**EXPERIMENTAL STA APPLICATION
PUBLIC INTEREST STATEMENT**

Raysat Antenna Systems, LLC ("RAS") hereby requests an experimental special temporary authorization ("STA") to operate up to 100 additional 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"). Specifically, in addition to RAS's 100 currently authorized StealthRay™ mobile terminals (*See* Call Sign WC9XZA, File No. 0327-EX-ST-2007), RAS seeks to test and demonstrate up to 100 new T5 terminals-- a lighter weight, lower cost terminal that is essentially identical to RAS's existing terminal from an operational and interference perspective. As discussed below, grant of the experimental STA would strongly serve the public interest by supplementing RAS's currently authorized LMSS experimental operations with an additional lower-cost antenna, which will result in expanded service and equipment options for U.S. government and other customers.

I. INTRODUCTION AND BACKGROUND

RAS currently holds an experimental STA to operate up to 100 LMSS terminals (*see* Call Sign WC9XZA, File No. 0327-EX-ST-2007). RAS is developing the T5 terminal, a low-profile antenna based on RAS's proprietary array antenna technology. The T5 is a smaller version of the StealthRay antenna currently authorized under RAS's existing STA, and for which RAS has a license application on file with the Commission.[1/] Both RAS terminals operate in Ku-band frequencies (14-14.5 GHz (transmit), 11.7 - 12.2 GHz (receive)).

[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); *see also* Application Amendment, Call Sign E060101, File No. SES-AMD-20070620-00839 (filed June 20, 2007).

The T5 has a low profile and a small footprint, which allows it to be placed unobtrusively on vehicles. The full motion tracking system allows the user to have access to high-speed data access on the move, thus allowing users access to critical communications anywhere in the United States and in a variety of mobile contexts. This includes Satcom-on-the-Move ("SOTM") for U.S. military operations, mobile communications for first responders in disaster recovery and other emergency circumstances, and other government and commercial applications.

RAS requires a STA to allow us to demonstrate the feasibility of the new lighter weight, lower cost antenna to potential customers, mainly in the government. As noted above, a blanket earth station application is currently pending before the International Bureau that will provide "regularized" authority for RAS's LMSS operations once granted and RAS will modify that authority to include the T5. Given the need to test the proposed operations and antennas in the short-term, however, RAS needs an experimental STA for a period of up to six months to add the T5 antenna to its existing experimental operations (demonstrations to U.S. military and government users, limited market study, etc.).

In the interest of administrative efficiency, the previous application information associated with Call Signs WD2XTB (File No. 0135-EX-ML-2005 and earlier file numbers) and WC9XZA (File No. 0327-EX-ST-2007) is hereby incorporated by reference. Only supplemental information and support for new experimental authority are provided in this STA request. To the extent the Commission requires additional information, RAS respectfully requests that it be permitted to supplement the record. In addition, RAS confirms that it understands and accepts that it will be subject to the same terms and conditions included in the existing STA.

II. TECHNICAL DATA

A. General Technical Data

The T5 antenna consists of two array panels, one for transmit and one for receive. Both panels are slaved together for azimuth, elevation and polarization angles.

