSO FSS space stations to METs. The 11.7-12.2 GHz band is allocated to the FSS for downlink operations on a primary basis.²⁷ It is also allocated on secondary basis for operation of grandfathered terrestrial radio stations.²⁸ As Raysat recognizes, this band contains no allocation – either domestically or internationally – for MSS.²⁹ Thus, Raysat requests a waiver of U.S. Table of Frequency Allocations (Table of Allocations) to permit the use of the 11.7-12.2 GHz frequency band for downlinks to its mobile-satellite network.³⁰

11. The use of the radiocommunication frequencies in the United States must accord with the Table of Allocations contained in Section 2.106 of the Commission's rules.³¹ The Commission will grant a waiver of the Table of Allocations for non-conforming uses "when there is little potential interference into any service authorized under the Table of Allocations and when the non-conforming operator accepts any interference from authorized services."³² In particular, the Commission has permitted METs to

²⁵ 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*).

²⁶ See *id.* at ¶ 2. Service rules for 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*).

²⁷ 47 C.F.R. § 2.106.

²⁸ 47 C.F.R. § 2.106, Footnote NG184.

²⁹ Application at 15.

³⁰ Application at 15.

³¹ See 47 C.F.R. §2.102(a).

³² Application at 15, citing Fugro-Chance, Inc., *Order and Authorization*, 10 FCC Rcd 2860 (Int'l Bur. 1995) (authorizing operations of receive-only mobile earth terminals in the 11.7-12.2 GHz band on a non-interference basis).

receive in spectrum assigned to FSS downlinks “when a downlink transmission from a fixed-satellite appears identical regardless of whether it is being received by fixed or mobile terminals.”³³

12. We find that circumstances justify a waiver of the Table of Allocations in this instance. Because Raysat’s METs will communicate with existing FSS space stations and will not alter either the footprint or the power of downlink transmissions from these satellites, Raysat’s proposed operations will not cause interference to other licensed users of the band. In similar circumstances, the Commission has previously permitted METs to receive communications in Ku-band spectrum assigned for FSS space-to-Earth communications.³⁴ Accordingly, we conclude that a waiver of Section 2.106 of the Table of Allocations serves the public interest. Raysat is permitted to receive FSS, however, in the 11.7-12.2 GHz band on a non-conforming basis with respect to the Table of Allocations, solely on a non-interference basis to all primary and secondary services allocated to use the band. Raysat must also accept interference from any of these services. Raysat states in its application that it would accept such conditions.³⁵

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

13. Raysat’s METs will transmit in the 14.0-14.5 GHz frequency band. This band is allocated on a primary basis for non-Federal FSS Earth-to-space communications.³⁶ It also contains an allocation for MSS Earth-to-space communications on a secondary basis for non-Federal government use.³⁷ Because Raysat proposes to operate its METs on a secondary basis in the 14.0-14.5 GHz band, we conclude that such use is consistent with the Table of Allocations and grant authority for such operations, subject to the conditions set forth in the paragraphs below.

14. Raysat must operate its MSS 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,³⁸ (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.

³³ *Id.*

³⁴ See, e.g., Qualcomm, Inc., *Memorandum Opinion, Order, and Authorization*, 4 FCC Rcd 1543, 1544 (1989) (*Qualcomm*) (authorizing space-to-Earth transmissions to up to 12,400 land mobile earth terminals in the 11.7-12.2 GHz frequency band on a non-interference basis).

³⁵ Application at 15.

³⁶ 47 C.F.R. § 2.106.

³⁷ *Id.* Systems operating under a secondary allocation must not interfere with, and must accept interference from, systems operating with primary status. Secondary services can, however, claim protection from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date. 47 C.F.R. §§ 2.104(d); 2.105(c).

³⁸ The secondary space research allocation is limited in the U.S. Table of Allocations to the 14.0-14.2. 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.

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

a. GSO FSS

15. *Non-routine Licensing.* Raysat's proposed system does not meet the Commission's technical requirements for routine licensing. 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.³⁹ These technical requirements ensure that the earth stations' operations do not cause harmful interference to adjacent satellite systems.⁴⁰ In part, these technical rules consist of a minimum antenna diameter⁴¹ and maximum power level limits, which are set forth in Sections 25.209 and 25.212 of the Commission's rules.⁴² Raysat acknowledges that, under the worst-case operating conditions, its METs do not comply with the off-axis gain limits of Section 25.209.⁴³ Specifically, Raysat states that the antenna pattern of its METs does not comply with the limits of Section 25.209 between 1.25 and 3.0 degrees, between 5 and 6 degrees, at 9 degrees, and at 15 degrees.⁴⁴ The worst case difference is 2.4 decibels (dB) at 2.25 degrees.⁴⁵

16. Although Raysat's proposed system is not eligible for routine licensing, it may still be authorized under the provisions of Section 25.220 of the Commission's rules, which govern the licensing of non-routine transmit/receive earth station operations that do not conform to Sections 25.209 and 25.212.⁴⁶ 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

³⁹ 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 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 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.

