EXHIBIT 4: RADIATION HAZARD ANALYSIS

RADIATION HAZARD CALCULATIONS FOR		0.90 meter EARTH STATION	
Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
D = Antenna Diameter		0.90	meters
d = Diameter of Feed Mouth		0.049	meters
P = Max Power into Antenna		3.3	Watts
n = Apperture Effeciency		67%	
k = Wavelength @ 30 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	PI*D^2/4	0.636	meters^2
l = Length of Near Field	D^2/4k	20	meters
L = Beginning of Far Field	0.6D^2/k	49	meters
G = Antenna Gain @ 30 GHz	n(PI*D/k)^2	53,569	47.3 dBi
a = Area of Feed Mouth	PI*d^2/4	0.0019	meters^2

POWER DENSITY CALCULATIONS

Region	Maximum Power Density in Region		Hazard Assessment (FCC MPE Limit = 1 mW/cm^2)
	Formula	Value (mW/cm^2)	
1 Near Field	4nP/A	1.38	Potential Hazard
2 Far Field	GP/(4(PI)L^2)	0.59	< FCC MPE Limit
3 Transition	<= Nr Fld Region	1.38	Potential Hazard
4 Near Reflector Surface	4P/A	2.06	Potential Hazard
5 Between Reflector & Ground	P/A	0.51	< FCC MPE Limit
6 Between Reflector and Feed	4P/a	693.6	Potential Hazard

RADIATION HAZARD ANALYSIS
0.9 meter EARTH STATION

This analysis calculates the non-ionizing radiation levels due to transmission from the earth station. The maximum level of non-ionizing radiation to which a person may be exposed corresponds to a power density of 10 Watts/square meter (or 1 mW/square centimeter) averaged over any thirty minute period, as derived from Standard C95.1 of the American National Standards Institute (ANSI).

The analysis estimates the maximum power density levels in the vicinity of the antenna for six regions: near field; far field; transition zone; near the reflector surface; between the reflector and the ground; and between the feed mouth and the reflector.

A brief discusion for each region is given below. The attached table shows the assumptions, formulae and calculations for all cases.

1. NEAR FIELD REGION

The near field (or Fresnel region) is essentially a cylindrical region with its axis co-incident with the antena boresight. The diameter of this cylinder is equal to that of the antenna. According to OET Bulletin No. 65, its length is equal to the square of the diameter divided by four times the wavelength. The maximum value of the on-axis power density is calculated using the equation given in the Bulletin.

2. FAR FIELD REGION

The far field (or Fraunhofer region) extends outwards from a distance equal to 0.6 times the square of the reflector diameter divided by the wavelength, according to OET Bulletin No. 65. Power density varies inversely as the square of the distance. The maximum value of the power density is calculated using the equation given in the Bulletin.

3. TRANSITION REGION

The transition region between the near field and the far field regions will have a power density that essentially decreases inversely as distance. In any case, the maximum power density will not exceed the value calculated for the near field region, for the purpose of evaluating potential exposure.

4. REGION NEAR REFLECTOR SURFACE

The power density in the region near the reflector surface can be estimated as equal to four times the power divided by the area of the reflector surface, assuming that the illumination is uniform and that it would be possible to intercept equal amounts of energy radiated towards and reflected from the reflector surface.

5. REGION BETWEEN REFLECTOR AND GROUND

The power density in the region between the reflector and the ground can be estimated as equal to the power divided by the area of the reflector surface, assuming even illumination over the reflector.

6. REGION BETEEN THE FEED MOUTH AND REFLECTOR

The radiation from the feed is essentially confined to a conical region whose vertex is located at the feed mouth and extends to the reflector. Power density is maximum at the feed mouth, and can be estimated as four times the output power divided by the area of the feed mouth.

The analysis shows that the power density levels will never exceed the ANSI limit even during periods of maximum output in both the far field and between the reflector and ground. To ensure compliance with the ANSI limit, the antenna will be installed well above ground, and the earth station transmitter will be turned off whenever maintenance and repair personnel are required to work within the potentially hazardous areas.