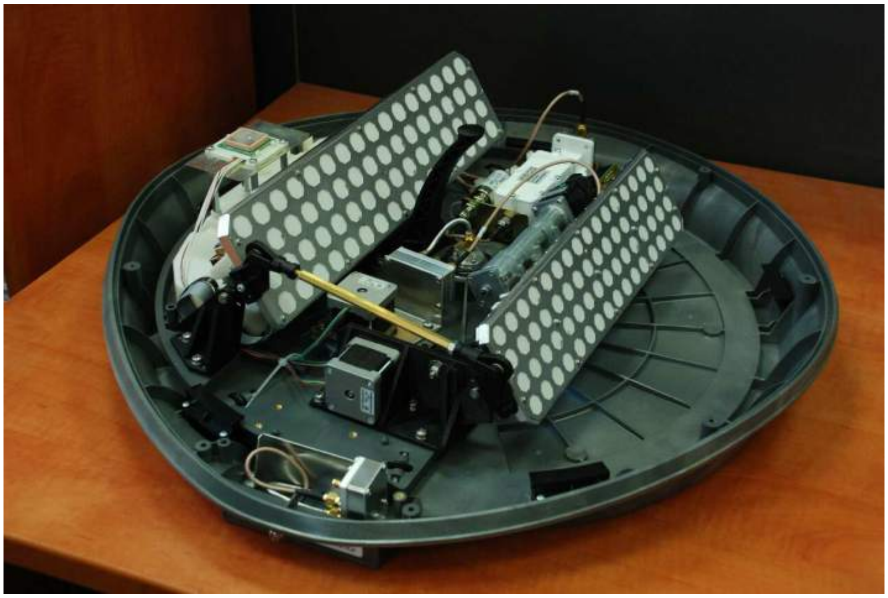

Figure 1. T5 Antenna

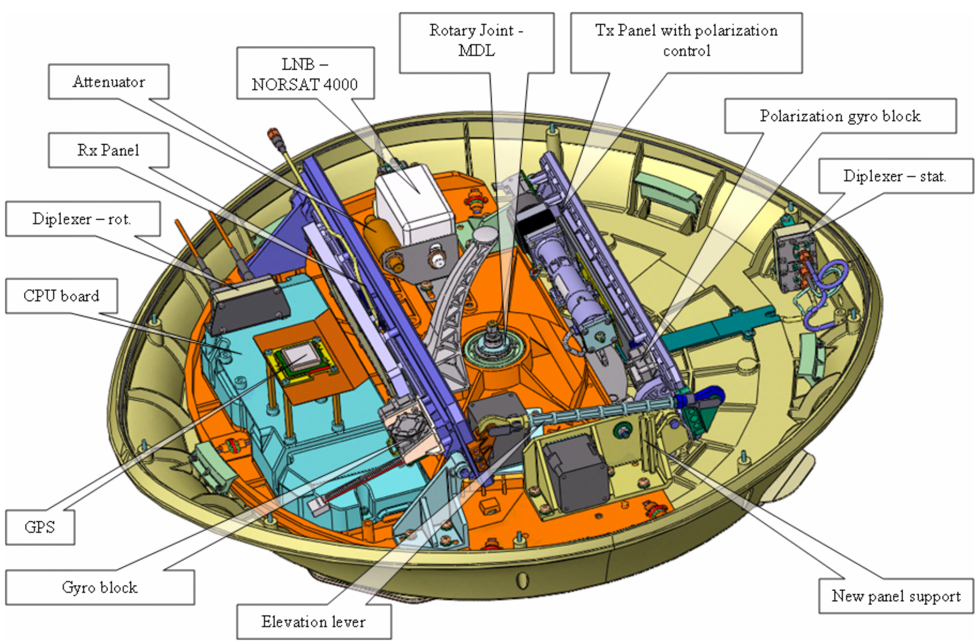

Figure 2. T5 Antenna (Diagram)

The main differences between the licensed StealthRay antenna and the new T5 antenna are as follows. First, as shown above, the T5 antenna consists of two array panels, one for transmit and one for receive. Both panels are slaved together for azimuth, elevation and polarization angles. The StealthRay antenna similarly has one transmit panel but three receive panels.

Second, the T5 antenna uses shorter panels for both transmit and receive (see below).

Parameter	**StealthRay**	**T5**
Tx Panel dimension	8.6cm x 59cm	8.6cm x 35cm
Tx gain	27.5 dBi	24 dBi
Antenna Dimension	45in x 35in x 5.9in	22in x 23in x 7in

Third, the StealthRay generates tracking beams electronically in the elevation plane while the T5 generates tracking beams electronically in the azimuth plane. This allows the T5 to produce smaller variations in the levels of adjacent satellite interference because the StealthRay antenna must mechanically scan in the azimuth plane to peak the signal (tracking beams ensure proper elevation), whereas the T5 scans in the elevation plane (*i.e.*, no side-to-side scanning in the azimuth plane). This results in enhanced adjacent satellite interference protection.

