EXHIBIT A

ANALYSIS OF NON-IONIZING RADIATION
FOR A 13 METER EARTH STATION

This report analyzes the non-ionizing radiation for a 13 meter earth station. The Office of Engineering and Technology (OET) Bulletin No. 65, August 1997, specifies two non-ionizing radiation limits relevant to earth stations operating at frequencies between 1.5 GHz and 100 GHz. The first limit, for occupational/controlled exposure, is a power density equal to 5.0 mW/cm^2 averaged over a six minute exposure period. The second limit, for general population/uncontrolled exposure, is a power density equal to 1.0 mW/cm^2 averaged over a 30 minute exposure period. It is the purpose of this report to determine the power flux densities of the earth station in the far field, near field, transition region, between the sub reflector and main reflector, at the main reflector surface, and between the antenna edge and the ground.

The following parameters were used to calculate the various power flux densities for this earth station:

Diameter of main reflector, *D*		= 13 meters
Main Reflector surface area, *A*		= 132.7 meters^2
Sub Reflector diameter, *d*		= 1.739 meters
Area of Sub Reflector, *a*		= 2.38 meters^2
Wavelength at 29.5 GHz, □		= 0.01016 meters
Maximum Transmit Power at Feed horn flange, *P*		= 282 Watts
Antenna Gain, *G*	= 68.5 dBi	= 7,079,458 Power Ratio
Antenna aperture efficiency, □		= 0.65

1. Far Field Calculations

The distance to the beginning of the far field region can be found by the following equation:

$$R_f = 0.60\left(D^2\right) / \lambda = 9978 \text{ meters}$$

The maximum main beam power density in the far field can be calculated as follows:

$$S_f = \frac{GP}{4\pi R_f^2} = 1.60 \text{ W/m}^2\text{, or } 0.16 \text{ mW/cm}^2$$

2. Near Field Calculations

Power flux density is considered to be at a maximum value throughout the entire length of the defined region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the extent of the near field region the power density decreases with distance from the transmitting antenna.

The distance to the end of the near field can be determined by the following equation:

$$R_n = D^2 / 4\lambda = 4157 \text{ meters}$$

The maximum on-axis power density in the near field is determined by:

$$S_n = \frac{16.0\eta P}{\pi D^2} = 5.52 \text{ W/m}^2\text{, or } 0.55 \text{ mW/cm}^2$$

3. Transition Region Calculations

The transition region is located between the near and far field regions. As stated above, the power density begins to decrease with distance in the transition region. While the power density decreases inversely with distance in the transition region, the power density decreases inversely with the square of the distance in the far region. The maximum power density in the transition region (St) will not exceed that calculated for the near field region. The on-axis power density in the near field region (Sn), as shown above, will not exceed 0.55 mW/cm^2, which means the off-axis power density should be of some value between that at the edge of the near field and that at the edge of the far field.

4. Region Between the Main Reflector and the Sub Reflector

With a cassegrain type feed the transmissions from the feed horn are directed toward the sub reflector surface and are reflected back. The maximum power density between the main reflector and the sub reflector surface can be calculated by determining the power density at the sub reflector surface. This can be accomplished as follows:

$$S_s = 4P / a = 474.9 \text{ W/m}^2\text{, or } 47.49 \text{ mW/cm}^2$$

5. Main Reflector Surface

The maximum power density at surface of the main reflector is determined in the same manner as the power density at the sub reflector, above, but the area is now the area of the main reflector aperture:

$$S_m = 4P / A = 8.50 \text{ W/m}^2\text{, or } 0.85 \text{ mW/cm}^2$$

6. Region between Antenna Edge and Ground

Assuming uniform illumination of the main reflector surface, the maximum power density between the antenna edge and ground can be calculated as follows:

$$S_g = P / A = 2.12 \text{ W/m}^2\text{, or } 0.21 \text{ mW/cm}^2$$

Summary of Expected Radiation Levels

General Population / Uncontrolled Exposure

Region	Calculated Maximum Radiation Level (mW/cm^2)	Hazard Assessment
1.) Far Field, (Sf) = 9978 meters	0.16	Within FCC Limit
2.) Near Field, (Sn) = 4157 meters	0.55	Within FCC Limit
3.) Transition Region, (St) Rn < Rt > Rf	0.55	Within FCC Limit

Occupational / Controlled Exposure

Region	Calculated Maximum Radiation Level (mW/cm^2)	Hazard Assessment
1.) Far Field, (Sf) = 9978 meters	0.16	Within FCC Limit
2.) Near Field, (Sn) = 4157 meters	0.55	Within FCC Limit
3.) Transition Region, (St) Rn < Rt > Rf	0.55	Within FCC Limit
4.) Between Main Reflector and Sub Reflector (Ss)	47.49	Potential Hazard
5.) Main Reflector Surface (Sm)	0.85	Within FCC Limit
6.) Between Antenna Edge and Ground (Sg)	0.21	Within FCC Limit

Conclusion: On the basis of the above analysis it is concluded that harmful levels of radiation could exist in regions which could be occupied by the earth station's operating personnel.

To ensure compliance with the occupational radiation safety limits, the earth station transmitter will be turned off whenever maintenance and repair personnel are required to work in an area where the radiation level exceeds applicable FCC limits. Also, the antenna structure will be appropriately marked and access restricted to keep the general public away from the immediate vicinity of the antenna.