

ANALYSIS OF NON-IONIZING RADIATION FOR A 3.8 METER EARTH STATION ANTENNA

THIS REPORT ANALYZES THE NON-IONIZING RADIATION LEVELS FOR AN EARTH STATION ANTENNA. THE OFFICES OF SCIENCE AND TECHNOLOGY BULLETIN NO. 65, EDITION 97-01, SPECIFIES THAT THE MAXIMUM LEVEL OF NON-IONIZING RADIATION THAT A PERSON MY BE EXPOSED TO OVER A SIX MINUTE PERIOD IS AN AVERAGE POWER DENSITY EQUAL TO 5 mW/cm² (FIVE MILLIWATTS PER CENTIMETER SQUARED). IT IS THE PURPOSE OF THIS REPORT TO DETERMINE THE POWER FLUX DENSITIES OF THE EARTH STATION ANTENNA IN THE FAR FIELD, NEAR FIELD, TRANSITION REGION, BETWEEN THE SUBREFLECTOR AND THE MAIN REFLECTOR SURFACE. AT THE MAIN REFLECTOR SURFACE AND BETWEEN THE ANTENNA EDGE AND THE GROUND.

THE FOLLOWING PARAMETERS WERE USED TO CALCULATE THE VARIOUS POWER FLUX DENSITIES FOR THIS EARTH STATION.

Antenna Diameter,	(D)	=	3.80 meters	380 cm
Antenna Surface area,	(S _a)	=	11.34 meters ²	113411.49 cm ²
Feed Flange Diameter	(D _f)	=	22.86 cm	0.2286 meters
Area of Feed Flange	(F _a)	=	410.43 cm ²	0.041 meters ²
Frequency in GHz			14.25 GHz	
Wavelength at Frequency	(λ)	=	2.11 cm	0.0211 meters
Transmit Power at Flange	(P)	=	100.00 Watts	
Antenna Gain at Frequency	(G _{es})	=	52.40 dB	
Gain converted to power ratio			173780.08	
Antenna Aperture Efficiency	(n)	=	0.55 Percentage / 100	

1. Far Field Calculations:

Distance to the far field region	(R _f)	=	411.54 meters	
On axis power density in the far field	(W _f)		0.08 mW/cm ²	

2. Near Field Calculations:

Extent of near field	(R _n)		171.48 meters	
Near field power density	(W _n)		0.19 mW/cm ²	

3. Transition Region Calculations:

The maximum power density in the transition region will not exceed that calculated for the near field region. The power density in the near field region, as shown above, will not exceed

0.19 mW/cm²

4. Region between main reflector & subreflector:

Power density at feed flange (W_f) 487.29 mW/cm²

5. Main Reflector Region:

Power density at reflector surface (W_s) 0.35 mW/cm²

6. Region Between Reflector & Ground:

At a distance of one antenna diameter or more

Power density between reflector & ground (W_g) 0.00 mW/cm²

Table 1

Summary of Expected Radiation Levels

Based on (5 mW/cm²) MPE for Controlled Environment

<u>Region</u>	<u>Calculated Maximum Radiation Level (mW/cm²)</u>	<u>Hazard Assessment</u>
1. Far Field, (R _f)=	0.08	SATISFIES ANSI
2. Near Field, (R _n)=	0.19	SATISFIES ANSI
3. Transition Region, (R _t) R _n < R _t < R _f	0.19	SATISFIES ANSI
4. Between Main Reflector and subreflector	487.29	POTENTIAL HAZARD
5. Reflector Surface	0.35	SATISFIES ANSI
6. Between Antenna and Ground	0.00	SATISFIES ANSI

It is the applicants responsibility to ensure that the public and operational personnel are not exposed to the harmful levels of radiation.

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