For both systems the maximum level of off-pointing is set to 0.5° in the azimuth plane after which the transmissions are commanded to turn off. In addition, reduced input power into the antenna ensures compliance with off-axis EIRP levels associated with two-degree spacing and the coordinated parameters of the serving satellite. All other network architecture parameters and operational procedures, including point of contact information and hub earth station control, are the same for both antennas.

B. Adjacent Satellite Interference Protection

Like the original StealthRay antenna, RAS has deployed an autonomous acquisition and tracking system in the T5 that combines open and closed loop elements. The system has been proven to be robust and reliable in field operations. Additionally, to ensure and maintain compliance with Commission regulations, the interaction includes "muting" of the modem transmitter (*i.e.*, automatic cessation of emissions) during intervals when the antenna pointing error exceeds 0.5 degrees in the azimuth plane.

RAS has performed detailed analysis and has confirmed that the adjacent satellite interference levels produced under the worst case operating conditions with a -20dBW/4kHz at the input flange would be no worse than a Section 25.209 compliant antenna with -14dBW/4kHz at its input flange. A detailed description of the system follows.

Signal Tracking Components. For the satellite acquisition and reacquisition, the proven principles implemented in existing RAS antenna will be applied. A simplified block diagram of the major components in the tracking and acquisition system is shown in Figure 3.

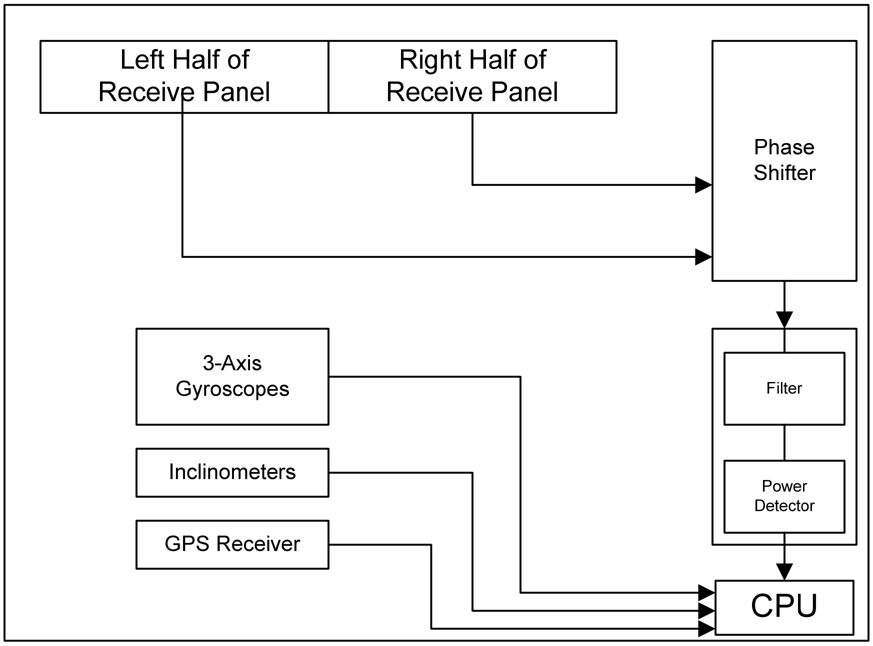

Figure 3. Tracking System Components

For the initial acquisition of the selected communications satellite the CPU receives information about antenna location from the GPS module. Using the antenna's positional information, along with the known orbit longitude of the target satellite, the elevation angle to the satellite and the polarization angles are calculated and set. The antenna is then rotated in azimuth.

