Radiation Hazard Analysis

11.1 Meter NWM-16
Bristow, Virginia 20136

Introduction

A radiation hazard anaylsis is presented for a 11.1 meter C band aperture antenna to be installed in BristowVirginia at the SES Washington Mediaport. This Radiation Analysis calculates the non-ionizing radiation levels expected to be emitted from the earth station on a worse cases basis and is performed in accordance with the Federal Communications Commissions Office of Engineering and Technology (OET) Bulletin, No. 65.

Requirements

OET 65 outlines the maximum permissible exposure limits in two cases for operation in this frequency range.

1. The first case is the maximum level that a person may be exposed to in the general population. The exposure limit is defined as a non-ionizing power level equal to 1 milliwatt per centimeter squared averaged over a thirty minute period.
2. The second case is a controlled environment where the maximum permissible exposure limit must not exceed 5 milliwatts per centimeter squared averaged over any six minute period.

Summary

The results indicate that no significant hazard will be presented to the general population and will be fully mitigated in the controlled area by the use of procedures that require the removal of transmit power before accessing the area around the main reflector.

Analysis

This analysis was performed on seven zones with the results shown in Radiation Hazard Zones. The Table labeled Input Values provides the - input data required to perform the analysis. The table labeled OET 65 Calculated Values provides the intermediate calculation used to perform the assessment in accordance with OET 65. The Analysis is performed for each a the each of seven radiation zones as shown in figure 1 – Analysis Zones. These zones are:

1. Point between the feed and the sub-reflector
2. The power at the surface of the antenna
3. The power level between the main reflector and ground
4. The near-field or Fresnel region in which the maxima can be reached before the field starts to diminish with distance
5. The Transition region where power begins to decrease inversely with distance from the antenna
6. The Far Field or Fraunhofer region where power decreases inversely with the square of the distance. This is the point at which the antenna beam is fully collimated
7. The off axis level in the near field. This is defined as the area outside of the main beam removed and at least one antenna diameter removed from the main beam

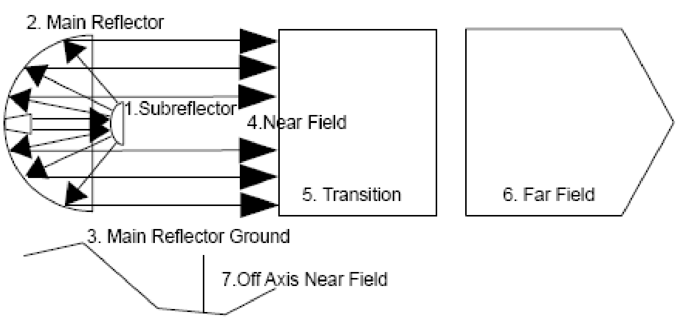

Figure 1 – Analysis Zones

Radiation Hazard Analysis

Operator:	**SES**	FCC Callsign:	
Location Designation:	**Washington Mediaport**	SES ID:	NWM-16
County:	**Prince William**	STA:	
Town:	**Bristow**		
State/Zip:	**Virginia 20136**		

Input Values	Value	Unit
D = Aperture Diameter	11.10	Meters
d = Subreflector Diameter	1.37	Meters
G = Antenna Gain	55.6	dBi
FCC Designation	C	Band
F = Frequency	6.175	GHz
P = Transmitter Power Watts:	350	Watts
R_{ua} = closest point to uncontrolled area	20	meters
Elevation angle at closest point R_{ua}	10	Degrees
Height (AGL)	3.47	meters

Band	Frequency
L	1000-2000
S	2000-4000
C	4000-8000
X	8000-12500
Ku	12500-18000
K	18000-25500
Ka	26500-40000
O	40000-50000
V	50000-75000

OET 65 Calculated Values	Formula	Value	Unit
λ= Wavelength	$\frac{c}{F}$	0.0486	meters
G = Antenna Gain	$10^{(G/10)}$	363078.0548	(W) linear
η = Apperture Efficiency	$\frac{G\lambda^2/4\pi}{\pi D^2/4}$	70%	percentage
A = Area of reflector	πR^2	96.769	meters ^{2}
a = area of subreflector	πr^2	14741.138	cm ^{2}
R_{nf} = Near-Field Region	$\frac{D^2}{4\lambda}$	634.441 110	meters Meters AGL
R_t = Transition Region	$>R_{nf}$ $<R_{ff}$	634.441 1522.659	>meters <meters
R_{ff} = Far Field Region	$\frac{0.6D^2}{\lambda}$	1522.659 264	meters Meters AGL

	Radiation Analysis Zone	Formula	Level	Value	Exposure Limits	
					General Public	Occupational
					<1mW/cm2	<5mW/cm2
1	Power Subreflector	$\frac{4P}{a}$	94.972	mW/cm2	>FCC MPE See Note 1	>FCC MPE See Note 2
2	Antenna Surface	$\frac{4P}{A}$	1.447	mW/cm2	>FCC MPE See Note 1	<FCC MPE
3	Main Reflector Ground	$\frac{P}{A}$	0.362	mW/cm2	<FCC MPE	<FCC MPE
4	S_{nf} =Near-Field Power Density	$\frac{4\eta P}{A}$	1.018	mW/cm2	>FCC MPE See Note 1	<FCC MPE
5	S_t = Max Transition Power Density	$\leq S_{nf}$	1.018	mW/cm2	>FCC MPE See Note 1	<FCC MPE
6	S_{ff} = Max Far field Power Density	$\frac{PG}{4\pi R_{ff}^2}$	0.436	mW/cm2	<FCC MPE	<FCC MPE
7	Off Access Level Near Field	S_{nf} - 20 dB	0.01018	mW/cm2	<FCC MPE	<FCC MPE

Notes

1. The antenna is installed in a controlled location access is restricted to authorized personnel only. The antenna is marked with RF Radiation Hazard signage.
2. Inside the controlled area, MPE levels exceed the MPE exposure for occupational levels. The levels will be reduced to safe MPE by removing power to the transmitters when work is performed on or around the antenna. This area can only be accessed by qualified personnel.
3. The field develops 3.47 meters above ground level at the minimum elevation angle which is not accessable to the general public.