Analysis of Non-ionizing Radiation For VERTEX RSI 2.4 Meter Antenna at 10 and 400 watts of transmit power at the frequency of 13.75 GHz.

This report analyzes the non-ioninizing radiation levels for an earth station using the VertexRSI antenna. The equations used in these calculations are presented in the Office of Science and Technology Bulletin No. 65, Oct. 1985 as revised in 1997 in Edition 97-01. The purpose of this analysis is to determine the power flux densities in the far field, near field, transition region, between the sub- and main-reflector surface, and between the antenna edges and ground.

Per FCC R&O 96-326, the maximum level of non-ionizing radiation is limited to a power density of 5 milliwatts per square centimeter over any 6 minute in a controlled environment. The maximum level of non-ionizing radiation is limited to a power density of 1 milliwatt per square centimeter over any 30 minutes in a uncontrolled environment.

Antenna Diameter 239 cm
Antenna Aperture Area 44863 cm**2
Subreflector Diameter 0 cm
Area of Subreflector 0 cm**2
Frequency 13.75 GHz
Wavelength 2.18 cm
Transmit Power at Flange 10 Watts
Antenna Gain 48.70 dB
Antenna Aperture Efficiency 0.63

Far Field Calculations

Distance to the beginning of far field 15719 cm
On axis power density in the far field 0.24 mW/cm**2

Near Field Calculations

Distance to the end of near field 6550 cm
Near Field Power Density 0.56 mW/cm**2

Transition Region Calculation

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 field region. The maximum power density in the transition region will not exceed that calculated for the near field region.

Main Reflector Region

The power density in the main reflector region is determined in the same manner as the power density in the subreflector above.
Power density at the main reflector edge 0.45 mW/cm**2

Region between Main Reflector and Ground

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

Power density between Reflector and Ground 0.22 mW/cm**2

Antenna Diameter 239 cm
Antenna Aperture Area 44863 cm**2
Subreflector Diameter 0 cm
Area of Subreflector 0 cm**2
Frequency **1**3.75 GHz
Wavelength 2.18 cm
Transmit Power at Flange **400 Watts**
Antenna Gain 48.70 dB
Antenna Aperture Efficiency 0.63

Far Field Calculations

Distance to the beginning of far field 15719 cm
On axis power density in the far field 9.55 mW/cm**2

Near Field Calculations

Distance to the end of near field 6550 cm
Near Field Power Density 22.29 mW/cm**2

Transition Region Calculation

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 field region. The maximum power density in the transition region will not exceed that calculated for the near field region.

Main Reflector Region

The power density in the main reflector region is determined in the same manner as the power density in the subreflector above.
Power density at the main reflector edge 17.83 mW/cm**2

Region between Main Reflector and Ground

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

Power density between Reflector and Ground 8.92 mW/cm**2