# ATTACHMENT 5

**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
| **RAYSAT ANTENNA SYSTEMS, LLC** | ) | File Nos. SES-LIC-20060629-01083 and SES-AMD_____ |
| 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 | ) | Call Sign E060101 |

## APPLICATION AMENDMENT

Raysat Antenna Systems, LLC ("RAS"), along with its affiliate RaySat, Inc. ("RaySat"), by their attorneys and pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 308 and 309, and Sections 1.927 and 25.116 of the Commission's Rules, 47 C.F.R. §§ 1.927 and 25.116, hereby amend application File No. SES-LIC-20060629-01083, Call Sign E060101, originally filed by RaySat for authority to operate Land Mobile-Satellite Service ("LMSS") earth stations in the 14.0-14.5 GHz and 11.7-12.2 GHz frequency bands (collectively, the "Ku-band").[1/] The purpose of this amendment is to substitute RAS as the applicant in this proceeding, to reduce the number of earth stations (hereinafter referred to as "mobile terminals") for which operating authority is requested, and to provide additional

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1/ *See* RaySat, Inc., Application for Authority to Operate 4,000 In-Motion Mobile Satellite Antennas in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, File No. SES-LIC-20060629-01083, Call Sign E060101 (filed June 29, 2006). Note that the caption of this submission reflects the characteristics of the application, as amended, rather than the original application.

information with respect to certain operational characteristics of the proposed LMSS network. All other information included in the original application remains unchanged.

The underlying application, as supplemented herein, demonstrates that the potential interference to adjacent satellites from RAS's proposed LMSS operations under worst-case conditions (*e.g.*, transmitting at a maximum offset angle of 0.5° and a skew angle of 50°) will be no greater than that of a perfectly pointed, fully compliant VSAT terminal. Indeed, during thousands of operating hours in a variety of real-world environments, including on commuter trains as well as on-road and off-road vehicles, RAS's LMSS operations have *never* caused a single case of interference to adjacent satellites.

## I. APPLICANT IN THE PROCEEDING

RAS and RaySat seek to substitute RAS as the applicant in this proceeding. Pursuant to a prior business transaction, RaySat transferred to RAS, among other assets, the right to develop, market and deploy two-way, broadband LMSS equipment and services in the Ku-band. The principal rationale for this transaction was to establish RAS as a separate entity focused on marketing of two-way, broadband LMSS equipment and services to U.S. Government customers and enterprise users, which would permit RaySat to focus on receive-only applications (*e.g.*, satellite video) for consumer and other applications.

An applicant may amend a pending application as a matter of right if it has not been designated for hearing or listed in a public notice as accepted for filing for competitive bidding.[2/] This amendment right includes the ability to change the control group of the applicant, or similarly change the applicant itself, subject to the Commission's major amendment rules.[3/] If

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2/ 47 C.F.R. §1.927.

3/ *See id.* Major amendments such as a change in control of the applicant must be placed on public notice. 47 C.F.R. §1.929.

the amendment involves a substantial change in the applicant's control group, the Commission's Rules require the applicant to demonstrate that the application was not acquired for the principal purpose of speculation or profitable resale of the authorization.[4/] This requirement is designed to allay any concerns with respect to trafficking in Commission authorizations.

In this case, no trafficking concerns are implicated. As a preliminary matter, the license at issue is non-exclusive and any other party interested in providing such services could simply apply to obtain its own authorization. Thus, while the license will be of value to RAS as it develops and implements two-way, broadband LMSS equipment and services, it does not have intrinsic value that would make it susceptible to "trafficking" or "flipping" to another prospective operator.

