Radiofrequency (RF) Radiation Hazard Study
License No. KA68: 33 Thomas St., Manhatten NY (AT&T Corp.)

This report summarizes the non-ionizing radiofrequency (RF) exposure levels associated with the above antenna system. RF prediction models and associated exposure limits referenced in this study are outlined in the Federal Communications Commission (FCC) Office of Engineering and Technology (OET) Bulletin 65 Edition 97-01 (August 1997). The FCC-exposure limits define the level of RF energy that a person may be continuously exposed without experiencing adverse health effects. This "safe" level, herein referred to as Maximum Permissible Exposure (MPE) limit, is comprised of two-tiers: one for conditions which the public may be exposed (General Population/Uncontrolled) and the other for exposure situations usually involving workers (Occupational/Controlled). Therefore, the intent of this study is to define the maximum "worst-case" RF exposure levels and compare the results relative to the applicable MPE limits.

Based upon the following system parameters, the applicable **MPE limits** are: **1.0** mW/cm^2 and **5.0** mW/cm^2 for General Population/Uncontrolled and Occupational/Controlled environments, respectively, as specified in 47 CFR Part 1.1310.

System Parameters

Antenna Diameter (D1):	8.1	meters	Antenna Surface Area (D1a):	51.53	meters^2
Subreflector Diameter (D2):	1.00	meters	Subreflector Surface Area (D2a):	0.79	meters^2
Operating Frequency:	14250	MHz	Wavelength (λ):	0.021	meters
Antenna Gain (G), @ 14250 MHz:	60.4	dBi	Numerical Gain:	1096478.2	
Transmit Power @ Antenna Input*:	150.0	watts			
Calculated Aperture Efficiency (n):	0.75		Center height above ground level:	4.8	meters

* Based on a 400 W maximum power amplifier rating(s), where the actual operating power level will be reduced by at least a factor of 2.6 (4.2 dB due to output backoff, line loss, etc.). For purposes of study, this equates to an aggregate output EIRP for all carriers of **82.16** dBW maximum.

Hazard Assessment

For parabolic aperture antennas, three (3) regions are defined for predicting maximum RF exposure levels within the main-beam (on-axis) path: ***near-field, transition, and far-field*** regions. RF prediction methods are based on where the point-of-interest falls within these regions:

1. The far field (Rff) region is determined by the following equation: $0.6\ D^2/\lambda$. This equates to a linear distance of approximately 1869.89 meters from the antenna. The maximum main beam RF exposure level (Sff), in terms of power density units, at this point can be calculated as follows:

$$Sff = PG / 40\pi(Rff)^2 = 0.37 \text{ mW/cm}^2$$

2. The near field (Rnf) region is determined by the following equation: $D^2/ 4\lambda$. This equates to a linear distance of approximately 779.12 meters from the antenna. The maximum RF exposure level (Snf), in terms of power density units, within this region can be calculated as follows:

$$Snf = 0.4n\,P/ D1a = 0.87 \text{ mW/cm}^2$$

(Assume maximum value maintained throughout the near field region)

** The transition (Rt) region is between the near-field and far-field regions, defined as Rff - Rnf. This equates to a region extending 1090.77 meters, beginning at 779.12 meters and ending 1869.89 meters from the antenna. While the exposure intensity decreases inversely with the square of the distance in the far field region, the exposure intensity decreases inversely with distance in the transition region. Therefore, the maximum RF exposure level in the transition region will not exceed the above calculated near field value (Snf). If the point-of-interest falls within the transition region, the estimated RF exposure level (St), in terms of power density units, can be calculated using the following mid-point (Rt) example:

St = Snf * Rnf / R = 0.51 mW/cm^2 - at mid-point of Rt

note: where 'R' is the point-of-interest within the Rt

This dual-reflector (cassegrain) antenna design uses a shaped subreflector to direct RF energy from the feed horn back towards the main reflector dish. The following calculations are used to predict the RF exposure levels directly in front of the main reflector surface (rim), and regions between the main reflector and subreflector surfaces:

3. The maximum RF exposure level (Smain-surface) in front of the main reflector surface (at rim), in terms of power density units, can be calculated as follows:

Smain-surface = 0.4*P / D1a = 1.16 mW/cm^2

4. The maximum RF exposure level at the subreflector surface (Ssub-surface), in terms of power density units, can be calculated as follows:

Ssub-surface = 0.4*P / D2a = 76.39 mW/cm^2

For evaluating accessible areas outside the main beam path, a practical estimation is to consider the maximum allowable gain pattern envelope for fixed-satellite services. Specifically, the antenna gain shall lie below the envelope defined as -10 dBi for angles greater than 48 degrees and less than/equal to 180 degrees from the main lobe axis. In considering areas immediately below the main reflector rim, the maximum RF exposure levels directed towards this region (Spoi), in terms of power density units, can be calculated as follows:

5. Spoi = PG/40π(R)^2 = 0.007 mW/cm^2

***Note**: where 'R' is the point-of-interest is just below antenna rim, which equates (in this case) to a centerline distance:* 4.05 meters

Radiofrequency (RF) Radiation Hazard Study - Continued
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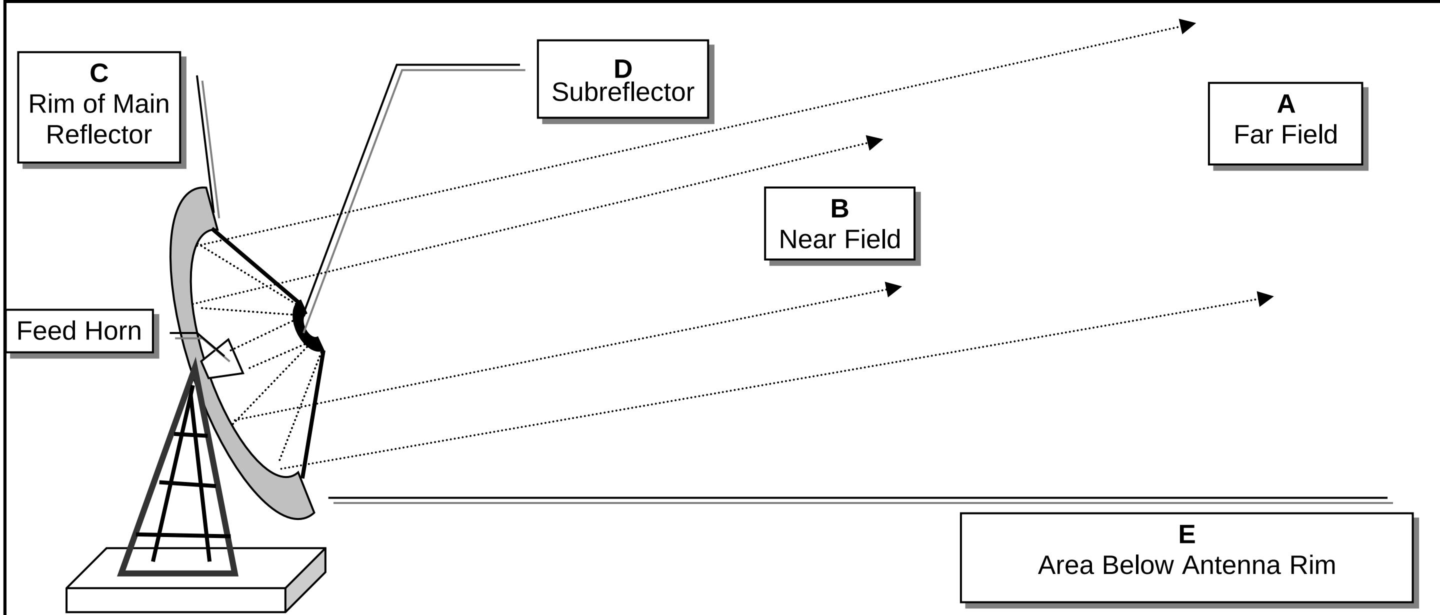
Hazard Assessment - Summary

Summary of Calculated RF Exposure Levels

Region			Level (mW/cm^2)	Assessment
A. Far Field (Rff),	1869.89	meters, =	0.37	Satisfies FCC MPE Limits
B. Near Field (Rnf),	779.12	meters, =	0.87	Satisfies FCC MPE Limits
C. Rim of Main Reflector =			1.16	Potential to exceed FCC General Population MPE Limit
D. Subreflector =			76.39	Potential to exceed FCC Occupational MPE Limit
E. Area below Antenna Rim =			0.007	Satisfies FCC MPE Limits



Conclusion

The results of this study indicate that accessible ground level areas, surrounding the antenna base and horizontal to the main beam axis, do not exceed the most restrictive FCC General Population/Uncontrolled MPE limit.

The highest RF exposure levels are isolated to regions located between the feed horn and subreflector surface, which are typically inaccessible during normal operations. To ensure compliance with the FCC Occupational/Controlled MPE limit, these areas shall be controlled (restricted access) and the antenna system de-energized during any maintenance/service activities occurring within the main reflector or subreflector regions.

This study concludes that operation of this satellite earth station will not expose workers or public members to RF levels in excess of the applicable MPE limits. Therefore, in accordance with 47 CFR Part 1.1307 (b), preparation and submission of an Environmental Assessment (EA) is not required.

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