

**Exhibit For
SES Americom, LLC
Woodbine, Maryland
Call Sign: E920698
STI 9.2 Meter Earth Station**

**Compliance with FCC Report & Order (FCC 96-377) for the 13.75 - 14.0 GHz Band
Analysis and Calculations**

1. Background

This Exhibit is presented to demonstrate the extent to which the SES Americom, LLC satellite earth station in Woodbine, Maryland is in compliance with FCC REPORT & ORDER 96-377. The potential interference from the earth station to US Navy shipboard radiolocation operations (RADAR) and the NASA space research activities in the 13.75 - 14.0 GHz Band is addressed in this exhibit. The parameters for the earth station are:

Table 1. Earth Station Characteristics

• Coordinates (NAD83):	39° 22' 33.0" N, 77° 04' 54.0" W
• Satellite Location for Earth Station:	(72.5° W) Astra 2C
• Frequency Band:	13.75-14.0 GHz for uplink
• Polarizations:	H,V
• Emissions	800KF9D
• Modulation:	Digital
• Maximum Aggregate Uplink EIRP:	85.0 dBW for the 800 kHz Carriers
Antenna Size:	Transmit Antenna Characteristics 9.2 meters in Diameter
Antenna Type/Model:	STI
Gain:	60.2 dBi
• RF power into Antenna Flange:	800 kHz 24.8 dBW or 1.8 dBW/4 kHz (Maximum)
• Minimum Elevation Angle: Woodbine, Md	44.2° @ 172.8° Az.
• Side Lobe Antenna Gain:	32 - 25*log(θ)

Because the above uplink spectrum is shared with the Federal Government, coordination in this band requires resolution data pertaining to potential interference between the earth station and both Navy Department and NASA systems. Potential interference from the earth station could impact with the Navy and/or NASA systems in two areas. These areas are noted in FCC Report and Order 96-377 dated September 1996, and consist of (1) Radiolocation and radio navigation, (2) Data Relay Satellites.

Summary of Coordination Issues:

- 1) Potential Impact to Government Radiolocation (Shipboard Radar)
- 2) Potential Impact to NASA Data Relay Satellite Systems (TDRSS)

2. Potential Impact to Government Radiolocation (Shipboard Radar)

Radiolocation operations (RADAR) may occur anywhere in the 13.4 - 14 GHz frequency band aboard ocean going United States Navy ships. The Federal Communication Commission (FCC) order 96-377 allocates the top 250 MHz of this 600 MHz band to the Fixed Satellite Service (FSS) on a co-primary basis with the radiolocation operations and provides for an interference protection level of -167 dBW/m²/4 kHz.

The closest distance to the shoreline from the Woodbine earth station is approximately 65.9 km Southeast toward the Chesapeake Bay. The calculation of the power spectral density at this distance is given by:

Clear Sky EIRP (dBW):	85.0
Carrier Bandwidth:	800 kHz
PD at antenna Input:	1.8 (dBW/4 kHz)
Transmit Antenna Gain:	60.2 dBi
Antenna Gain Horizon:	FCC Reference Pattern
Antenna Elevation Angle:	44.2°

The proposed earth station will radiate interference toward the Chesapeake Bay according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of -8.8 dBi toward the Chesapeake Bay.

The signal density at the shoreline, through free space is:

800 kHz Carriers

PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m²).

$$\begin{aligned} &= 1.8 \text{ dBW/4 kHz} + (-8.8) \text{ dBi} - 10 \cdot \log[4\pi \cdot (65900\text{m})^2] \\ &= -114.36 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses } (\sim 63.0 \text{ dB}) \\ &= -177.36 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

Our calculations identified additional path losses of approximately 63.0 dB including absorption loss and earth diffraction loss for the actual path profiles from the earth station to the nearest shoreline.

The worst case calculated PFD including additional path losses to the closest shoreline location is $-177.36 \text{ dBW/m}^2/4 \text{ kHz}$ for all carriers. This meets the $-167 \text{ dBW/m}^2/4 \text{ kHz}$ interference criteria of R&O 96-377. Therefore, there should be no interference to the US Navy RADAR from the Woodbine earth station due to the distance and the terrain blockage between the site and the shore.

3. Potential Impact to NASA's Data Relay Satellite System (TDRSS)

The geographic location of the SES Americom earth station in Woodbine, Maryland is outside the 390 km radius coordination contour surrounding NASA's White Sands, New Mexico ground station complex. Therefore, the TDRSS space-to-earth link will not be impacted by the SES Americom earth station in Woodbine, Maryland.

The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP less than 71 dBW/6 MHz in this band. The 9.2 meter earth station antenna will have an EIRP greater than 71 dBW/6 MHz for the 800 kHz carrier. The total EIRP for the 800 kHz carrier is 85.0 dBW and the equivalent EIRP per 6 MHz segment would be 84.8 dBW/6 MHz.

In order to meet the 71 dBW/6 MHz interference criteria, the earth station's 800 kHz carrier would have to be limited to an RF power density 13.8 dB lower than the maximum of 1.8 dBW/4kHz or -12.0 dBW/4kHz for an EIRP of 71.2 dBW. If this operational condition cannot be met, then the Woodbine, Maryland earth station will not be tuned to operate at the frequencies in the 13.772 to 13.778 GHz Band.

4. Coordination Issue Result Summary and Conclusions

The results of the analysis and calculations performed in this exhibit indicate that compatible operation between the earth station at the Woodbine facility and the US Navy and NASA systems space-to-earth link are possible for all of the proposed carriers. Operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will also be permitted with the reduced EIRP of 71.2 dBW.