In addition, the four members of RAS have a long history in telecommunications generally and broadband LMSS equipment and services in particular.[5/] David Gross, RAS's Chief Executive Officer, has worked in the telecommunications and network security fields for many years. RAS's President, Ilan Kaplan, who previously served as General Manager of RaySat, has nearly 20 years of experience with respect to satellite systems and services, including LMSS systems. RaySat, the prior applicant in this proceeding, is also a member of RAS and provides support to RAS pursuant to a cross-services agreement. Lastly, RaySat Antenna Systems, Inc. ("RAS, Inc."), a Delaware corporation controlled by Israeli citizens

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4/ 47 C.F.R. §1.927(g) (*citing* 47 C.F.R. §1.948(i)(2)).

5/ RAS, a limited liability company, has "members" rather than shareholders. The only members of RAS are those identified in this narrative. RAS will update the Commission with respect to RAS's members, or file an appropriate transfer application subsequent to grant, in the event of a proposed change to RAS's control group.

previously employed by RaySat, holds a membership interest in the company.[6/] Given the background of RAS's members, it is clear that transferring the application to RAS was a well-considered effort to enable an experienced team to implement the two-way LMSS business, rather than a mere exercise in trafficking.

## II. REDUCTION IN THE NUMBER OF MOBILE TERMINALS FOR WHICH OPERATING AUTHORITY IS SOUGHT

The application, as amended, seeks authority to operate only 400 mobile terminals within the United States. This represents a reduction of 90% in the number of mobile terminals requested in the application. Given the evolution of its business plan, RAS believes that this number represents an appropriate number of mobile terminals that RAS itself may operate in the near to medium term.

RAS anticipates that other operators will purchase LMSS mobile terminals from RAS to include in their own networks and seek separate operating authority from the Commission. Thus, the 400 figure does not represent the maximum number of RAS mobile terminals that may operate in the United States, but rather the number that RAS itself may operate as part of its initial nationwide LMSS network.

## III. ADDITIONAL TECHNICAL INFORMATION RELATED TO THE PROPOSED LMSS NETWORK

A number of technical and operational issues were raised in a recent *ex parte* presentation to the Commission regarding this application.[7/] RAS underscores and supplements information included in the original application with respect to these issues.

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6/ *See generally* Affidavit of Ilan Kaplan (attached).

7/ *See* RaySat, Inc., Notice of *Ex Parte* Presentation (June 7, 2007).

### A. Multiple Access Schemes

RAS is requesting authority to operate its proposed LMSS network using only FDMA or TDMA multiple access schemes. As set forth in the original application and supplemental information, the transmissions of an RAS mobile terminal comply with the VSAT off-axis EIRP mask even under worst-case operating conditions.

Because RAS will not use an access scheme such as CDMA that may involve multiple earth stations continuously transmitting simultaneously on the same frequency, it does not propose at this time to employ fully automated, centralized network management features that would control the aggregate off-axis EIRP from simultaneously transmitting LMSS mobile terminals. However, depending on the need, subject to sufficient demonstration to the Commission of an ability to control aggregate off-axis EIRP, and as part of an application to modify its blanket license, RAS reserves the right to employ CDMA and similar multiple access schemes in the future.

### B. Initial Satellite Acquisition

The RAS LMSS mobile terminal utilizes well-established engineering and operational principals to ensure that it will transmit only when appropriately authorized by a controlling hub earth station, and only when the mobile terminal antenna is correctly pointed towards the intended satellite. A simplified block diagram of the major components in the tracking and acquisition system of the RAS LMSS mobile terminal is shown in Figure 1.

