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This report presents an analysis of the non-ionizing radiation levels for a Viking 3.8 M system.

The calculations used in this analysis were derived from and comply with the procedures outlined in the Federal Communication Commission, Office of Engineering and Technology Bulletin Number 65, which establishes guidelines for human exposure to Radio Frequency Electromagnetic Fields. Bulletin 65 defines exposure levels in two separate categories, the General Population/Uncontrolled Areas limits, and the Occupational / Controlled Area limits. The Maximum Permissible Exposure (MPE) limit of the General Population / Uncontrolled Area is defined in Table (1), and represents a maximum exposure limit averaged over a 30 minute period. The MPE limit of the Occupational / Controlled Area is defined in Table (2), and represents a maximum exposure limit averaged over a 6 minute period. The purpose of this report is to provide an analysis of the earth station power flux densities, and to compare those levels to the specified MPE's.

This report provides predicted density levels in the near field, far field, transition region, main reflector surface area, area between the main reflector and sub reflector or feed assembly, as well as the area between the antenna edge and ground.

MPE Limits for General Population/Uncontrolled Area

Frequency Range (MHz)	Power Density (mW/cm2)
1500-100,000	1.0

Table 1

MPE Limits for Occupational/Controlled Area

Frequency Range (MHz)	Power Density (mW/cm2)
1500-100,000	5.0

Table 2

Table 3 Contains formulas, equations and parameters that were used in determining the Power Flux Density Levels for the Viking 3.8 M

Data Type	Data Symbol	Data Formula	Data Value	Unit of Measure
Power Input	P	Input	100	W
Antenna Size	D	Input	3.8	m
Antenna Area	A	$A = (\Pi D^2) \div 4$	11.34	m^2
Subreflector Size	Sub	Input	N/A	cm
Subreflector Area	A_{sub}	$A_{sub} = (\Pi Sub^2) \div 4$	N/A	cm^2
Gain dBi	G_{dbi}	Input	53	dBi
Gain Factor	G	$G = 10^{Gdbi/10}$	199526.23	Gain Factor
Frequency	f	Input	14250	MHz
Wavelength	λ	$299.79 / f$	0.021047	meters
Aperture Efficiency	η	$\eta = [(G\lambda^2) \div (4\Pi)] \div A$	0.62	n/a
Pi	π	Input	3.14159	Numeric
Constant	C	Input	299792458	m/Sec

Table 3

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1. Far Field Analysis

The distance to the far field can be calculated using the following formula:

$$R_{ff} = \frac{0.6D^2}{\lambda} =$$ **411.65** Meters

The power density in the far field can be calculated using the following formula. Note: this formula requires the use of power in milliwatts and far field distance in centimeters, or requires a post calculation conversion from W/M2:

$$S_{ff} = \frac{PG}{4\Pi R_{ff}^{2}} =$$ **0.94** mW/cm²

2. Near Field Analysis

The extent of the Near Field region can be calculated using the following formula:

$$R_{nf} = \frac{D^2}{4\lambda} =$$ **171.52** Meters

The power density of the near field can be calculated using the following formula. Note: this formula requires the use of power in milliwatts and diameter in centimeters, or requires a post calculation conversion from W/M2:

$$S_{nf} = \frac{16\eta P}{\Pi D^2} =$$ **2.187** mW/cm²

3. Transition Region Analysis

The transition region extends from the end of the near field out to the beginning of the far field. The power density in the transition region decreases inversely with distance from the antenna, while power density in the far-field decreases inversely with the square of the distance. However the power density in the transition region will not exceed the density in the near field, and can be calculated for any point in the transition region (R), using the following formula. Note: This formula requires the use of distance in centimeters, or requires a post calculation conversion from W/M2.

$$S_t = \frac{S_{nf} R_{nf}}{R} =$$ **2.187** mW/cm²

4. Main Reflector Surface Analysis

The maximum power density at the antenna surface area can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M2.

$$S_{surface} = \frac{4P}{A} =$$ **3.527** mW/cm²

5. Subreflector Surface Analysis

The area between the sub reflector and main reflector presents a potential hazard, with the highest density being located at the sub reflector area. The power density at the sub reflector can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M2.

$$Sub_{surface} = \frac{4P}{A_{sub}} =$$ **N/A** mW/cm²

6. Power Density between Reflector and Ground Analysis

The power density between the reflector and the ground can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M2.

$$S_{ground} = \frac{P}{A} =$$ **0.882** mW/cm²

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Area	Range Meters	Power Density	Occupational	General Public
Far Field	**412**	**0.94** mW/cm²	**Meets Requirements**	**Meets Requirements**
Near Field	**172**	**2.19** mW/cm²	**Meets Requirements**	**Potential Hazard**
Transition Region	**172 - 412**	**2.19** mW/cm²	**Meets Requirements**	**Potential Hazard**
Main Reflector Surface	N/A	**3.53** mW/cm²	**Meets Requirements**	**Potential Hazard**
Sub-Reflector Surface	N/A	**N/A** mW/cm²	**N/A**	**N/A**
Area Between Reflector and Ground	N/A	**0.88** mW/cm²	**Meets Requirements**	**Meets Requirements**