The signal level at the Receive Signal Strength Indicator ("RSSI") is constantly sampled. If the received power exceeds the specified threshold, the antenna tracks on the signal and waits for an acknowledgement from the user-supplied modem. If the modem sends an acknowledgement of a signal lock the antenna will continue to track the signal. If the modem does not acknowledge the signal, the antenna stops tracking and continues to rotate in azimuth until it finds the next signal. This process continues until the correct signal is found. The signal acquisition is robust and can acquire a satellite while the antenna is on the move.

Tracking Methodology. Once the target satellite is acquired, the tracking process is controlled by the CPU using the information from gyroscope sensors for platform rotation in azimuth and elevation as well as from signal levels at the RSSI. In the azimuth plane the antenna electronically generates two tracking beams in addition to the main signal beam through the phase combining network with signals from the left and right half of the receive panel. The tracking beams are located to the left and right of the main beam. The CPU determines that the antenna is pointed correctly when the levels of the left and right tracking beams are equal in amplitude. If the tracking signal levels are not equal, a proportionate correction is applied in the appropriate direction until equilibrium is restored. In the elevation plane the antenna scans mechanically above and below the satellite position. During the scanning process the correlation of the antenna position and the RSSI level is made via information from the gyro block. The antenna calculates the position of the satellite from the drop in the signal level. The mechanical scanning angle is variable since the energy detector is set to determine when the signal level has dropped 0.3 dB from the peak. This results in the scanning angle ranging from ± 0.8° at a skew angle of 45° to ± 2.6° at a skew angle of 0° as shown in Figure 4.