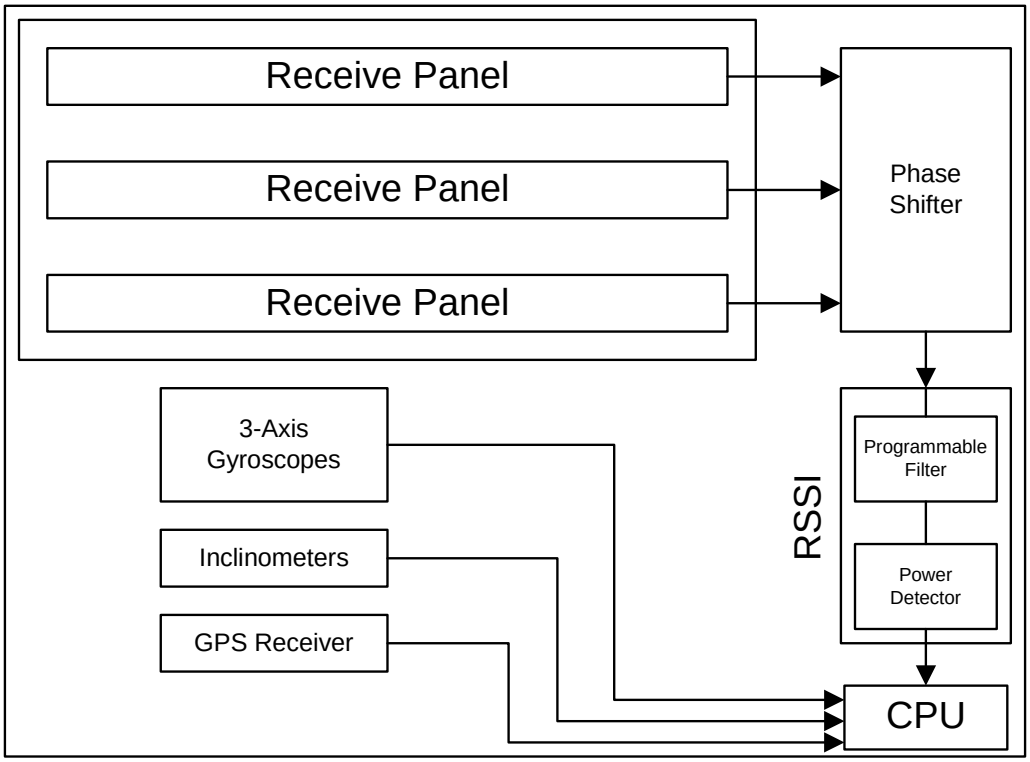

Figure 1 - Tracking System Components

The transmit antenna of the mobile terminal uses a single panel (not shown in Figure 1) that is slaved to the motion of, and fully aligned with, the receive panels in both azimuth and elevation.

Information regarding the serving satellite and associated network characteristics (*e.g.*, satellite location, assigned frequency, polarization, network identification information, etc.) is pre-programmed in the RAS mobile terminal. For initial acquisition of the serving satellite, the central processor unit ("CPU") receives information about the mobile terminal's location from the onboard GPS receiver. Using this location information, along with the known orbit longitude of the serving satellite, the elevation angle to the satellite and the polarization angles are calculated and set. The mobile terminal antenna is then rotated in azimuth.

The signal level at the Receive Signal Strength Indicator ("RSSI") is constantly sampled. If the received power exceeds a specified threshold, the antenna will track that satellite signal and wait for the modem to lock onto the downlink signal. If the modem acknowledges with a

signal lock (*i.e.*, verifies the correct RF characteristics, network identification and other parameters), the antenna will continue to track the satellite signal and only then will the RAS mobile terminal be permitted to transmit.

If the modem does not lock onto the satellite downlink signal and provide an acknowledgement to the mobile terminal's CPU (which means the antenna is not pointing towards the correct satellite), the antenna stops tracking that satellite downlink signal and rotates in azimuth until it finds the next downlink signal. This process continues until the correct downlink signal from the intended satellite and network is found. Importantly, throughout the initial satellite acquisition process, the RAS mobile terminal will not be permitted to transmit until it finds the correct downlink signal and the antenna is properly pointed towards the serving satellite.

### C. Antenna Tracking Methodology

Once the serving satellite is acquired, the antenna tracking process is continuously and automatically controlled by the CPU using the information from gyroscope sensors, as well as from signal levels at the RSSI and modem information, for antenna panel tilt in the elevation plane and antenna platform rotation in the azimuth plane. Tracking is achieved in the elevation and azimuth planes in different ways, as described below.

