RAYSAT ANTENNA SYSTEMS, LLC
APPLICATION FOR EXPERIMENTAL LICENSE
STEALTHRAY™ 5000 ANTENNA

Raysat Antenna Systems, LLC ("Raysat"), by its attorneys and pursuant to Section 5.55 of the Commission's rules, 47 C.F.R. § 5.55, hereby requests an experimental authorization to test and demonstrate up to five (5) vehicle-mounted earth stations ("VMESs") (designated the "StealthRay™ 5000" antenna) in the 14.0-14.5 GHz and 11.7-12.2 GHz frequency bands (collectively, the "Ku-band") to be incorporated in vehicles pursuant to a Department of Defense ("DOD") contract.[1] The antennas will be incorporated into military vehicles for distribution to a foreign theater of operations to meet U.S. national security needs. The earth stations will communicate with the Horizons 2 satellite at 74° W.L. or the AMC-2 satellite at 79° W.L.

I. DISCUSSION

On January 15, 2011, Raysat was granted a special temporary authorization ("STA") for these operations, which expires on July 15, 2011.[2] Given the ongoing operational requirements, Raysat seeks a full two-year experimental license subject to the same terms and conditions included in its prior authority. Specifically, Raysat seeks to continue testing and demonstrating the StealthRay™ 5000 VMES terminal in connection with the Department of Defense contract discussed below. Raysat hereby incorporates by reference all technical and public interest information submitted in the context of obtaining its prior experimental STA, Call Sign WE9XQH, including the radiation hazard analysis and link budget.

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[1] As demonstrated herein, the terminals will meet the substantive requirements of the VMES rules. *See* 47 C.F.R. § 25.226.

[2] *See* ELS File No. 0580-EX-ST-2011, Call sign WE9XQH.

Pursuant to Section 5.61(b), Raysat will continue operations pursuant to its current STA beyond July 15, 2011 pending disposition on the instant application unless otherwise notified by the Commission. In the instant application, Raysat requests a two-year experimental license.

The StealthRay™ 5000 is a derivative of the StealthRay™ antenna that is currently authorized and operated by Raysat pursuant to experimental and long-term commercial authority.[3] Raysat current holds an experimental authorization to operate the StealthRay™ terminals, including authority for limited market studies and provision of service under government contract.[4] The major difference between the StealthRay™ 5000 terminal and the previously authorized terminals is that the StealthRay™ 5000 has a larger transmit panel array, allowing for enhanced transmit performance and throughput, whereas prior versions have a smaller transmit panel.

A. The StealthRay™ 5000 Antenna

Raysat has developed the StealthRay™ 5000 in response to customer requests for an antenna with higher transmit data rates. The StealthRay™ 5000 has a relatively low profile, which allows it to be placed unobtrusively on vehicles. The full motion tracking system allows the user to have broadband data access while on the move. The major enhancement to the StealthRay™ 5000 is in the transmit panels, which compose a larger transmit panel array than the single transmit panel in the StealthRay™ antenna. Thus, for a given input power level, the

[3] *See Application of Raysat Antenna System, LLC 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*, Order and Authorization, File Nos. SES-LIC-20060629-01083, *et seq.*, DA 08-401 (Int'l Bur. And OET, Feb. 15, 2008). *See also* Call Signs E060101, E060447, E060448, E060449, E060450 and E060451. The licenses were modified on Feb. 10, 2009. *See* File Nos. SES-MOD-20081221-01677, SES-MOD-20081221-01672, SES-MOD-20081221-01673, SES-MOD-20081221-01674, SES-MOD-20081221-01675 and SES-MOD-20081221-01676.

[4] *See* Call Sign WE2XTX, ELS File No. 0235-EX-RR-2010.

transmitted EIRP will be greater than on the StealthRay™ antenna.[5] Specifically, the maximum EIRP of the StealthRay™ 5000 is 21,877 W (13,340 W ERP). Raysat will employ a maximum transmit bandwidth of 16.2 MHz to remain fully compliant with the Commission's off-axis EIRP spectral density limits when operating at full power.[6]

The StealthRay™ 5000 antenna consists of a 23 inch-by-6.75 inch transmit panel array along with two separate receive panels, which are mounted on a rotatable platform. The platform rotates in azimuth to orient the panel towards the satellite and the panel tilts to set the panel's elevation angle. The antenna also has a polarization control mechanism that automatically sets the correct polarization angle for both transmit and receive. A drawing of the antenna assembly is shown in Figure 1.

