EXHIBIT A
14/12 GHz Ground Terminal Radiation Hazard Report

Introduction

This study analyzes the non-ionizing radiation levels for Tx /Rx terminals, 1.2 meter, 1.8 meter and 2.4 meter antenna types, for use in a 14/12 GHz VSAT network. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are depending on the area of exposure and/or the status of the individuals who are subject to the exposure -- the General Population/Uncontrolled Environment and the Controlled Environment, where the general population cannot access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 5.0 milliwatts per square centimeter (5.0 mW/cm^2) averaged over any 6 minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1.0 milliwatt per square centimeter (1.0 mW/cm^2) averaged over any 30 minute period in a uncontrolled environment.
In the normal range of transmit powers for these antennas, the power densities at or around the antenna surface are not to exceed these safe levels. The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the antenna edge and the ground

Input Parameters

The input parameters required for the power flux density calculations are listed in Section A of Table 1. It shows first column dedicated to the parameters, values and calculations for the 1.2 meter terminal, and a second and a third column similarly dedicated to the 1.8 meter and the 2.4 meter terminals respectively.

Calculated Parameters

The values of wavelength, effective and physical antenna areas, and antenna efficiency are calculated in Section B of Table1 using the above input parameters and the corresponding formulas from Bulletin 65; these formulas are listed in the comments column for reference.

Behavior of EM Fields as a Function of Distance

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also is the region between the antenna and the ground.

For parabolic antennas with circular cross sections, such as the antennas under study, the near-field, far-field and transition region distances are calculated in Section C of Table 1.
The distance in the transition region is between the near and far fields. However, for this analysis, it is made equal to the near field distance. This assumption is conservative and valid since the transition region is actually farther away and its power flux density will not exceed that of the nearer near field region.

Power Flux Density Calculations

The power flux density calculations are shown in Section D of Table 1. The formulas used to calculate power flux density in the three regions, and between the reflector and ground, all correspond to those stated in Bulletin 65. These formulas are listed in the comments column for reference.

The power flux density is considered to be at a maximum through the entire length of the near-field region. This region is contained within a cylindrical volume with a diameter, D, equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance.

Table 1: Power Flux Density Calculations and Results

Section	Parameter	Symbol	Unit	Calculations			Comments
				1.2 m Terminal	1.8 m Terminal	2.4 m Terminal	
A	Antenna Diameter	D	m	1.2	1.8	2.4	
	Antenna Tx Gain -dB	G	dBi	43.3	46.8	48.9	Manufacturer data
	Ant. Tx Gain Factor	g		21379.6	47863.0	77624.7	g=10^(G/10)
	Frequency	f	MHz	14300.0	14300.0	14300.0	Tx frequency
	RF Power	P	W	3.0	8.0	8.0	Manufacturer data
B	Wavelength	L	m	0.0210	0.0210	0.0210	L=300/f
	Effective Antenna Area	A	m^2	0.7488	1.6763	2.7187	A=g*L^2/4*PI
	Physical Antenna Area	S	m^2	1.1310	2.5447	4.5239	S=PI*(D/2)^2
	Antenna Efficiency	n		0.6621	0.6588	0.6010	n=A/S
C	Near Field Distance	ND	m	17.1600	38.6100	68.6400	ND=D^2/(4*L)
	Far Field Distance	FD	m	41.1840	92.6640	164.7360	FD=0.6*D^2/L
	Transition Distance	TD	m	17.1600	38.6100	68.6400	TD=ND
D	Near-field Power Density	NPD	mW/cm^2	0.7025	0.8284	0.4251	NPD=1.6*n*P/(PI*D^2) ; MPE=1.0 mW/cm^2
	Far-field Power Density	FPD	mW/cm^2	0.3009	0.3549	0.1821	FPD=g*P/(40*PI*FD^2); MPE= 1.0 mW/cm^2
	Transition Power Density	TPD	mW/cm^2	0.7025	0.8284	0.4251	TPD=NPD
	Ground Power Density	GPD	mW/cm^2	0.4006	0.4772	0.2943	GPD=P/(10*A); MPE=1.0 mW/cm^2

Conclusions

In conclusion, the results show that the antennas comply with FCC MPE requirements with good margins in both controlled (MPE=5 mW/cm^2) and uncontrolled (MPE= 1.0 mW/cm^2) environments.

As an added precaution, standard radiation hazard warnings in the vicinity of the terminal antennas will be placed by the applicant to inform the general population who might be working or otherwise present in or near the path of the main beam.

The applicant will ensure that the main beam of the antenna will be pointed at least one diameter away from any building. Since one diameter removed from the center of the main beam the levels are down at least 20 dB, or by a factor of 100, public safety will be ensured.

The transmitter will be turned off during periods of maintenance so that the operating personnel in the vicinity of the antenna will be safe from radiation hazards.