In the elevation plane, receive tracking beams are generated on either side of (*i.e.*, above and below) the main beam by means of the phase combining network. Adjustments in elevation pointing are made in order to equalize the level of the signals from these two tracking beams. This ensures that the main beam is optimally pointed in elevation towards the intended satellite.

In the azimuth plane, the RAS mobile terminal is cyclically scanned by a small amount (±0.35°) on either side of the satellite's location. Gyroscope sensor data is used to ensure that

the azimuth scanning offset is maintained at ±0.35°. Fine adjustments in the antenna azimuth pointing direction are continuously made by sampling the output of the RSSI one hundred times per second and "peaking" the receive signal strength (centering the antenna on peak signal), thus ensuring that the nominal antenna azimuth pointing direction is correct. At all times during the offset scanning process (and indeed out to an offset angle of ±0.5°), the off-axis EIRP produced by an RAS mobile terminal is less than or equal to that produced by a fully compliant, perfectly pointed VSAT terminal.

**D. Automatic Muting of Transmissions**

In addition to the satellite acquisition and tracking functions described above, the RAS mobile terminal has "fail-safe," automatic transmission muting capabilities designed to prevent unacceptable levels of interference into adjacent satellites. First, the mobile terminal will mute transmissions when, using data from the gyros and the RSSI, it determines the angular offset between the target satellite and the actual antenna position reaches 0.5°. This will be accomplished in less than 100ms. Second, if the downlink signal is lost for any reason (*e.g.*, blockage of the line-of-sight signal path from the satellite), the modem and the RSSI will sense the loss of the receive carrier and the mobile terminal will mute transmissions. Again, this automatic muting of transmissions will be accomplished in less than 100ms.

After an event that results in the muting of the transmit carrier, there are two processes by which the RAS mobile terminal may recommence transmissions. If receive signal lock has been lost, the mobile terminal will initiate the satellite acquisition routine (described in Section III.B, *supra*) to reacquire the correct satellite with which to communicate. If receive signal lock has not been lost, the RAS mobile terminal will not allow transmission to recommence until the tracking algorithm has determined the antenna pointing offset is 0.5° or less.

As noted previously and in prior submissions, the off-axis EIRP of RAS mobile terminal transmissions at the worst-case 0.5° angular offset are fully compliant with the permissible values for a perfectly pointed VSAT terminal. Thus, there is no potential for harmful interference to adjacent satellites from recommencing RAS mobile terminal transmissions at this offset angle.

### E. Control Functions of Hub Earth Stations and Individual Users

The underlying application included a limited number of hub earth stations through which, via contractual arrangements, RAS will control its LMSS earth station operations. Like a traditional VSAT network, each mobile terminal will operate under the control of a single hub earth station manned by qualified personnel that, subject to RAS's direction and control, will ensure that the mobile terminal operates in accordance with RAS's license.

Furthermore, RAS will be able to respond quickly and effectively to address potential claims of harmful interference through its hub earth stations. The typical sequence of events in a case of adjacent satellite interference would be: (i) a party whose service is being interfered with will notify its satellite carrier; (ii) the satellite carrier will notify the operator of the adjacent satellites, identifying the frequency and bandwidth characteristics of the interfering transmission; and (iii) the adjacent satellite operators will compare the frequency and bandwidth of the interferer with the authorized transmissions on their networks and will notify the offending user to correct or cease its transmissions. If an RAS mobile terminal is the cause of harmful interference, RAS will immediately contact the relevant hub earth station operator to cease transmissions of the offending terminal and thereafter take additional measures to analyze and correct the issue. In this way, RAS will ensure that potential interference events are quickly and effectively resolved.

Significantly, fully automated, centralized network control features are not necessary to adequately control the RAS network. This is because there are no complex aggregate interference issues to manage as the RAS network uses only FDMA and TDMA transmission schemes. RAS can appropriately rely on separate hubs to manage its limited number of mobile terminals without any risk of causing interference to adjacent satellites. Moreover, each of RAS's satellite points of communication provides full CONUS coverage (with skew angles of 50° or less) so there is no for real-time "hand-offs" between satellites (*i.e.*, a terminal associated with a particular satellite and hub will remain associated until reprogrammed).