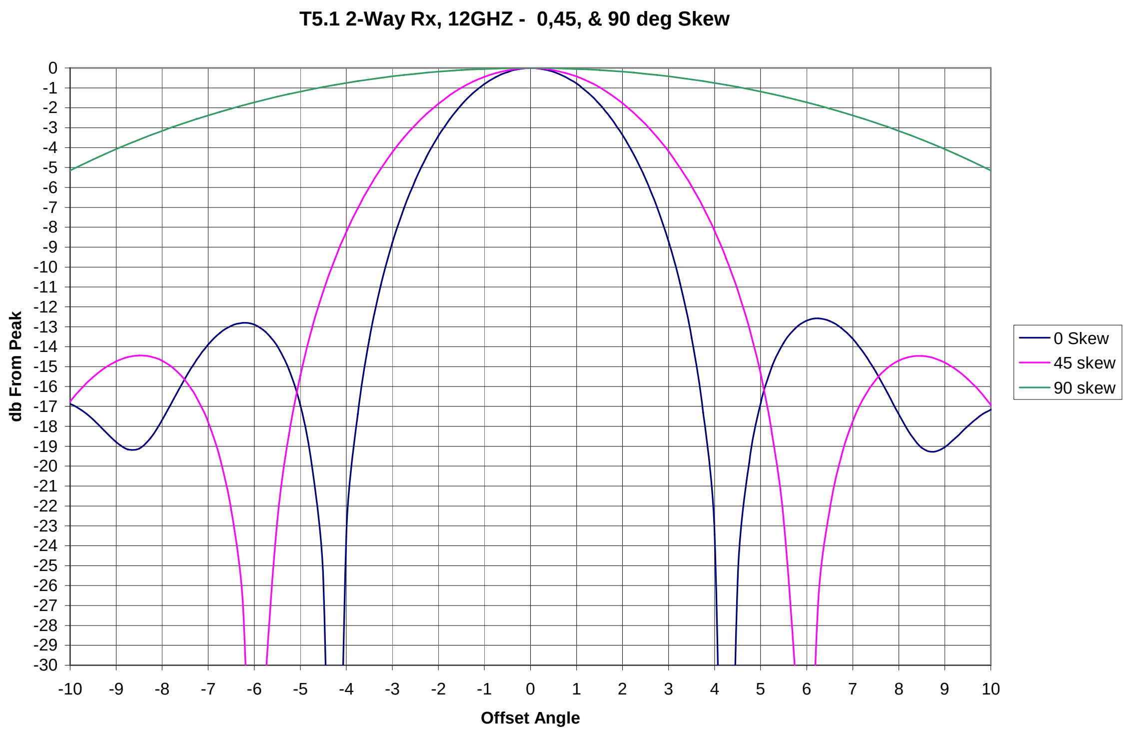

Figure 4. Receive Pattern at Various Skew Angles

Although the T5 has a significant scan angle in the elevation plane, the contribution of the elevation pattern to adjacent satellite interference is minimal due to the broad pattern in the elevation plane. This can be seen in Figure 5 which is a section of the two dimensional antenna transmit contour pattern.[2] As shown in Figure 5, at a skew angle of 45° the elevation movement is ±0.8° for the 0.3 dB drop required by the RSSI. In Figure 5, the ±0.8° movement lines are drawn intersecting the 2° circle at it can be seen the increase in the level of interference to the adjacent satellite is only 0.25 dB.

[2] The contour pattern shows the equi-gain antenna contours similar to that of a topographical map. For example, all possible locations of a satellite 2° away from the target satellite can be described by a circle with a radius of 2°. Further, if the required skew angle to the adjacent satellite is 45° then the position of the satellite relative to the antenna can be seen as the intersection of a 45° line with the 2° circle as seen in Figure 3.

