ANALYSIS OF NON-IONIZING RADIATION

for Thunderbird School of Global Management

Site: Glendale State: AZ

11-20-2008

The Office of Science and Technology Bulletin, No. 65, October 1985 and revised August 1997, specifies that the maximum level of non-ionizing radiation that a person may be exposed to over a six minute period is an average power density equal to 5 mW/cm**2 (five milliwatts per centimeter squared) for a controlled environment. For an uncontrolled environment, the maximum level of non-ionizing radiation that a person may be exposed to over a thirty minute period is an average power density equal to 1 mW/cm**2 (one milliwatt per centimeter squared). It is the purpose of this report to determine the maximum power flux densities of the earth station in the far zone, near zone, transition zone, at the main reflector surface, and between the antenna edge and the ground.

Parameters which were used in the calculations:
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Antenna Diameter,              (D) = 2.5000 m

Antenna Surface Area          (Sa) =   pi(D**2)/4     = 4.9087 m**2

Wavelength at 14.1000 GHz  (lambda) = 0.0212 m

Transmit Power at Flange       (P) = 40.0000 Watts

Antenna Gain at Earth Site   (GES) = 49.7500 dBi    =   94406.0876
                                                           Power Ratio:
                                                          AntiLog(GES/10)
pi                                 =    3.1415927

Antenna Aperture Efficiency    (n) = 0.7500
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1. FAR ZONE CALCULATIONS

Distance to the Far Zone (Df) = $\frac{(n)(D^{2})}{\lambda}$ = 221.1085 m

Far Zone Power Density (Rf) = $\frac{(GES)(P)}{4\pi (Df^{2})}$ = 6.1467 W/m**2

= 0.6147 mW/cm**2

2. NEAR ZONE CALCULATIONS

Power Flux Density is considered to be at a maximum value throughout the entire length of this Zone. The Zone is contained within a cylindrical volume which has the same diameter as the antenna. Beyond the Near Zone, the Power Flux Density will decrease with distance from the Antenna.

Distance to the Near Zone (Dn) = $\frac{D^{2}}{4\lambda}$ = 73.7028 m

Near Zone Power Density (Rn) = $\frac{16.0(n)P}{\pi (D^{2})}$ = 24.4462 W/m**2

= 2.4446 mW/cm**2

3. TRANSITION ZONE CALCULATIONS

The Power Density begins to decrease with distance in the Transition Zone. While the Power Density decreases inversely with distance in the Transition Zone, the Power Density decreases inversely with the square of the distance in the Far Zone.

Since the maximum Power Density in the Transition Zone will not exceed the Near Zone values, it is not calculated.

4. MAIN REFLECTOR ZONE

Main Reflector Power Density = $\frac{2(P)}{Sa}$ = 16.2975 W/m**2

= 1.6297 mW/cm**2

5. ZONE BETWEEN THE MAIN REFLECTOR AND THE GROUND

Applying uniform illumination of the Main Reflector Surface:

Main to Ground Power Density = $\frac{P}{Sa}$ = 8.1487 W/m**2

= 0.8149 mW/cm**2

CALCULATED SAFETY MARGINS SUMMARY AND EVALUATION

Controlled Safety Margin = 5.0 - Calculated Zone Value (mW/cm**2)

	Zones	Safety Margins (mW/cm**2)	Conclusions
1.	Far Zone	4.3853	Complies with ANSI
2.	Near Zone	2.5554	Complies with ANSI
3.	Transition Zone	Rf < Rt < Rn	Complies with ANSI
4.	Main Reflector Surface	3.3703	Complies with ANSI
5.	Main Reflector to Ground	4.1851	Complies with ANSI

Uncontrolled Safety Margin = 1.0 - Calculated Zone Value (mW/cm**2)

	Zones	Safety Margins (mW/cm**2)	Conclusions
1.	Far Zone	0.3853	Complies with ANSI
2.	Near Zone	-1.4446	POTENTIALLY HAZARDOUS
3.	Transition Zone	Rf < Rt < Rn	Complies with ANSI
4.	Main Reflector Surface	-0.6297	POTENTIALLY HAZARDOUS
5.	Main Reflector to Ground	0.1851	Complies with ANSI

6. EVALUATION

A. Controlled Environment
B. Uncontrolled Environment
The NEAR ZONE does not comply with the ANSI standards!
WARNING SIGNS will be posted for the affected Zone indicating danger while the system is in use. Additionally, the system will be shut down for servicing.

The MAIN Reflector Surface ZONE does not comply with the ANSI standards!
WARNING SIGNS will be posted for the affected Zone indicating danger while the system is in use. Additionally, the system will be shut down for servicing.