⁴⁰ *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).

⁴¹ The antenna diameter is important because it affects the antenna gain. 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 ¶ 42 and n.88.

⁴² 47 C.F.R. §§ 25.209 and 25.212.

⁴³ *See* Application at 13. 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." *See VMES Notice*, 22 FCC Rcd at 9669 n.88.

⁴⁴ Application at 13.

⁴⁵ Application at 13.

⁴⁶ 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*).

satellites adjacent to the target satellites.⁴⁷ 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. 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 the operators of all adjacent GSO satellites within six degrees of separation.

17. We find that Raysat has satisfied the procedural options of both Section 25.220(c)(1) and (c)(2). First, Raysat confirms that it has reduced the power density of its system pursuant to Section 25.220(c)(1) so that it appears to be a routine earth station from the perspective of adjacent satellites.⁴⁸ Second, as part of its application Raysat submitted letters from the target satellite operators, as set forth by Section 25.220(c)(2), which certify that the operators have coordinated Raysat's proposed operations with the operators of satellites within six degrees of the intended satellite.⁴⁹ We find that these factors are sufficient to protect currently-deployed GSO FSS space stations from interference from Raysat's proposed operations.

18. In the event, however, that another lawfully operating co-frequency FSS satellite commences operation at a location within six degrees of the target satellites in the future, Raysat must reduce aggregate off-axis radiation from its METs to levels one dB below the routine-processing envelope, pending demonstration of coordination with the operator of the new satellite. Such a reduction in power is reasonable during any period of time when Raysat's operations have not been coordinated and will minimize the possibility of unacceptable interference to new FSS satellites.

19. **Pointing Accuracy, Operational Characteristics, and Link Margins.** ViaSat questions whether the pointing accuracy of Raysat's METs is sufficient to prevent interference to adjacent satellites, because Raysat proposes to operate its system using a single channel per carrier (SCPC) modem that transmits at relatively narrow bandwidths at high power densities compared to a spread-spectrum modem.⁵⁰ Thus, ViaSat contends, minor shifts in antenna pointing would emit high power densities in the direction of victim satellites. Although Raysat designed its system to mute transmissions when a MET mispoints by more than 0.5 degrees,⁵¹ ViaSat observes that Raysat's METs have a pointing error standard deviation of 0.35 degrees, which ViaSat claims will not support viable service in real-world conditions because such deviation would result in the MET not being operational 15 percent of the time.⁵² We are satisfied that the pointing accuracy of Raysat's system, in conjunction with the other protections for GSO FSS operators described in this *Order and Authorization*, is sufficient to protect adjacent GSO FSS satellites from interference. Although ViaSat is correct that SCPC systems have higher power density per bandwidth than spread spectrum systems, Raysat has reduced the power density of its system under

⁴⁷ See *Fifth Report and Order* at 5669 ¶ 3; 47 C.F.R. § 25.202(a)(2).

⁴⁸ Application at 13 (stating that the RF flange power density of the Raysat system will be -18.1 dBW/4 KHz, which is more than 4 dB below the input power-density limit of -14 dBW/4KHz specified in Section 25.212(c)). The minimum margin at any off-axis angle is 1.64 dB. See Application at 17.

⁴⁹ See Application at Exhibit 1.

⁵⁰ ViaSat Comments at 4.

⁵¹ See *supra*, para. 6.

⁵² ViaSat Comments at 5. Raysat also presents calculations to counter ViaSat's assertion that its METs will not be operational 15 percent of the time. Raysat Reply Comments at 8. Under Raysat's calculations, the outage will be less than 0.4 percent of the time. *Id.*

Section 25.220(c)(1), so that a Raysat MET appears to be a routine earth station from the perspective of adjacent satellites.⁵³ As long as an applicant demonstrates successfully that its MET meets the Commission's two-degree spacing requirements, we will not dictate whether a system uses SCPC or spread spectrum technology, nor decline to authorize the system based upon claimed performance deficiencies.⁵⁴

20. In addition, ViaSat claims that Raysat fails to demonstrate that its METs can achieve a positive link margin from the MET to the hub earth station using the power density level at which Raysat proposes to operate, even under ideal circumstances.⁵⁵ Raysat submitted an analysis disputing ViaSat's claim.⁵⁶ We have reviewed the link budget information supplied by Raysat and are satisfied that a positive link margin can be achieved for one of the two emissions requested, the 518KGTW emission.⁵⁷

21. Raysat's application, however, also seeks to operate a higher data rate emission (2M07G7W) at an equivalent isotropically radiated power (EIRP) density of 6 dB less than its 518KGTW emission. Raysat did not supply a link budget analysis for this emission, and we share ViaSat's concern that Raysat may not be able to achieve either a positive link margin or the required bit error rate without increasing the EIRP at the MET.⁵⁸ Without further information we cannot evaluate Raysat's proposed use of this emission designator. Accordingly, we dismiss, without prejudice, Raysat's proposed use of the 2M07G7W emission designator.

