

**Exhibit For  
Comsat, Inc.  
Santa Paula, California  
Call Sign E890649  
TIW/ 14.2 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 licensed Comsat, Inc. satellite earth station, 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' 6.96" N, 119° 4' 21.25" W
- Satellite Location for Earth Station: From 46.0° W to 192.0° W
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: H, V
- Emissions: 72M0G7W
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 86 dBW for the 72 MHz Carriers
- Transmit Antenna Characteristics
  - Antenna Size: 14.2 meters in Diameter
  - Antenna Type/Model: TIW
  - Gain: 64.6 dBi
- RF power into Antenna Flange:
  - 72 MHz
  - 21.4 dBW
  - or -21.1 dBW/4 kHz (Maximum)
- Minimum Elevation Angles:
  - Santa Paula, CA. 5.2° @ 99.8° Az

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

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  $-167 \text{ dBW/m}^2/4 \text{ kHz}$ .

The closest distance to the shoreline from the Santa Paula earth station is approximately 24.13 km West toward the Pacific Ocean. The calculation of the power spectral density at this distance is given by:

#### 72MHz

1. Clear Sky EIRP (dBW): 86.0
2. Carrier Bandwidth: 72MHz
3. PD at antenna Input:  $-21.1 \text{ (dBW/4 kHz)}$
4. Transmit Antenna Gain: 64.6 dBi
5. Antenna Gain Horizon: FCC Reference Pattern
6. Antenna Elevation Angle:  $5.2^\circ$

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 40.6 dBi toward the Coast.

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

72 MHz Carriers

$\text{PFD} = \text{Antenna Feed Power density (dBW/4 kHz)} + \text{Antenna Off-Axis Gain (dBi)} - \text{Spread Loss (dBW-m}^2\text{)}$ .

$$\begin{aligned}
 &= -21.1 \text{ dBW/4 kHz} + (40.6) \text{ dBi} - 10 \cdot \log[4\pi \cdot (24126\text{m})^2] \\
 &= -79.14 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses (}\sim 89.4 \text{ dB)} \\
 &= -168.54 \text{ dBW/m}^2/4 \text{ kHz}
 \end{aligned}$$

Our calculations show additional path loss of approximately 89.4 dB including absorption loss and earth diffraction loss for the actual path profiles from the proposed earth station to the nearest shoreline.

The worst case calculated PFD including additional path losses to the closest shoreline location is  $-168.54 \text{ dBW/m}^2/4 \text{ kHz}$ . This is 1.54 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 Santa Paula earth station in both the main beam and side lobe of the radar.

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

The geographic location of the Comsat, Inc. earth station in Santa Paula, 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 Comsat, Inc. earth station in Santa Paula, 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 total EIRP for the 72 MHz Carrier is 86 dBW and the equivalent EIRP per 6 MHz segment will be 74 dBW/6 MHz. To avoid interference to the TDRSS space-to-space link the 72 MHz carriers will not be used for the transmit spectrum of 13.772 to 13.778 GHz by this earth station.

### **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 Santa Paula facility and the US Navy and NASA systems space-to-earth link are possible for all of the proposed carriers. To avoid interference to the TDRSS space-to-space link the 72 MHz carriers will not be used for the transmit spectrum of 13.772 to 13.778 GHz by this earth station.