

**Exhibit For**  
**3201 Dickerson Properties LLC**  
**Nashville, Tennessee**  
**(Call Sign: E960109)**  
**Vertex / 8.1 Meter KPK 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 3201 Dickerson Properties LLC. satellite earth station (E960109), which is being modified in Nashville, Tennessee, 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): 36° 14' 6.60" N, 86°45' 24.3" W
- Satellite Location for Earth Station: From 15.0° W  
Telstar-12
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear and Circular
- Emissions: 3M65G7W
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 76.7 dBW for the 3.65 MHz Carriers
- Transmit Antenna Characteristics
  - Antenna Size: 8.1 meters in Diameter
  - Antenna Type/Model: Vertex KPK
  - Gain: 59.8 dBi
- RF power into Antenna Flange: 3.65 MHz  
16.9 dBW, or 7.9 dBW/MHz  
or -12.6 dBW/4 kHz (Maximum)

- Minimum Elevation Angles:  
Nashville, Tn. 6.0° @ 101.0° Az. (Telstar-12) at 15.0° 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  $-167 \text{ dBW/m}^2/4 \text{ kHz}$ .

The closest distance to the shoreline from the Nashville, Tennessee earth station is approximately 840 km Southeast toward Hampstead, N.C.. The calculation of the power spectral density at this distance is given by:

3.65 MHz

- |                              |                       |
|------------------------------|-----------------------|
| 1. Clear Sky EIRP:           | 76.7 dBW              |
| 2. Carrier Bandwidth:        | 3.65 MHz              |
| 3. PD at antenna input:      | -12.6                 |
|                              | dBW/4 kHz             |
| 4. Transmit Antenna Gain:    | 59.8 dBi              |
| 5. Antenna Gain Horizon:     | FCC Reference Pattern |
| 6. Antenna Elevation Angle : | 6.0°                  |

The earth station will radiate interference toward Hampstead, N.C. according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of 11.8 dBi toward Hampstead, N.C. and the coastline.

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

### 3.65 MHz Carriers

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

$$\begin{aligned} &= -12.6 \text{ dBW/4 kHz} + (11.8) \text{ dBi} - 10 \cdot \log[4\pi \cdot (840000\text{m})^2] \\ &= -130.27 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses} (\sim 89.7 \text{ dB}) \\ &= -220.2 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

Our calculations show additional path loss of approximately 89.7 dB including absorption loss and earth diffraction loss for the actual path profiles from the proposed earth station to the nearest shoreline.

The calculated PF<sub>D</sub> including additional path losses to the closest shoreline location is –220.2 dBW/m<sup>2</sup>/4 kHz for the 3.65 MHz carriers. This is 53.2 dB (3.65 MHz) below the –167 dBW/m<sup>2</sup>/4 kHz interference criteria of R&O 96-377. Therefore, there should be no interference to the US Navy RADAR from the Nashville 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 3201 Dickerson Properties LLC earth station in Nashville 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 3201 Dickerson Properties LLC. earth station in Nashville, Tennessee.

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 8.1 meter earth station antenna will have an EIRP greater than 71 dBW/6 MHz for the 3.65 MHz carriers in this band. For the 3.65 MHz carriers, the total EIRP of 76.7 dBW will equate to an EIRP per 6 MHz of 76.09 dBW/6 MHz. This level is 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 3.65 MHz emissions.

In order to meet the 71 dBW/6 MHz interference criteria, the earth station’s 3.65 MHz carrier would have to be limited to an RF power density 5.09 dB lower than the maximum of -12.6 dBW/4kHz or -17.69 dBW/4kHz for an EIRP of 76.7 dBW. If this operational condition cannot be met, then the Nashville, Tennessee earth station may 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 Nashville facility and the US Navy and NASA systems space-to-earth link will be possible for the 3.65 MHz carrier.

The results of the analysis and calculations performed in this exhibit also indicate that compatible operations between the earth station at the Nashville facility and the US Navy and NASA systems space-to-earth link will be possible for the 3.65 MHz carriers. However, the analysis based on the assumption of a 3.65 MHz bandwidth carrier indicates that operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will not be permitted. Therefore, the 3.65 MHz carriers will only transmit on frequencies 13,780.0 to 14,000.0 MHz.

The operations of the existing 8.1 meter Ku-band earth station (Call Sign E960109) in the extended Ku-band will be limited to 13,800 – 14,000 MHz avoiding any interference to NASA space research activities