22. Central Network Management. ViaSat also expresses concern that Raysat's proposed use of an unspread signal will increase the risk of interference to GSO FSS systems without central network

⁵³ See *supra*, para. 17. We also note that Raysat has obtained certification from adjacent satellite operators stating that they do not oppose its proposed operations. *Id.*

⁵⁴ We note that we have authorized Raysat's network based on the information that it has provided for a non-spread spectrum system. See Amendment at 10 (stating that "[Raysat] network uses only FDMA and TDMA transmission schemes"). Raysat acknowledges that it must obtain prior Commission approval, through a modification application, before it can use spread spectrum multiple access schemes, such as code division multiple access (CDMA). See Amendment at 5.

⁵⁵ ViaSat Comments at 6.

⁵⁶ Raysat Reply at 9-10. In its application, Raysat states its system will operate using 1/3 forward error correcting codes (FEC), but its demonstration is based on a slightly lower rate of 5/16 FEC. We are not concerned about this minor difference because Raysat has demonstrated that it can achieve the required positive link margin, and we expect that the FEC technique and rate that Raysat chooses in its final system implementation will not affect the emission designator that Raysat has submitted in its application.

⁵⁷ Raysat has demonstrated that it can achieve a link margin of 1.7 dB using a power spectral density of -18.1 dBW/4 kHz at the antenna flange for its 518KGTW emission. Emission designators describe the emission, modulation, and transmission characteristics of the signal employed and are codified in Section 2.201 of the Commission's rules. See 47 C.F.R. § 2.201. Emissions are designated according to their classification and necessary bandwidth, and a minimum of three symbols are used to describe the characteristics of a signal: the first symbol shows the type of modulation; the second, the nature of the signal(s) modulating the main carrier; the third, the type of information to be transmitted. See *id.* Accordingly, an emission with the designator 518KGTW is phase modulated (G) with two or more channels containing quantized or digital information (7) transmitting a combination of different types of information (W). See *id.* The prefix "518K" indicates that the bandwidth of the emission is 518 kilohertz. See 47 C.F.R. § 2.202(b)(2).

⁵⁸ In order to achieve a non-negative link margin for the 2M07G7W emission, using the same FEC technique and rate that it uses for its 518KGTW emission, Raysat would need to use a power spectral density of at least -19.8 (= -18.1 - 1.7) dBW/4 kHz at the antenna flange, resulting in a higher EIRP out of the earth station antenna. Raysat, however indicates it would use a power spectral density of -24.1 dBW/4 kHz, which is 4.3 dB too low to achieve a non-negative link margin, assuming the same FEC characteristics are used for the two emission types. Raysat states it intends to use.

management.⁵⁹ ViaSat argues that lack of central network management allows each antenna user to adjust the power and bandwidth usage of the antenna, which could lead to aggregate power levels in excess of the off-axis EIRP density mask set defined by Sections 25.209 and 25.134 of the rules and result in interference to adjacent GSO FSS satellites.⁶⁰ We find that Raysat's application, as amended, adequately addresses this concern. In its amendment, Raysat explains that each MET will operate through a single hub earth station manned by qualified personnel that, subject to Raysat's direction, will ensure that the MET operates in accordance with Raysat's license.⁶¹ Raysat states that it will assign each individual MET to a particular hub and satellite, and that METs are not able to switch from one hub station or satellite to another on their own.⁶² For this reason, we have authorized Raysat's system as six separate earth station licenses. Thus, there will be central control over all METs associated with a particular hub.⁶³

23. In sum, we conclude that we can license Raysat's METs under our existing rules for non-routine earth stations. Specifically, Raysat has obtained certifications from adjacent GSO FSS operators that they do not object to Raysat's proposed operations. In addition, Raysat's reduction in transmitter power, combined with the antenna accuracy and muting capabilities of its system, will help minimize the risk of interference to adjacent GSO FSS networks. Should interference in fact result to GSO FSS networks from Raysat's operations, it is incumbent upon Raysat to immediately cease transmissions from the interfering MET in order to terminate the interference.