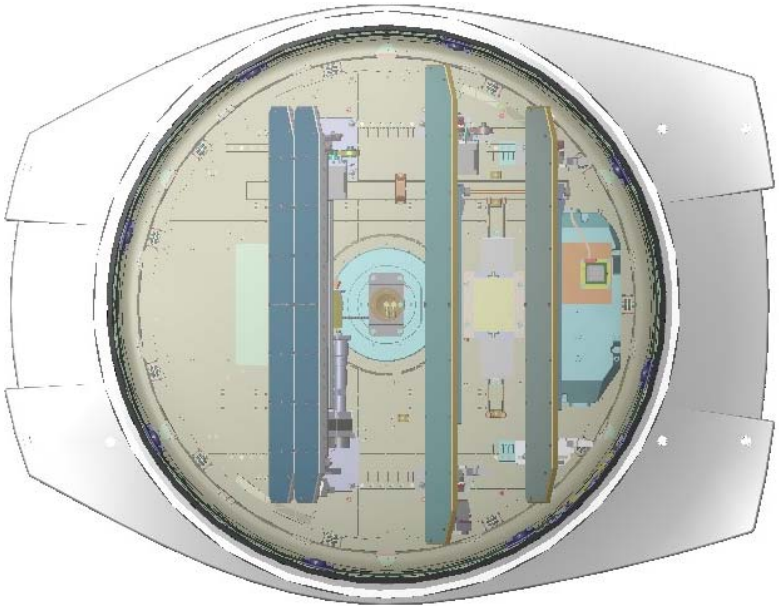

Figure 1
StealthRay™ 5000 Panel Array

[5] Raysat provided a Radiation Hazard Analysis in its granted application for STA pursuant to Section 25.226(b)(8). *See* ELS File No. 0580-EX-ST-2011, Attachment A.

[6] *See* 47 C.F.R. §§ 25.226(a)(1)(i), (b)(1). Raysat provided a link budget in its granted application for STA. *See* ELS File No. 0580-EX-ST-2011, Attachment B.

B. StealthRay™ 5000 Antenna Operation

As with all Raysat antennas, the StealthRay™ 5000 has active control of the azimuth, elevation and polarization angles. The antenna moves mechanically in azimuth and elevation. For satellite acquisition and reacquisition, the proven principles implemented in currently authorized StealthRay™ antennas will be applied. A simplified block diagram of the major components in the tracking and acquisition system is shown in Figure 2.

