Exhibit For
SES Americom, LLC
Mt. Airy, Maryland
Vertex Corporation 13.1 Meter Earth Station

Compliance with FCC Report & Order (FCC96-377) 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 Mt. Airy, 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' 37.1" N, 77° 04' 49.1" W
- Satellite Location for Earth Station: NSS 7 (20.0° W), SES 4 (22.0° W), and NSS 806 (40.5° W)
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear
- Emissions: 100KG7W, 1M00F9D, 24M0G7W, and 36M0G7W
- Modulation: Analog and Digital
- Maximum Aggregate Uplink EIRP: 63.5 dBW for the 100 kHz Carriers
  79.5 dBW for the 1 MHz Carriers
  87.3 dBW for the 24 MHz Carriers
  89.0 dBW for the 36 MHz Carriers
- Transmit Antenna Characteristics
  - Antenna Size: 13.1 meters in Diameter
  - Antenna Type/Model: Vertex Corporation
  - Gain: 63.5 dBi
- RF power into Antenna Flange: 100 kHz
  0.0 dBW
  or -14.0 dBW/4 kHz (Maximum)

- RF power into Antenna Flange: (Continued)

  1.0 MHz
  16.0 dBW or 16.0 dBW/MHz
  or -8.0 dBW/4 kHz (Maximum)

  24 MHz
  23.8 dBW or 10.0 dBW/MHz
  or -14.0 dBW/4 kHz (Maximum)

  36 MHz
  25.5 dBW or 10.0 dBW/ MHz
  or –14.0 dBW/4 kHz (Maximum)

- Minimum Elevation Angle:
  Mt. Airy, MD

  16.5° @ 112.3° Az. (NSS 7) at 20.0° W
  18.0° @ 113.9° Az. (SES 4) at 22.0° W
  30.9° @ 130.5° Az. (NSS 806) at 40.5° W

- Side Lobe Antenna Gain: $32 - 25*\log(\theta)$

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 $dBW/m^2/4$ kHz.

The closest distance to the shoreline from the Mt. Airy 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:

		100 kHz	1.0 MHz	25.0 MHz	36.0 MHz
1.	Clear Sky EIRP:	63.5 dBW	79.5 dBW	87.3 dBW	89.0 dBW
2.	Carrier Bandwidth:	100 kHz	1 MHz	24 MHz	36 MHz
3.	PD at antenna Input: (dBW/4 kHz)	-14.0	-8.0	-14.0	-14.0
4.	Transmit Antenna Gain:	63.5 dBi			
5.	Antenna Gain Horizon:	FCC Reference Pattern			
6.	Antenna Elevation Angles:	16.5° , 18.0°, and 30.9°			

The proposed earth station will radiate interference toward the Bay according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of 1.4 dBi toward the Chesapeake Bay.

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

100 kHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -14.0 dBw/4 kHz + 1.4 dBi – 10*log[4Π*(65900m)^2]
= -120.0 dBW/m^2/4 kHz + Additional Path Losses (~63.0 dB)
= -183.0 dBW/m^2/4 kHz

1 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -8.0 dBw/4 kHz + 1.4 dBi – 10*log[4Π*(65900m)^2]
= -114.0 dBW/m^2/4 kHz + Additional Path Losses (~63.0 dB)
= -177.0 dBW/m^2/4 kHz

24 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -14.0 dBw/4 kHz + 1.4 dBi – 10*log[4Π*(65900m)^2]
= -120.0 dBW/m^2/4 kHz + Additional Path Losses (~63.0 dB)
= -183.0 dBW/m^2/4 kHz

36 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -14.0 dBw/4 kHz + 1.4 dBi – 10*log[4Π*(65900m)^2]
= -120.0 dBW/m^2/4 kHz + Additional Path Losses (~63.0 dB)
= -183.0 dBW/m^2/4 kHz

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 –177.0 dBW/m^2/4 kHz for the 1 MHz carriers, and -183.0 dBW/m^2/4 kHz for the 100 kHz, 24 MHz, and 36 MHz carriers. This is 10 dB below the –167 dBW/ m^2/4 kHz interference criteria of R&O 96-377 for the 1 MHz carriers and 16.0 dB below the –167 dBW/ m^2/4 kHz interference criteria of R&O 96-377 for the 100 kHz, 24 MHz, and 36 MHz carriers. Therefore, there should be no interference to the US Navy RADAR from the Mt. Airy 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 Mt. Airy, 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 Mt. Airy, 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 13.1 meter earth station antenna will have an EIRP less than 71 dBW/6 MHz for the 100 kHz carriers in this band. The total EIRP for the 100 kHz, carriers is 63.5 dBW. The equivalent EIRP per 6 MHz segment will remain at 63.5 dBW/6 MHz. Therefore, there should not be interference to the TDRSS space-to-space link for the 100 kHz carriers. For the 1 MHz, 24 MHz, and 36 MHz carriers, the total EIRP of 79.5 dBW (1 MHz), 87.3 dBW (24 MHz), and 89.0 dBW (36 MHz) equate to an EIRP per 6 MHz of 79.5 dBW/6 MHz, 83.3 dBW/6 MHz and 83.0 dBW/6 MHz, respectively. These levels are above the 71.0 dBW/6 MHz threshold, and there will be interference to the TDRSS space-to-space link. Therefore, transmit operations from 13770 to 13780 MHz will not be permitted for the 1 MHz, 24 MHz and 36 MHz emissions.

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 Mt. Airy facility and the US Navy and NASA systems space-to-earth link are possible for the 100 kHz carriers. Operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will also be permitted for the 100 kHz carriers.

For the 1 MHz, 24 MHz, and 36 MHz carriers, the results of the analysis and calculations performed in this exhibit indicate that compatible operation between the earth station at the Mt. Airy facility and the US Navy and NASA systems space-to-earth link are possible. However, operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will not be permitted. Frequencies from 13770.0 to 13780.0 MHz will need to be avoided for the 1 MHz, 24 MHz and 36 MHz carriers.