b. NGSO FSS

24. In 2001, the Commission permitted NGSO FSS gateway and user terminal uplinks to operate in the 14.0-14.5 GHz band as a primary service.⁶⁴ Thus, Raysat's MSS network – as a secondary service in this band – has an obligation to protect NGSO FSS operations from interference. We observe, however, that there are no authorized Ku-band NGSO FSS systems and no pending applications for such systems.⁶⁵

25. Raysat states that the antenna radiation pattern of its METs will not meet the off-axis EIRP limitations of Section 25.209(a)(2) for regions not in the plane of the geostationary arc, *i.e.*, the elevation plane.⁶⁶ Raysat has committed, however, to take all necessary steps to protect any future Ku-band NGSO FSS systems licensed by the Commission, prior to the new system's launch, to ensure that the Raysat

⁵⁹ ViaSat Comments at 2-3.

⁶⁰ ViaSat Comments at 3.

⁶¹ Amendment at 9.

⁶² Amendment at 10. For this reason, we have authorized Raysat's system as six separate earth station licenses. *See infra* paras. 33-34.

⁶³ In addition, we observe that the tracking and acquisition safeguards discussed above provide real time, near instantaneous shutoff protection to adjacent GSO FSS operators.

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, *First Report and Order and Further Notice of Proposed Rule Making*, ET Docket No. 98-206, FCC 00-418, 16 FCC Rcd 4096 (2000).

⁶⁵ The only authorized Ku-band NGSO FSS systems surrendered their authorizations. *See* Virtual Geosatellite LLC, IBFS File No. SAT-LOA-19990108-00007, Public Notice, Policy Division Information, Actions Taken, Report No. SAT-00420, DA 07-617 (Int'l Bur. Feb. 9, 2007); SkyBridge L.L.C., IBFS File No. SAT-LOA-19970228-0021, Public Notice, Policy Division Information, Actions Taken, Report No. SAT-00314, DA 05-2327 (Int'l Bur. Aug. 19, 2005).

⁶⁶ Application at 14.

system does not cause harmful interference to the new system.⁶⁷ These steps include Raysat operating its system at reduced power levels sufficient to mitigate harmful interference into Ku-band NGSO FSS systems that comply with the technical requirements of Part 25 of the Commission's rules.⁶⁸

26. We agree that such conditions are appropriate to protect future Ku-band NGSO FSS systems from interference. Accordingly, if the Commission authorizes a Ku-band NGSO FSS system in the future, Raysat must successfully coordinate its operations with that future licensee and obtain an affidavit from the licensee that Raysat's system proposed operations are acceptable. In the absence of such an affidavit, Raysat'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 Raysat's METs to further conditions by the Commission designed to address potential harmful interference.⁶⁹

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

27. 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).⁷⁰ The National Aeronautics and Space Administration (NASA) currently operates SRS Tracking and Data Relay Satellite System (TDRSS) stations in White Sands, New Mexico, and in Guam that receive signals from geostationary satellites in the 14.0-14.05 GHz segment of the SRS band.⁷¹ NASA also plans to establish an additional TRDSS receive facility at Blossom Point, MD, in the near future.⁷²

28. As part of its application, Raysat included a copy of a coordination agreement with NASA to protect the current and future TDRSS sites.⁷³ Pursuant to this agreement, Raysat will protect TDRSS operations at White Sands by means of exclusion zones within which Raysat's METs will be prohibited from operating.⁷⁴ Above 14.2 GHz, an exclusion zone extends for 10 kilometers (km) north and south of

⁶⁷ Application at 14-15.

⁶⁸ Application at 15.

⁶⁹ Raysat states that its application, as amended, extends only to those mobile earth stations that Raysat itself may operate, and that other operators may purchase mobile earth stations from Raysat to include in their own networks. Such operators will seek separate operating authority from the Commission. Amendment at 4. We anticipate that any future authorizations will be subject to the same condition to protect future NGSO FSS systems from interference.

⁷⁰ 47 C.F.R. § 2.106.

⁷¹ See *VMEIS Notice*, 22 FCC Rcd at 9665 (para. 31).

⁷² On August 17, 2007, the National Telecommunications and Information Administration (NTIA) informed the Commission that a site in Blossom Point, MD has been selected for a new TDRSS earth station. The coordinates are 38°25'44" N, 77°05'20" W, and the site has a terrain height at approximately sea level. The new earth station is expected to become operational within three years and to have similar technical characteristics to that of its White Sands, NM, terminal except that this station will have improved RF filtering. See Public Notice, International Bureau Announces New NASA TDRSS Earth Station Site, Report No. SPB-221, DA 07-4028 (rel. Sept. 25, 2007).