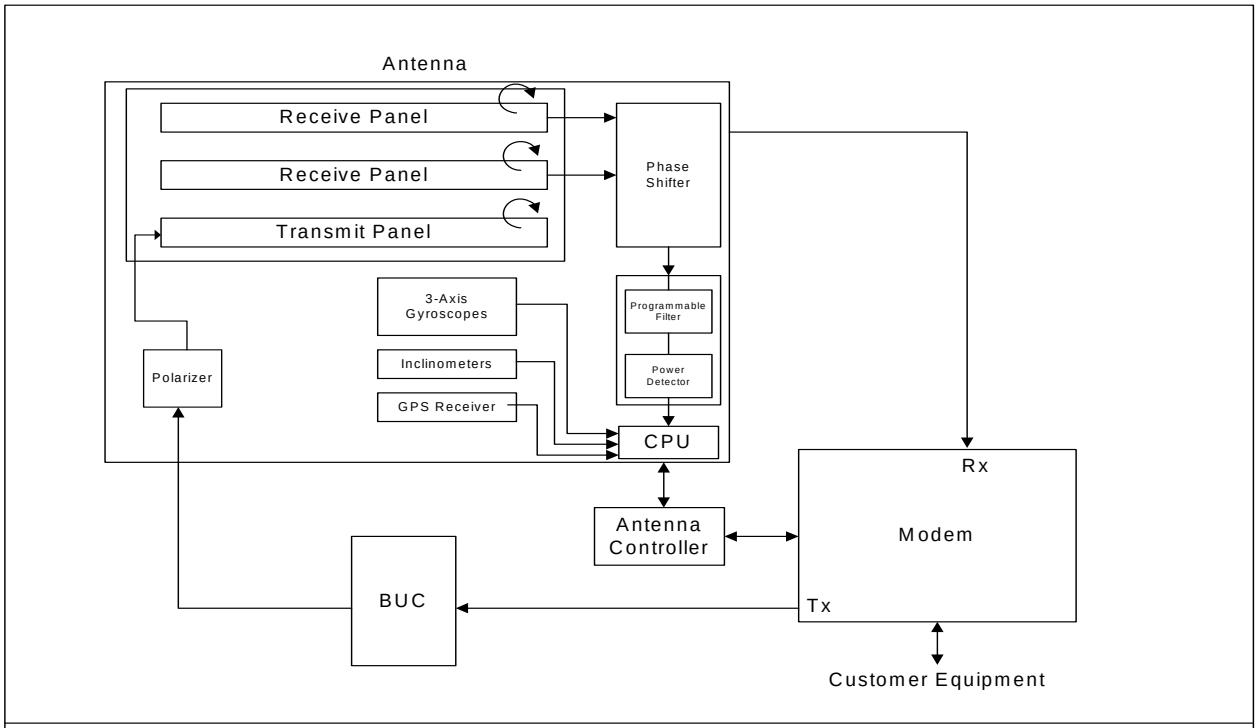

Figure 2
Typical Antenna Configuration

Antenna Operation and Satellite Acquisition. During operation, the antenna uses a built-in GPS receiver to determine its position on the earth for several purposes. First, it uses the geographical position and the longitudinal position of the satellite to determine the appropriate elevation angle. Once the elevation angle is set, the antenna rotates in azimuth. During the scanning process, the antenna receives Eb/No and network information from the modem to

verify that the target satellite has been acquired. During testing and demonstration, the terminals will communicate with Horizons 2 at 74° W.L. or AMC-2 at 79° W.L.

Second, the antenna uses GPS to ensure protection of NASA Tracking and Data Relay Satellite System ("TDRSS") sites and radio astronomy service ("RAS") observatories in the 14.47-14.5 GHz band, consistent with the special conditions contained in Raysat's current authorizations and coordination agreements executed with NASA and the National Science Foundation.[7]

Antenna Pointing Accuracy and Tracking. Once the satellite is acquired, the antenna dithers in azimuth by ±0.3° to peak the signal and maintain accurate pointing to the satellite. There is no mechanical dithering in elevation as the tracking beams are generated by phase-combing the outputs from the two receive panels. The transmit signal is enabled after the satellite is acquired and being tracked by the antenna. The antenna has internal 3-axis gyroscopes and 2-axis inclinometers to help with the tracking while it is in motion. The antenna will also use the information from the gyros to determine when the pointing offset has reached 0.5° and will cease transmissions within 100 milliseconds when that occurs.[8] The StealthRay™

[7] *See* 47 C.F.R. §§ 25.226(c),(d),(e). Raysat is subject to special conditions contained in its current authorizations (*e.g.*, Call Sign WE2XTX) that require it to not transmit within the TDRSS and RAS coordination zones, and Raysat will comply with those conditions with respect to the operations of its StealthRay™ 5000 antennas. Raysat has also executed coordination agreements with NASA and NSF to protect TDRSS and RAS locations. *See* ELS File No. 0033-EX-ST-2009 (narrative exhibit).

[8] *See* 25.226(b)(1)(iv)(B). Although the antenna dithers in azimuth by ±0.3° and Raysat expects pointing accuracy to typically remain at that value, Raysat is implementing a declared pointing accuracy of 0.5° – the offset at which antenna transmissions automatically terminate – to set maximum transmit power levels. *See* 47 C.F.R. §§ 25.226(a)(1)(ii)(B), (b)(1).

5000 will not resume transmission until pointing accuracy is within 0.35 degrees.[9] The following is the Raysat 24/7 point of contact with the authority and ability to cease all emissions from the terminals:

Ilan Kaplan
703-462-5001
1750 Old Meadow Road
McLean, VA 22180

C. StealthRay™ 5000 Antenna Patterns

The transmit gain pattern shown in Figure 3 below exceeds the Commission's routine licensing guidelines, but by limiting the input power spectral density ("PSD") to -20.8 dBW/4kHz, the off axis EIRP spectral density remains below the off-axis PSD mask even with a 0.5 degree pointing error in the GSO plane.[10] This is shown in Figure 4 (up to 20 degrees).

[9] *Id*. Although the VMES rules permit the resumption of transmissions at the declared pointing maximum pointing error (*i.e.*, 0.5°), Raysat will not resume transmissions until pointing accuracy is within 0.35°.

[10] *See* 47 C.F.R. §§ 25.226(a)(1)(i), (b)(1).

