Analysis of Non-ionizing Radiation
For General Dynamics 1.50 Meter Antenna

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	152	cm
Antenna Aperture Area	18241	cm^2
Subreflector Diameter	0	cm
Area of Subreflector	0	cm^2
Frequency	**14.125**	GHz
Wavelength	2.12	cm
Total Transmit Power at Flange	**400**	Watts
Antenna Gain	45.50	dB
Antenna Aperture Efficiency	69.7%	
Height of Object to be cleared by main beam	**3**	m

Far Field Calculations

Distance to the beginning of far field	6566	cm
On axis power density in the far field	26.20	mW/cm^2

Near Field Calculations

Distance to the end of near field	2736	cm
Near Field Power Density	61.16	mW/cm^2
Controlled Environment:	Non-Compliant with FCC Limits	
Uncontrolled Environment:	Non-Compliant with FCC Limits	

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.

Region between Main Reflector and Subreflector

Transmissions from the feed horn are directed toward the subreflector surface, and are reflected back toward the main reflector. The energy density between the subreflector and main reflector surfaces can be calculated by determining the power density at the subreflector surface.

Power density at subreflector edge	N/A mW/cm^2

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	43.86 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	21.93 mW/cm^2
Controlled Environment:	Non-Compliant with FCC Limits
Uncontrolled Environment:	Non-Compliant with FCC Limits

Safety region in front of Antenna

Considering walking along the antenna boresight, the distances one has to obtain from the antenna to achieve safe power density levels are, respectively,

Controlled Environment; distance on-axis	150.29 m
Uncontrolled Environment; distance on-axis	336.07 m

Similarly, when a path is followed parallel to the antenna's boresight axis yet removed from the center axis by a distance equal to the antenna diameter, the power density is reduced by at least 20 dB (per Bulletin 65).
The safety region in front of the antenna is finally defined by the following distance from a vertical axis through the antenna center as

Elevation Angle	Minimum distance
5	31.6 m
10	15.8 m
20	7.9 m
30	5.2 m
40	3.8 m