Analysis of Non-Ionizing Radiation for a 6.3-Meter Earth Station System

The below report provide by the system supplier analyzes the non-ionizing radiation levels for a Vertex/RSI Corporation Model 6.3M 6.3-meter earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the proposed earth station in the far-field, near-field and at the main reflector surface, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	**Power Density (mW/cm2)**
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	**Power Density (mW/cm2)**
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Based on the analysis it is concluded that the FCC RF Guidelines of Tables 4 and 5 have been met. The applicant, however, has in place and will continue to have procedures for not pointing in the direction of populated areas, and that access to hazardous areas are restricted while the unit is in operation.

Radiation Hazard Based on FCC OET Bulletin 65
S = Power Density

Limits for Occupational/Controlled Exposure = **5 mW/cm^2**
Limits for General Population/Uncontrolled Exposure = 1 **mW/cm^2**

HPA Power	**100.0**	Watts	
HPA Power	20.0	dBW	
Operating Backoff	**1.0**	dB	
IFL Loss	**3.0**	dB	
Feed Power	16.0	dBW	
Feed Power	39.8	Watts	
Antenna Diameter	**6.3**	meters	
Physical Antenna Area	31.2	meters^2	
$S_{surface}$	5.1	W/m^2	
$S_{surface}$	**0.5**	mW/cm^2	Wrst Case

Frequency	**14.3**	GHz
λ	0.02	meters
Near Field Extent	471.3	meters
Far Field Begins	1131.2	meters

Antenna Gain	**57.5**	dBi
Antenna Gain	562,341	Ratio
Antenna Efficency	0.64	Ratio
$S_{max\ near\ field}$	3.3	W/m^2
$S_{max\ near\ field}$	**0.3**	mW/cm^2

$S_{max\ far\ field}$	1.4	W/m^2
$S_{max\ far\ field}$	**0.1**	mW/cm^2

For off-axis calculations in the near-field and in the transition region it can be assumed that, if the point of interest is at least one antenna diameter removed from the center of the main beam, the power density at that point would be at least a factor of 100 (20 dB) less than the value calculated for the equivalent distance in the main beam. (OET Bulletin 65 Page 30)

Antenna EL	**20.0**	°

$D_{20\ dB}$ = Distance in front of antenna at which center of main beam is one antenna diameter above typical persons head.

Height of Person	**2.0**	meters
$D_{20\ dB}$	**14.1**	meters