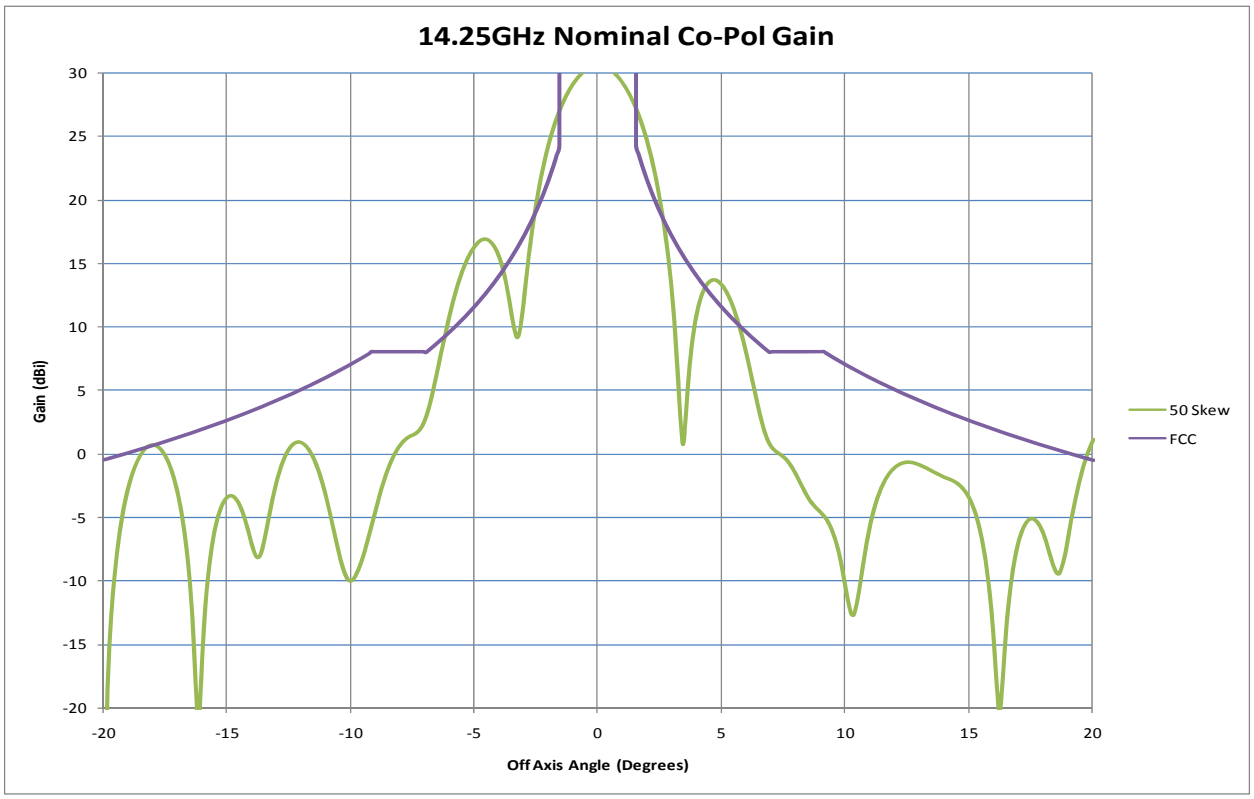

Figure 3 – Gain Pattern

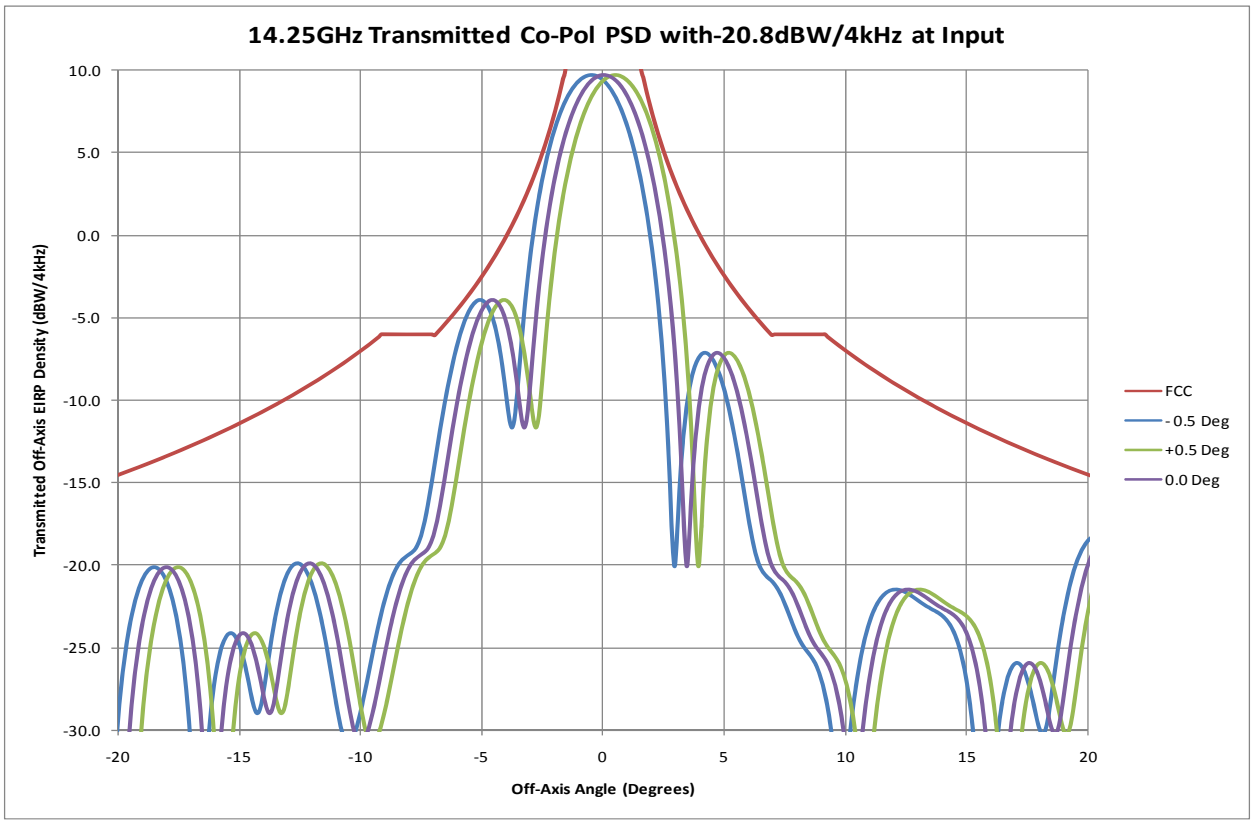

Figure 4 –Off-Axis PSD Pattern

Reduced input PSD into the antenna ensures compliance with permissible off-axis EIRP levels associated with two-degree spacing and the coordinated parameters of the serving satellite. Therefore, at all times transmissions from the StealthRay™ 5000 antenna are compliant with the Commission's two-degree spacing levels, even with a 0.5 degree pointing error in the GSO plane.

Raysat has performed detailed analysis and has confirmed that the adjacent satellite interference levels produced under the worst case operating conditions with a PSD of -20.8 dBW/4kHz at the input flange would be no worse than those of a Section 25.209 compliant antenna with a PSD of -14 dBW/4kHz at its input flange (*i.e.*, a routinely licensed VSAT antenna).

E. Public Interest Statement

As the Commission is aware, Raysat has been engaged with the U.S. Government and DoD on numerous contracts. The instant request for STA is filed in order to permit Raysat to provide StealthRay™ 5000 antennas pursuant to government contract. The antennas will continue to be tested pursuant to Raysat's authorization and incorporated into military vehicles and then shipped to a foreign theater of operations for deployment. Raysat will not operate the antennas as part of a satellite communications service unless and until it is granted commercial authority pursuant to the planned above-referenced application for modification of Raysat's existing commercial licenses. Rather, Raysat has manufactured the antennas and will operate them in the United States only for the purpose of integration and testing before deployment abroad.[11] Therefore, grant of the instant application will serve the public interest by supporting national security priorities.

[11] Additional information concerning the Raysat government contract is provided in a confidential exhibit submitted herewith.

II. CONCLUSION

In view of the foregoing, Raysat requests that the Commission consider and act on the instant application for experimental authority as soon as practicable to allow Raysat to continue to meet the requirements of a DPAS government contract. The StealthRay™ 5000 antennas are currently authorized pursuant to STA. Further, they are a derivative of the StealthRay™ antennas, which are authorized pursuant to experimental and long-term commercial licenses. Finally, the VMES terminals will meet the Commission's two-degree spacing levels.

The terminals will be operated intermittently for purposes of integration and testing only and will not be used by Raysat to provide communications services. Given the important national security interests implicated by the instant application, expeditious grant would plainly serve the public interest.