ANALYSIS OF NON-IONIZING RADIATION

Site: PGO-VOR State: OK
Latitude: 34 40 49.37
Longitude: 094 36 32.42 (NAD83)
05-24-2011

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) = 2.4000 m

Antenna Surface Area (Sa) = pi(D**2)/4 = 4.5239 m**2

Wavelength at 6.1750 GHz (lambda) = 0.0485 m

Transmit Power at Flange (P) = 0.095 Watts

Antenna Gain at Earth Site (GES) = 42.4000 dBi = 17378.0083

Power Ratio:
AntiLog(GES/10)

pi = 3.1415927

Antenna Aperture Efficiency (n) = 0.7000

1. FAR ZONE CALCULATIONS

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Distance to the Far Zone (Df) = (n)(D**2) = 83.1340 m
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                               Lambda

Far Zone Power Density (Rf) =  (GES)(P)     = 0.0.01901 W/m**2
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                               4*pi*(Df**2)
                                            = 0.0019 mW/cm**2
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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) = $\frac{D^{2}}{4 \lambda}$ = 29.6907 m

Near Zone Power Density (Rn) = $\frac{16.0 (n) P}{\pi (D^{2})}$ = 0.0647 W/m**2

= 0.0065 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 = $\frac{2(P)}{Sa}$ = 0.0420 W/m**2

= 0.0042 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 = $\frac{P}{Sa}$ = 0.0210 W/m**2

= 0.0021 mW/cm**2