**RADIATION HAZARD ANALYSIS**
**2.4 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 50 Watts/sq.meter (or 5 mW/sq. cm) average over any six 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 five regions: near field; far field; transition zone; near the reflector surface; and between the reflector and the ground.

A brief discussion for each region is given below. The attached table shows the assumptions, formulae and calculation 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 antenna boresight. The diameter of this cylinder is equal to that of the antenna. According to OST 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 outward from a distance equal to 0.6 times the square of the reflector diameter divided by the wavelength, according to OST 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 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 with distance. In any case, the maximum power density will not exceed the maximum 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 twice 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.

**RADIATION HAZARD CALCULATIONS**
**FOR 2.4 METER EARTH STATION**

| NOMENCLATURE | FORMULA | VALUE | UNIT |
|---|---|---|---|
| INPUT PARAMETERS | | | |
| D = Antenna Diameter | | 2.4 | meters |
| d = Diameter of Feed Mouth | | 0.133 | meters |
| P = Maximum Power into Antenna | | 2.0 | watts |
| n = Aperture Efficiency | | 100 | percent |
| k = Wavelength @ 14.5 GHz | | 0.0211 | meters |
| CALCULATED VALUES | | | |
| A = Area of Reflector | $\pi$ x rad2 | 4.52 | $meters^2$ |
| 1 = Beginning of Near Field | $D^2$ /4k | 68.57 | meters |
| L = Beginning of Far Field | $0.6D^2$ /k | 163.7 | meters |
| G = Antenna Gain @ 14.25 GHz (n=100 for worst case) | $n(\pi^2 D/K) \times 2$ | 83,176 (49.2) | dBi |
| a = Area of Feed Mouth | $\pi^2$ D x 2/4 | 0.0139 | $meters^2$ |

POWER DENSITY CALCULATIONS

| REGION | MAXIMUM POWER DENSITY IN REGION | | HAZARD ASSESSMENT |
|---|---|---|---|
| | FORMULA | VALUE ($W/m^2$) | (ANSI limit=$50W/m^2$) |
| 1. Near Field | 4nP/A | 13.26 | < ANSI LIMIT |
| 2. Far Field | GP/(4$\pi$)L2 | 4.934 | < ANSI LIMIT |
| 3. Transition | $\leq$ Nr Field Region | 13.26 | < ANSI LIMIT |
| 4. Near Reflector Surface | 2P/A | 0.88 | < ANSI LIMIT |
| 5. Between Reflector and Ground | P/A | 0.44 | < ANSI LIMIT |