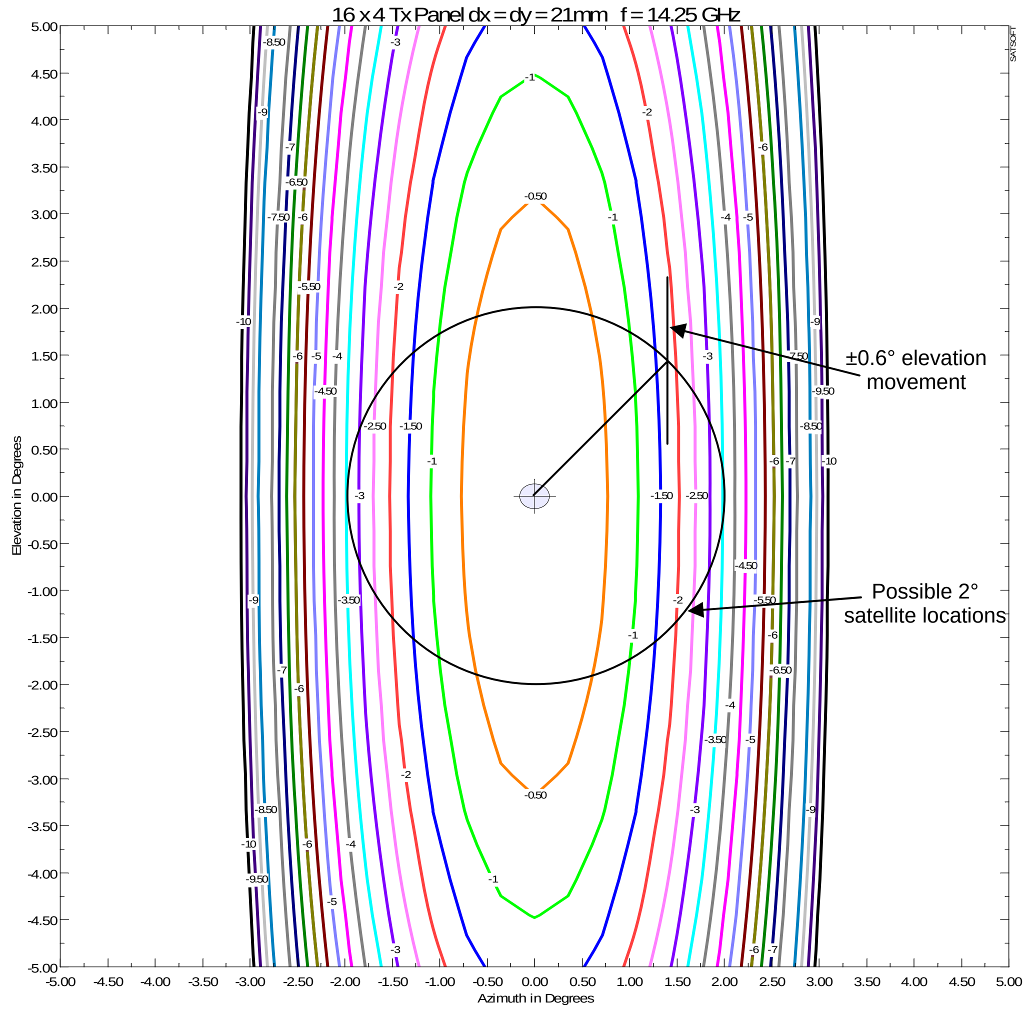

Figure 5. 0.25 dB ASI Variation with Elevation scanning at a 45° Skew Angle

It should be noted that the Antenna Control Unit will issue a command to mute the modem when the angular error between the satellite and the antenna position reaches or exceed 0.5 degrees in the azimuth plane. Additionally the modem transmit is also muted when the receive path is obstructed.

Antenna Patterns. The predicted transmit pattern is shown in Figure 6, along with the Commission’s off-axis sidelobe pattern mask.