⁷³ Application at 8. A copy of Raysat's coordination agreement with NASA is attached as Exhibit 2 to Raysat's application. See "A Coordination Agreement Between the National Aeronautics and Space Administration (hereinafter "NASA") and Raysat, Incorporated for Operation of the Raysat LMSS Terminals in the 14.0-14.5 GHz-Band" (NASA Coordination Agreement). Because Raysat's application is only for operations within the Contiguous United States (CONUS), the coordination agreement does not address protection of NASA's TDRSS site in Guam. If Raysat applies for future authorization to operate outside of CONUS, the coordination agreement with NASA calls on Raysat and NASA to develop an addendum to accommodate Raysat's protection of the Guam site. See NASA Coordination Agreement at n1.

⁷⁴ Application at 8.

the White Sands for Raysat transmissions; below 14.2 GHz, the zone extends 46 km to the north and 73 km to the south.⁷⁵ Raysat states that it will program the coordinates of these exclusion zones into its METs, and that the stations will terminate transmissions within these zones by means of a GPS system integrated into the antenna.⁷⁶ Accordingly, we condition the authority granted in this Order upon Raysat's adherence to the terms of the coordination agreement with NASA. Raysat will also need to update its coordination agreement with NASA to include the new TDRSS site at Blossom Point, MD. Raysat will be required to cease operations within 125 km of the new Blossom Point facilities when those facilities become operational, unless Raysat reaches an agreement with NASA permitting such operations.⁷⁷

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

29. 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.⁷⁸ 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.⁷⁹ 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).⁸⁰ Because the 14.4-14.5 GHz band is shared with the U.S. government, we have coordinated Raysat's application with National Telecommunications and Information Administration (NTIA) which administers authorizations for federal stations. NTIA has concurred with Raysat's proposed frequencies and operations.

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

30. The National Science Foundation (NSF), an independent Federal agency created by Congress, 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 Table of Allocations, which requires steps to be taken to minimize interference with such operation from terrestrial radio transmitters.⁸¹ 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.

31. As part of its application, Raysat includes a coordination agreement reached with the NSF

⁷⁵ See NASA Coordination Agreement at tables 3 & 4.

⁷⁶ Application at 8.

⁷⁷ We note that the Commission has proposed to prohibit VMES operators from operations in the 14.0-14.2 GHz band within 125 km of TDRSS sites, absent successful coordination of such operations with NASA. See *VMES Notice*, 22 FCC Rcd at 9665-66 (para. 32). This is the same approach that the Commission took for ESSVs. See *id.*, n.75.

⁷⁸ *VMES Notice*, 22 FCC Rcd at 9667. See also 47 C.F.R. § 2.106.

⁷⁹ *VMES Notice*, 22 FCC Rcd at 9667.

⁸⁰ *Id.*

⁸¹ 47 C.F.R. § 2.106, Footnote US203.

regarding the measures that Raysat will undertake to protect radio astronomy service sites.⁸² Pursuant to this agreement, Raysat will protect radio astronomy operations at ten sites by means of exclusion zones within which Raysat's METs will be prohibited from operating.⁸³ These exclusion zones range from 160 km separation from the Green Bank, WV, and Socorro, NM, sites to 25 km separation from the Very Long Baseline Array site at Hancock, NH.⁸⁴ Raysat states that the coordinates of these exclusion zones will be programmed into its METs, and that antenna transmissions within these zones will be terminated by means of a GPS system integrated into the antenna.⁸⁵ We condition the authority granted in this Order on Raysat's adherence to the terms of its coordination agreement with NSF.

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

32. 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 licensing 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 the stations to operate in other bands in addition to the 14.2 – 14.4 GHz band, giving them an alternative to operating 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 Raysat's operation is unlikely to interfere with these grandfathered licenses.

C. Other Matters

1. Separate Call Signs

33. We find that it is appropriate to license Raysat's METs under six separate authorizations, each with a separate call sign, rather than under a single authorization and call sign.⁸⁶ Although Raysat sought authorization for its METs under a single license application, Raysat states that it relies on separate hubs to manage its METs, and that individual METs can operate with only one hub station at any given time.⁸⁷ The six hub earth stations are geographically distinct, and there is no single point governing the entire network of Raysat METs.⁸⁸ Instead, personnel of each hub earth station will ensure that the METs operate in accordance with Raysat's license, pursuant to contractual arrangement.⁸⁹ Thus, we conclude that Raysat actually seeks to operate its METs as six separate networks, rather than as a single network. As a condition to this *Order and Authorization*, Raysat must submit the application fees for five additional earth station applications that would have been due when it filed its original application, a total

⁸² Application at 8. A copy of Raysat's coordination agreement with NSF is attached as Exhibit 3 to Raysat's application. See "Technical Operational Coordination Agreement for the Joint Usage of the Band 14.0-14.5 GHz Between the National Science Foundation and Land Mobile Satellite Service Earth Stations (LMSS) Operated by Raysat, Inc." (NSF Coordination Agreement).

