

Exhibit E

Intelsat License LLC Hagerstown, Maryland GD SATCOM Technologies 9.0 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 proposed Intelsat License LLC satellite earth station, to be located in Hagerstown, Maryland, is in compliance with FCC Report & Order 96-377. The potential interference from the earth station to U.S. 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 (NAD 83): 39° 35' 54.7" N, 77° 45' 21.9" W
- Satellite Location for Earth Station: 58° WL (Intelsat 21)
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Circular and Linear
- Emissions: 660KF2D
1M00F2D
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 85.0 dBW for the 660 kHz Carriers
85.0 dBW for the 1 MHz Carriers
- Transmit Antenna Characteristics
 - Antenna Size: 9.0 meters in Diameter
 - Antenna Type/Model: GD SATCOM Technologies
 - Gain: 60.1 dBi
- RF power into Antenna Flange: 660 kHz
24.9 dBW
or 2.7 dBW/4 kHz (Maximum)

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|-----------------------------|--|
| | 1.0 MHz |
| | 24.9 dBW or 24.0 dBW/ MHz |
| | or 0.9 dBW/4 kHz (Maximum) |
| • Minimum Elevation Angles: | |
| Hagerstown, Md. | 39.8° @ 150.6° Az. (Intelsat 21) at 58.0° WL |
| • Side Lobe Antenna Gain: | 32 - 25*log(θ) |

The 13.75 - 14.0 GHz uplink spectrum is shared with the Federal Government. This requires an analysis of potential interference between the proposed earth station operations and both Navy and NASA systems. Potential interference from the earth station could occur 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 U.S. Navy ships. FCC's Report & 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 Hagerstown earth station is approximately 131 km Southeast toward the Atlantic Ocean. The calculation of the power spectral density at this distance is given below.

	<u>660 kHz</u>	<u>1 MHz</u>
1. Clear Sky EIRP:	85.00 dBW	
2. Carrier Bandwidth:	660 kHz	1.0 MHz
3. PD at antenna input:	2.7 dBW/4 kHz	0.9 dBW/4 kHz
4. Transmit Antenna Gain:	60.1 dBi	
5. Antenna Gain Horizon:	FCC Reference Pattern	
6. Antenna Elevation Angle:	39.8°	

The proposed earth station will radiate interference toward the ocean according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of -10.0 dBi towards the Atlantic Ocean.

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

660 kHz Carriers

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

$$\begin{aligned} &= 2.7 \text{ dBW/4 kHz} + (-10.0 \text{ dBi}) - 10 \cdot \log[4\pi \cdot (131000\text{m})^2] \\ &= -120.6 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses} (\sim 69.7 \text{ dB}) \\ &= -190.3 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

1 MHz Carriers

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

$$\begin{aligned} &= 0.9 \text{ dBW/4 kHz} + (-10.0 \text{ dBi}) - 10 \cdot \log[4\pi \cdot (131000\text{m})^2] \\ &= -122.4 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses} (\sim 69.7 \text{ dB}) \\ &= -192.1 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

Our calculations show additional path loss of approximately 69.7 dB including absorption loss and earth diffraction loss for the actual path profiles from the proposed earth station to the nearest shoreline.

For the 660 kHz carriers, the calculated PFD including additional path losses to the closest shoreline location is -190.3 dBW/m²/4 kHz. This is 23.3 dB below the -167 dBW/m²/4 kHz interference criteria of R&O 96-377. For the 1 MHz carriers, the calculated PFD including additional path losses to the closest shoreline location is -192.1 dBW/m²/4 kHz. This is 25.1 dB below the -167 dBW/m²/4 kHz interference criteria of R&O 96-377. Therefore, for either emission, there should be no interference to the US Navy RADAR from the Hagerstown 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 Intelsat License LLC earth station in Hagerstown, 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 Intelsat License LLC earth station in Hagerstown, 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 9.0 meter earth station dish will have an EIRP greater than 71 dBW/6 MHz in this band. The total EIRP for all carriers is 85.0 dBW, and the equivalent EIRP per 6 MHz segment remains at 85.0 dBW/6 MHz for both of the emissions.

However the Maryland earth station will not operate at the frequencies in the 13.770 to 13.780 GHz range. Therefore, there will be no interference to the TDRSS space-to-space link (Table 1).

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 Hagerstown facility and the U.S. Navy and NASA systems space-to-earth link are possible. These analyses have been based on the assumption of 660 kHz and 1 MHz bandwidth carriers. The earth station will not operate in NASA systems space-to-space link (13772.0 to 13778.0 MHz) frequency range.

Table 1

Excluded Frequency Range for Intelsat License LLC Earth Station

System	Frequency Restriction
TDRSS	13.770-13.780 GHz

No interference to U.S. Navy RADAR operations from the Hagerstown, Maryland earth station will occur.