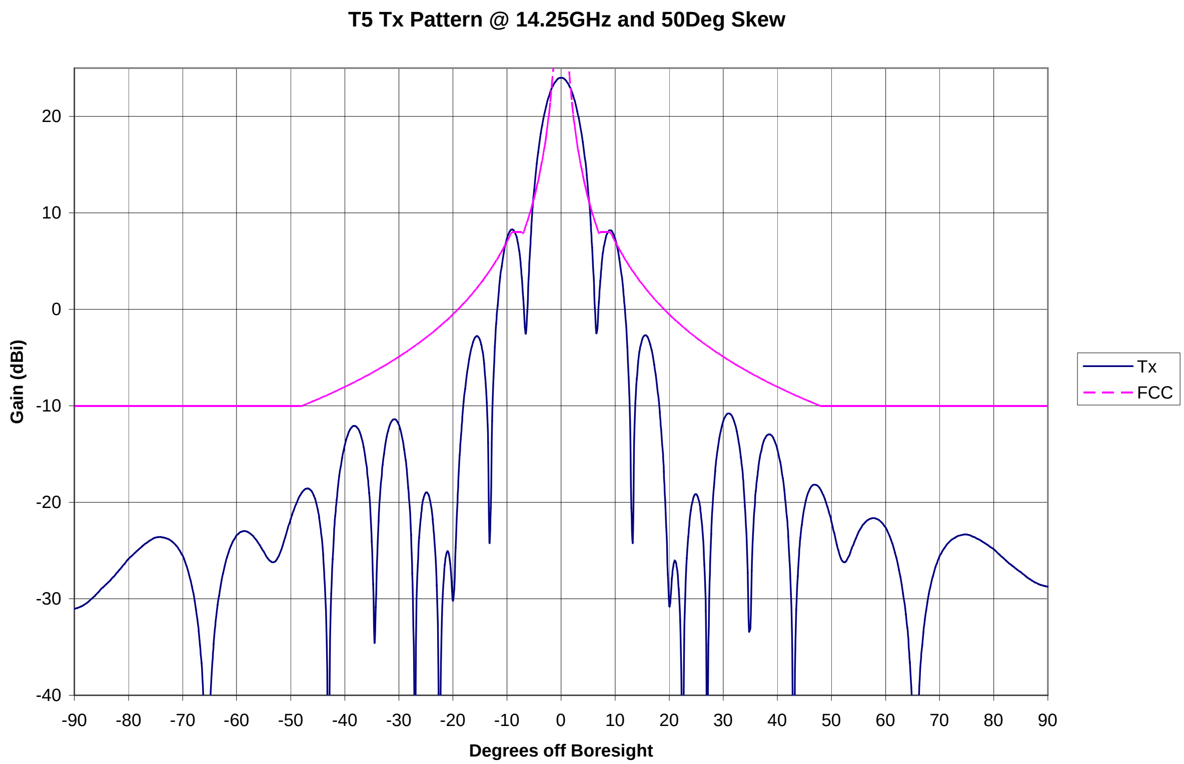

Figure 6. Antenna Gain Pattern

The transmit pattern exceeds the Commission's routine licensing guidelines, but by limiting the input power spectral density to -20dBW/4kHz the off axis EIRP density remains under the off-axis PSD mask *even with a 0.5 degree azimuth pointing error* as shown in Figure 7. Thus, at all times transmissions from the T5 antenna are compliant with the Commission's 2-degree spacing levels.

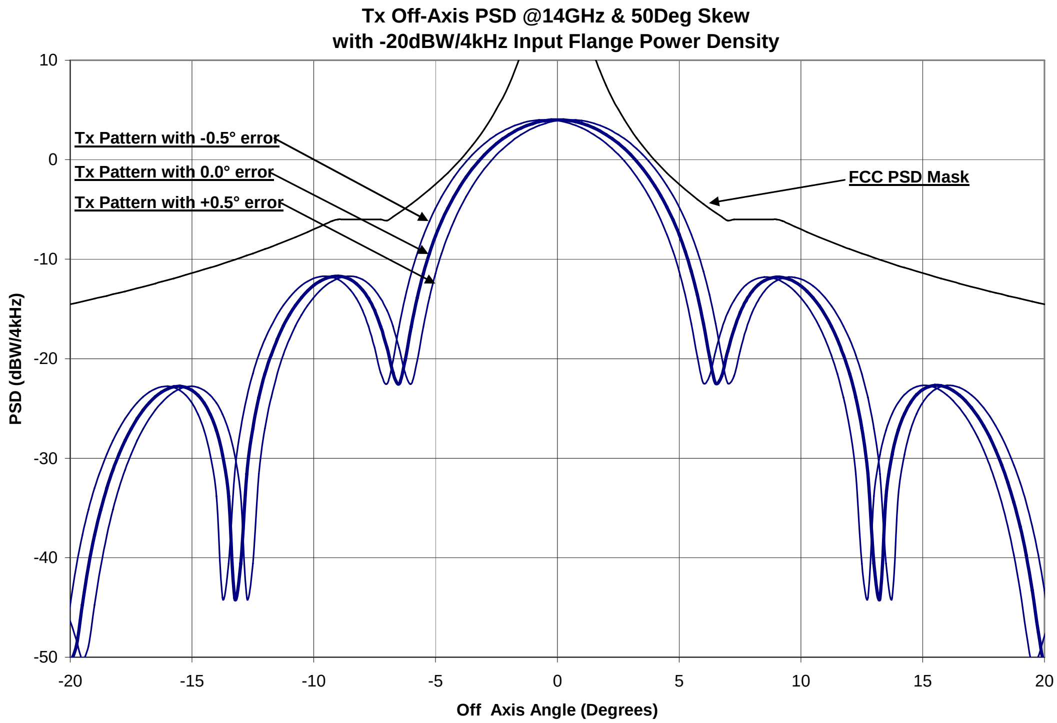

Figure 7. Off Axis PSD with -20dBW/4kHz Input Power Density

III. CONCLUSION

As demonstrated herein, grant of the requested experimental STA would strongly serve the public interest. Specifically, grant of the requested authority would permit RAS to add a new antenna to its already authorized LMSS operations and expand the range of mobile broadband options available to U.S. government users, without increasing the potential for interference to other users of Ku-band spectrum.