⁸³ Application at 8.

⁸⁴ See NSF Coordination Agreement at 4.

⁸⁵ Application at 8.

⁸⁶ The six authorized earth station hubs are in the following locations: (1) McLean, VA; (2) Hagerstown, MD; (3) Silver Spring, MD; (4) Englewood, CO; (5) Woodbine, MD; and (6) Charlotte, NC. See Application at 2.

⁸⁷ Amendment at 10.

⁸⁸ Raysat Reply at 4.

⁸⁹ Amendment at 9.

of \$41,300, within 30 days of the release date of this *Order and Authorization*.⁹⁰ Failure to do so will render its authorizations null and void.

34. Accordingly, we shall issue six call signs to Raysat, and each of the call signs will be associated with a particular hub earth station as set forth in Appendix A to this authorization. Raysat may allocate METs among the six call signs, up to an aggregate of 400 mobile user earth stations. A MET can operate under only one call sign at any given time, although Raysat may allocate METs dynamically among call signs during the license terms, as Raysat deems necessary. Raysat must maintain an up-to-date roster of which METs operate pursuant to a particular call sign at any given time, and this roster must be available to Commission staff upon demand.

2. Data Logging Requirements

35. As a condition of its authorization, Raysat must maintain logs on the operation of its METs, as well as a point of contact for resolving any interference complaints, as set forth below. ViaSat argues that data logging requirements should apply to Raysat's proposed operations in order to identify and correct interference issues, should they arise.⁹¹ Raysat proposed operations will be transitory in nature and will take place in bands where regularly licensed spectrum operators have equal or superior rights. We agree with ViaSat that maintaining logs on METs operations will help identify and resolve any interference concerns raised by such operators. The Commission has imposed such data logging requirements on LMSS operations in the Ku-band in the past,⁹² and data logging is part of the rules governing analogous ESV operations.⁹³ We also note that the Commission is considering similar data logging requirements for VMES in the Ku-band.⁹⁴

36. We will impose data logging and point of contact requirements on Raysat's proposed operations similar to those imposed on previous Ku-band LMSS and ESV licensees. Accordingly, Raysat must maintain a point of contact within the United States with the authority and capability to mute the METs if necessary. Raysat shall submit a letter to be included in its license file with the name and telephone number of the contact prior to commencing operation. Raysat must also maintain records of the locations of METs in longitude and latitude, and of the ownership of vehicles on which the METs have been installed. The geo-location information must be recorded at time intervals of no greater than every twenty minutes while the mobile earth station terminal is transmitting.⁹⁵ Raysat must maintain the information for a year and make it available to appropriate entities within twenty-four hours of request. We also require Raysat to maintain logs of all alleged incidences of interference, the stations involved, and the outcome of the incident.⁹⁶

37. We disagree that data logging requirements are unnecessary and impractical, as Raysat contends.⁹⁷ Although Raysat contends that the similarly-situated mobile satellite-newsgathering and ESVs have been able to operate in the Ku-band with minimal interference to FSS users, we agree that

⁹⁰ See contactMEO Communications, LLC, *Order and Authorization*, 21 FCC Rcd 4035 (Int'l Bur. 2006).

⁹¹ ViaSat Comments at 4.

⁹² See *Qualcomm*, 4 FCC Rcd at 1545-46.

⁹³ See 47 C.F.R. § 25.222(c); see also *ESV Report and Order*, 20 FCC Rcd at 695-96, ¶ 48.

⁹⁴ See *VMES Notice*, 22 FCC Rcd at 9676-77 ¶¶ 61-64.

⁹⁵ *Accord with 47 C.F.R. § 25.222(c)(1)*.

⁹⁶ Compare with *Qualcomm*, 4 FCC Rcd at 1456.

