RF Radiation Hazard Analysis

PSSI 5.5m #1

Antenna Diameter (D) = 5.5 meters, 18.046 feet
Antenna Surface Area (SA) = 23.758 sq meters
Sub-reflector Diameter (DS) = N/A
Sub-reflector Surface Area (AS) = N/A
C-Band Wavelength at 6.175 GHz Center Band, LAMBDA = .049 meters
Power at output at HPA = 750 watts
Path Loss to OMT (IL) = .70 dB
Power at OMT Flange (P) = 595.799 watts
Antenna Gain at 6.1750 GHz (G) = 45.9 dBi
Antenna Gain given in Power Ratio (GES) = 3.8904.10.4
Antenna Aperture Efficiency (N) = .60

Region	*Radiation Level*	*Hazard Assessment*
Far Field (RF) = 370.408 meters, 1215.31 feet	1.7354 mW/cm sq	Satisfies ANSI
Near Field (RN) = 154.337 meters, 506.379 feet	13.608 mW/cm sq	Potential Hazard
Transition Region (RT) = or <	13.608 mW/cm sq	Potential Hazard
Main Reflector Region (WM)	5.3737 mW/cm sq	Potential Hazard
Power Density Between Reflector and Ground	2.6869 mW/cm sq	Potential Hazard

Conclusion:

Based on the above analysis, harmful areas of radiation do exist in areas around the antenna and in the path of the antenna toward the satellite that it is pointed. The area occupied by the general public will not exceed the ANSI limit of 5mW/cm sq. because precautions will be taken to warn, educate and limit the access of personnel around the areas of the antenna and its path that may pose a radiation hazard. The bottom edge of the antenna is 7 feet high when deployed which moves the hazard away from the public. Normal look angles for domestic operation move the potential hazard even further away from the general public. The antenna will be marked with the standard radiation hazard signs. The warning signs will warn personnel to avoid the area around and in front of the reflector when the transmitter is operational. To ensure compliance with safety limits, the Earth Station transmitter will be turned off and marked to remain off whenever maintenance and repair personnel are required to work in the areas of potential hazard as defined in the above study. Additionally, all Earth Station personnel will be trained to insure that the antenna path is clear at all times while the transmitter is in operation.

Note: See the following sheet for how the above calculations were made.

Analysis of Non-Ionizing Radiation

PSSI 5.5m #1 – Supporting Calculations

Antenna Diameter, (D) =…………..	D: = 5.5 meters	D·3.281 = 18.046 Feet
Antenna Surface Area, (Sa) =……..	Sa: = π · ((D · D) / 4)	Sa = 23.758 sq. meters
Sub-reflector Diameter, (Ds) =..	Ds: = 0.0 cm	Ds · .3937 = 0 inches
Area of Sub-reflector, (As) =….	As: = π · ((Ds · Ds) / 4)	As = 0 sq. cm
Center Frequency, (Cf) =……...	Cf: = 6.175 GHz	
Wavelength at Cf, (Lambda) =..	Lambda = .049 meters C-band, .0211 meters Ku-band	
Transmit Power at HPA, (P1) =	P1: = 750 watts P2: = log (P1) · 10 Loss: = .70 dB	P2 = 28.7506 dB
Path loss from HPA to OMT, (Loss) =	P3: = P2 – Loss	P3 = 28.0506 OMT Power in dB
Power at OMT, (P) =…………	P: = $10^{(P3 \div 10)}$	P = 638.3517 OMT Power in Watts
Antenna Gain at Cf, (Gain) =...	Gain: = 45.9 dBi	

Antenna Gain Converted to Power Ratio, (Ges) = Ges: = $10^{(Gain \div 10)}$ Ges = 3.890E+4 Ratio

Antenna Aperture Efficiency, (n) = n: = .60

Far Field (Rf) = Rf: = (.60 ·(D·D)) / Lambda Rf = 370.408 meters Rf · 3.281 = 1215.31 feet

Far Field Pwr Density (Wf) = Wf: = ((Ges·P) / 4·π·(Rf·Rf))·.1 Wf = 1.7354 mw sq cm

Near Field (Rn) = Rn: = (D·D)/4·Lambda Rn = 154.337 meters Rn·3.281 = 506.379 feet

Near Field Pwr Density (Wn) = Wn: = ((16·n·P)/π·(D·D))·.1 Wn = 13.608 mw sq cm

Transition Region (Rt) = Rt: = Wn·1 Rt = 13.608 mw sq cm (Equal to or less than)

Pwr Density at Sub-reflector (Ws) = Ws = N/A (no sub-reflector)

Main Reflector Region Pwr Density (Wm) = Wm: = ((2·P)/Sa)·.1 Wm = 5.3737 mw sq cm

Pwr Density between Main Reflector and Ground (Wg) = Wg: = (P/Sa)·.1 Wg = 2.6869 mw sq cm