RAS mobile terminals must be individually programmed with satellite position (for TDMA timing offset), the hub-to-remote carrier information (frequency, bandwidth, modulation, FEC, etc.), the remote-to-hub carrier information (frequency, bandwidth, modulation, FEC, etc.) and related data. RAS mobile terminals can operate with only one set of network parameters at any given time and so will operate only as part of a single satellite/hub network. Operating with a different satellite requires reprogramming of the mobile terminal, which can only be accomplished through close coordination with RAS, the hub earth station operator and the satellite vendor -- it cannot be done by a user "on the fly."

## IV. SECTION 304 WAIVER

In accordance with Section 304 of the Communications Act of 1934, 47 U.S.C. § 304, RAS hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum because of previous use of the same, whether by license or otherwise.

## V. CONCLUSION

RAS and RaySat hereby amend pending application File No. SES-LIC-20060629-01083, Call Sign E060101, to substitute RAS as the applicant, to reduce the number of mobile terminals, and to provide additional information with respect to certain operational characteristics of the

proposed LMSS network. As discussed herein and in the underlying application, grant of the application, as amended, would strongly serve the public interest by expanding the mobile broadband services available to U.S. Government customers and other users.

Respectfully submitted,

**RAYSAT ANTENNA SYSTEMS, LLC and RAYSAT, INC.**

/s/

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**CERTIFICATION OF PERSON RESPONSIBLE**
**FOR PREPARING ENGINEERING INFORMATION**

I hereby certify that I am familiar with Part 25 of the Commission's Rules, that I have either prepared or reviewed the engineering information submitted in this Application Amendment, and that it is complete and accurate to the best of my knowledge and belief.

Richard J. Barnett, PhD, BSc
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Dated: June 20, 2007

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**AFFIDAVIT OF ILAN KAPLAN**

I, Ilan Kaplan, being of lawful age and under no disability, and having personal knowledge of the matters set forth herein, declare and state as follows:

1. I am President of Raysat Antenna Systems, LLC ("RAS"), previously served as General Manager of RaySat, Inc. ("RaySat") and have nearly 20 years of experience with respect to satellite systems and services, including Land Mobile-Satellite Service ("LMSS"). In my present capacity, I am primarily responsible for the development and implementation of RAS's two-way, broadband LMSS business. I am submitting this Affidavit in support of the application amendment filed by RAS in the above-referenced proceeding.

2. RAS is a limited liability company with four members. The members include: (i) David Gross, RAS's Chief Executive Officer, who has worked in the telecommunications and network security fields for many years; (ii) myself; (iii) RaySat Antenna Systems, Inc. ("RAS, Inc."), a Delaware corporation controlled by Israeli citizens previously employed by RaySat; and (iv) RaySat, the prior applicant in this proceeding.

3. RaySat has transferred to RAS, among other assets, the right to develop, market and deploy two-way, broadband LMSS equipment and services in the Ku-band. The principal rationale for this transaction was to establish RAS as a separate entity focused on marketing of two-way, broadband LMSS equipment and services to U.S. Government customers and enterprise users, which would permit RaySat to focus on receive-only applications (*e.g.*, satellite video) for consumer and other applications. RaySat and RAS continue to provide support for each other's activities pursuant to a cross-services agreement.

I declare under penalty of perjury that the foregoing is true and correct.

By: _____
Ilan Kaplan
President, Raysat Antenna Systems, LLC

Dated: June 20, 2007

## CERTIFICATE OF SERVICE

I, Christopher R. Bjornson, hereby certify that on this 20th day of June 2007, served a true copy of the foregoing Application Amendment by first class mail, postage pre-paid upon the following:

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Sonny Ellis
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1133 Fifteenth Street, N.W.
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/s/
Christopher R. Bjornson