⁹⁷ Raysat Reply at 7.

such operations still have the potential to cause interference in some instances.⁹⁸ Indeed, ESVs are subject to data logging requirements for this very reason, as noted above. Furthermore, we are not persuaded by Raysat's assertion that data logging requirements are unnecessary because Raysat's operations under an experimental license have not yielded any examples of interference into other systems.⁹⁹ Limited operations under an experimental license do not rule out the possibility of interference resulting from the operation of a larger number of METs under a commercial license. Finally, the security concerns raised by Raysat regarding disclosure of the location of METs used by U.S. Government and military users can be addressed while still maintaining data logging requirements. We observe that the geo-location information that must be logged is required to be made available only to other network operators or U.S. Government agencies, and need not be disclosed publicly. If, in particular circumstances, national security or other concerns argue against even this limited disclosure, Raysat is free to seek limited waiver of the disclosure requirement under existing Commission rules.¹⁰⁰

3. Radiation Hazard Requirements

38. The Commission has observed that the mounting of earth stations on vehicles may pose the possibility of human exposure to radiofrequency (RF) radiation.¹⁰¹ The Commission's rules define the maximum permissible exposure (MPE) to non-ionizing radiation for the general public in an uncontrolled environment in the 14.0-14.5 GHz band to be 1.0 mW/cm² averaged over any 30 minute time period.¹⁰² For individuals in a controlled occupational environment, the MPE is 5.0 mW/cm² averaged over any 6 minute time period.¹⁰³ Raysat has provided a radiation hazard analysis that states that the METs will produce power densities that would result in exceeding these criteria for a person located at or around the surface area of the MET antennas.¹⁰⁴

39. We are conditioning the authorization to require that a label or labels be permanently placed on the MET, warning about the radiation hazard and including a diagram showing the regions around the earth station where the levels could exceed 1.0 mW/cm². 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.

IV. CONCLUSION

40. We conclude that we can grant Raysat's application, as amended, under existing Commission rules for the licensing non-routine earth stations. Accordingly, we grant Raysat authority to operate up to four hundred technically identical in-motion METs to be mounted on vehicles throughout the continental United States, subject to the conditions specified herein.

V. ORDERING CLAUSES

41. Accordingly, IT IS ORDERED that the applications of Raysat Antenna Systems, LLC (IBFS File Nos. SES-LIC-20060629-01083, SES-LIC-20060629-02248, SES-LIC-20060629-02249, SES-LIC-20060629-02250, SES-LIC-20060629-02251, SES-LIC-20060629-02252), as amended by IBFS File No.

⁹⁸ ViaSat Response at 4.

⁹⁹ Raysat Reply at 7.

¹⁰⁰ See 47 C.F.R. § 1.3.

¹⁰¹ *VMEIS Notice*, 22 FCC Rcd at 9680.

¹⁰² 47 C.F.R. § 1.1310.

¹⁰³ *Id.*

¹⁰⁴ Application, Radiation Hazard Analysis at 1.

SES-AMID-20070620-00839, ARE GRANTED, to the extent indicated herein, and Raysat Antenna Systems, LLC IS AUTHORIZED to operate up to four hundred technically identical in-motion METs to be mounted on vehicles throughout the continental United States, according to the specifications of its application and amendment, and in compliance with the Commission's rules, subject to the conditions specified herein.

42. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC's METs are limited to communications with the satellites set forth in its application, specifically Intelsat-Americas 7 at 129° W.L., Intelsat-Americas 8 at 89° W.L., AMC-4 at 101° W.L., AMC-5 at 79° W.L., AMC-6 at 72° W.L., SBS-6 at 74° W.L., and Horizons-1 at 127° W.L. Raysat Antenna Systems, LLC must seek Commission approval to modify its authorization in the event the satellites change orbital locations, or if Raysat Antenna Systems, LLC desires to add satellites as points of communication.

43. IT IS FURTHER ORDERED that the Raysat Antenna Systems, LLC METs must accept interference from 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 a 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.

44. IT IS FURTHER ORDERED that the operation of an Raysat Antenna Systems, LLC MET shall immediately terminate upon notification that such operation is causing harmful interference, not permitted under the terms of pertinent coordination agreements, with (1) 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) operation of any TDRSS earth station in the band 14-14.2 GHz, or (3) radio astronomy observations in the 14.47-14.5 GHz band.

45. IT IS FURTHER ORDERED that, if the Commission authorizes a Ku-band NGSO FSS system in the future, Raysat Antenna Systems, LLC must successfully coordinate its operations with that future licensee and obtain an affidavit from the licensee that Raysat Antenna Systems, LLC's system proposed operations are acceptable. In the absence of such an affidavit, Raysat Antenna Systems, LLC'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 Raysat Antenna Systems, LLC's METs to further conditions by the Commission designed to address potential harmful interference.

46. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC shall maintain a point of contact for discussing interference concerns with other licensees and U.S. Government agencies and shall submit a letter to be included in its license file with the name and telephone number of the contact prior to commencing operation. Raysat Antenna Systems, LLC shall maintain records of the locations of mobile earth station stations in longitude and latitude, and of the ownership of vehicles on which the mobile earth station stations have been installed. The geo-location information shall be recorded at time intervals of no greater than every twenty minutes while the mobile earth station terminal is transmitting. Raysat Antenna Systems, LLC must maintain the information for a year and make it available to appropriate entities within twenty-four hours of request. Raysat Antenna Systems, LLC must maintain logs of all alleged incidences of interference, the stations involved, and the outcome of the incident.

47. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC METs must employ a tracking algorithm that is resistant to capturing and tracking adjacent satellite signals, and each Raysat Antenna Systems, LLC MET must be capable of inhibiting its own transmission in the event it detects unintended satellite tracking.

48. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC METs must be monitored and controlled by a ground-based network control and monitoring center. Each Raysat Antenna Systems, LLC 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 each Raysat Antenna Systems, LLC METs to determine if it is malfunctioning, and each Raysat Antenna Systems, LLC 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.

49. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC's operation in the 11.7-12.2 and 14.0-14.5 GHz bands shall be in accordance with the space station authorization for the satellites with which Raysat Antenna Systems, LLC's METs communicate.

50. IT IS FURTHER ORDERED that operations pursuant to this authorization shall conform to the requirements of Raysat Antenna Systems, LLC's coordination agreements with NASA and NSF. Raysat Antenna Systems, LLC will need to update its coordination agreement with NASA to include operations within 125 km of the new TDRSS site at Blossom Point, MD. Raysat Antenna Systems, LLC METs shall cease operations within 125 km of the new Blossom Point facilities when those facilities become operational, unless Raysat Antenna Systems, LLC reaches an agreement with NASA permitting such operations.

51. IT IS FURTHER ORDERED that, in the event that another co-frequency FSS satellite commences operation at a location within six degrees of the target satellite, Raysat Antenna Systems, LLC must reduce aggregate off-axis radiation from its METs to levels one dB below the routine-processing envelope, pending demonstration of coordination with the operator of the new satellite.

52. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC's proposed use of the 2M07G7W emission designator IS DISMISSED without prejudice for the reasons stated herein.

53. IT IS FURTHER ORDERED that Section 2.102 of the Commission's rules IS WAIVED with respect to operation of the Raysat Antenna Systems, LLC METs in the 11.7-12.2 GHz downlink band consistent with the terms of this authorization.

54. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC shall take all reasonable and customary measures to ensure that the MET does not create a potential for harmful non-ionizing radiation to persons who may be in the vicinity of the MET when it is in operation. At a minimum, permanent warning label(s) shall be affixed to the MET warning of the radiation hazard and including a diagram showing the regions around the MET where the radiation levels could exceed 1.0 mW/cm^2 . The operator of the MET shall be responsible for assuring that individuals do not stray into the regions around the MET where there is a potential for exceeding the maximum permissible exposure limits required by Section 1.1310 of the Commission's rules, 47 C.F.R. § 1.1310. This shall be accomplished by means of signs, caution tape, verbal warnings, placement of the MET so as to minimize access to the hazardous region and/or any other appropriate means.

55. IT IS FURTHER ORDERED that Raysat Antenna Systems, LLC must submit application fees for its five additional earth station hubs in the amount of \$41,300 within 30 days of the release of this *Order and Authorization*. Failure to do so will render its authorizations null and void.

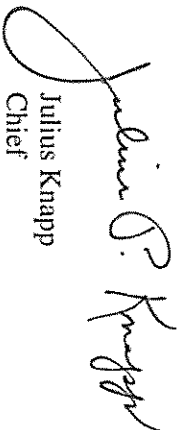
56. Raysat Antenna Systems, LLC may decline this authorization as conditioned within 30 days from the date of release of this *Order and Authorization*. Failure to respond within that period will constitute formal acceptance of the authorization as conditioned.

57. 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. Petitions for reconsideration under Section 1.106 of the Commission's rules, 47 C.F.R. § 1.106, may be filed within thirty days of the date of this *Order and Authorization*.

FEDERAL COMMUNICATIONS COMMISSION



Helen Domenici
Chief
International Bureau



Julius Knapp
Chief
Office of Engineering and Technology

Appendix: Hub Earth Station Association with Call Signs

Raysat Authorization IBFS File No.	Raysat Call Sign	Associated Hub Earth Station
SES-LIC-20060629-01083	E060101	Spacenet, McLean, VA (Call Sign E860326)
SES-LIC-20060629-02248	E060447	Intelsat, Hagerstown, MD (Call Signs E040140, E040141, E040144, E040475)
SES-LIC-20060629-02249	E060448	G2, Silver Spring, MD (Call Sign KA416)
SES-LIC-20060629-02250	E060449	Stratos, Englewood, CO (Call Sign E950149)
SES-LIC-20060629-02251	E060450	SES Americom, Woodbine, MD (Call Sign E920698)
SES-LIC-20060629-02252	E060451	Charlotte, NC (Call Sign E050007)