

**Intelsat License LLC  
 Filmore (E000063), California  
 RSI 11.0 Meter 1130KS 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 Intelsat License LLC satellite earth station in Filmore, California 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): 34° 24' 18.0" N, 118° 53' 42.4" W
- Satellite Location for Earth Station: IS-1R (50.0° W)
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear and Circular
- Emissions: 850KFXD
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 85.0 dBW for the 850 kHz Carrier
- Transmit Antenna Characteristics
  - Antenna Size: 11.0 meters in Diameter
  - Antenna Type/Model: RSI
  - Gain: 62.5 dBi
- RF power into Antenna Flange: 850 kHz  
 22.5 dBW  
 or -0.8 dBW/4 kHz (Maximum)
- Minimum Elevation Angle:  
 Fillmore, CA 8.7° @ 102.3° Az. (IS-1R) at 50.0° W
- 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  $-167 \text{ dBW/m}^2/4 \text{ kHz}$ .

The closest distance to the shoreline from the Filmore earth station is approximately 39.4 km Southwest toward the Pacific Ocean. The calculation of the power spectral density at this distance is given by:

	<u>850.0 kHz</u>
1. Clear Sky EIRP:	85.0 dBW
2. Carrier Bandwidth:	850 kHz
3. PD at antenna Input: (dBW/4 kHz)	-0.8
4. Transmit Antenna Gain:	62.5 dBi
5. Antenna Gain Horizon:	FCC Reference Pattern
6. Antenna Elevation Angle:	8.7°

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

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

850 kHz Carriers

PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m<sup>2</sup>).

$$\begin{aligned} &= -0.8 \text{ dBW/4 kHz} + (-10.0) \text{ dBi} - 10 \cdot \log[4\pi \cdot (39400\text{m})^2] \\ &= -113.7 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses } (\sim 71.7 \text{ dB}) \\ &= -185.4 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

Our calculations identified additional path losses of approximately 65.6 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  $-185.4 \text{ dBW/m}^2/4 \text{ kHz}$  for the 850 kHz carriers. This is 18.4 dB below 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 Filmore 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 earth station in Filmore, California 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 Filmore, California.

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 11.0 meter earth station antenna will not have an EIRP less than 71 dBW/6 MHz for the 850 kHz carriers in this band. The total EIRP for the 850 kHz, carriers is 85.0 dBW. The equivalent EIRP per 6 MHz segment will remain at 85.0 dBW/6 MHz. 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 850 kHz emissions.

In order to meet the 71 dBW/6 MHz interference criteria, the earth station would have to be limited to an RF power density 14.05 dB lower than the maximum of  $-0.8 \text{ dBW/4kHz}$  or  $-14.85 \text{ dBW/4kHz}$  for an EIRP of 70.95 dBW. If this operational condition cannot be met, then the Filmore, California earth station may not be tuned to operate at the frequencies in the 13.770 to 13.780 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 Fillmore facility and the US Navy and NASA systems space-to-earth link are possible. These analyses have been based on the assumption of 850 kHz bandwidth carriers. Operations in NASA systems space-to-space link (13770.0 to 13780.0 MHz) will not be permitted.

**Table 1**

#### **Excluded Frequency Range for Intelsat License LLC Earth Station**

<b>System</b>	<b>Frequency Restriction</b>
TDRSS	13.770-13.780 GHz (see Note 1)

**Note 1:** In order to meet the 71 dBW/6 MHz interference criteria, the earth station would have to be limited to a maximum total EIRP of 70.95 dBW.

No interference to US Navy RADAR operations from the Fillmore, California earth station will occur.