Exhibit No. WVU 1

RADIATION HAZARD STUDY

For

West Virginia University

This report is to analyze the non-ionizing radiation levels for a Transportable Ku Uplink utilizing the MEAS (2-port), 2.4 meter Earth Station Antenna. The Office of Science and Technology Bulletin, No. 65, August 1997, specified that the maximum level of non-ionizing radiation that a person may be exposed to over a .1 hour (6 minute) period is an average power density equal to 5mW/cm^2 (five mill watt per centimeter squared). It is the purpose of this report to ascertain the power flux densities of the earth station in the far field, near field, transition region, 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 the earth station:

Antenna Diameter, (D)	= 2.4 meters	
Antenna Surface Area, (Sa)	= **p**(D^2)/4	= 4.5239 m^2
Wavelength at 14.25 Ghz, (λ)	= 300/F	= 0.0211 meters
Transmit Power at Flange, (P)	= 100 watts	
Antenna Gain, (Ges)	= 48.9dbi	
Antenna gain at 14.3GHz = 48.9dBi, converted to a power ratio given by: Ges=10 ^ dBi/10		
Antenna Gain Factor (G)	=77624.7117	
p	= 3.1415927	
Antenna Aperture Efficiency, (n)	= G(**λ**^2)/(**p**2D^2)	=0.6052
ANSI Safe Power Density, (Ws)	= 5.0mW/cm^2	

I. Far Field Calculations

The distance to the beginning of the far field region can be found by the following equation:

Distance to the Far Field Region, (Rf) = (0.6(D^2))/λ
= 164.16 meters

The maximum main beam power density in the far field can be calculated as follows:
Far Field On-axis power density, (Wf) = ((Ges)(P))/(4 p (Rf^2))
= 22.9222 W/m^2
= 2.2922 mW/cm^2

II. Near Field Calculations

Power flux density is considered to be at a maximum value throughout the entire length of the defined region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the extent of the near field region, the power density decreased with distance from the transmitting antenna.

The distance to the end of the near field can be determined by the following equation:

Extent of Near Field, (Rn) = D^2/4λ
= 68.4 meters

The maximum power density in the near field is determined by:
Near Field On-axis power density, (Wn)
= (16(n)P)/(**p** (D^2))
= 53.5104 W/m^2
= 5.351 mW/cm^2

III. Transition Region Calculations

The transition region is located between the near and far field regions.
As stated above, the power density begins to decrease with distance in the transition region.
While the power density decreases inversely with distance in the transition region, the power density decreases inversely with the square of the distance in the far field region.
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 = 5.351 mW/cm^2.

IV. Far Field On-axis Distance to ANSI 5 mW/cm^2 Calculations - (Dsafe)

Since the power density decreases inversely with the square of the distance in the far field region, the distance to the On-axis Power Density of 5 mW/cm^2 can be calculated from the following:

(Dsafe)= Rf((Wf / Ws)^.5)
= 111.150 meters

V. Main Reflector Region Calculations

Transmissions from the feed horn are directed toward the main reflector surface. The power density in the main reflector region can be calculated by the following:

Main Reflector Surface Power Density	= 4(P)/Sa
	= 88.4194 W/m^2
	= 8.8419 mW/cm^

VI. Off-axis Evaluation

For off-axis calculations in the near-field and in the transition region, it can be assumed that, if the point of interest is at least one antenna diameter removed from the center of the main beam, the power density at that point would be at least a factor of 100 (20dB) less than the value calculated for the equivalent distance in the main beam.

Near Field On-axis power density,

Wn = 5.351 mW/cm^2

Near Field Off-axis power density, 2.4 meters from main beam center

Wn(off) = 0.01 Wn

= 0.0535 mW/cm^2

Therefore, the area around and behind the dish at a distance of one dish diameter (2.4 meters) from the center of the main beam will be equal to or less than 5.351 mW/cm^2.

For off-axis calculations in the far-field, the calculated main-beam power density of (Wf) can be multiplied by the appropriate relative power density factor obtained from the antenna gain pattern to obtain a more realistic estimate.

The proposed antenna meets or exceeds the performance specifications under part 25.209 of the FCC rules. The off-axis gain of this antenna, therefore, is equal to or greater than 10dBi less than the on-axis gain in any direction of 48 degrees or more removed from the center line of the main beam.

Far Field On-axis power density

Wf = 2.2922 mW/cm^2

Far Field Off-axis power density

Wf(off) = .1 Wf

= 0.2292 mW/cm^2

Exhibit No. WVU 1

VII. Summary of Expected Radiation Levels

Region		Calculated Maximum Radiation Level (mW/cm^2)	Hazard Assessment
Far Field Region:	= 164.16 meters	2.2922	Potential Hazard
Near Field Region:	= 68.4 meters	5.351	Potential Hazard
Transition Region:		5.351	Potential Hazard
Reflector Surface Region:		8.8419	Potential Hazard
Far Field off-axis Region:		0.2292	Satisfies ANSI
Near Field off-axis Region:		0.0535	Satisfies ANSI
Area around dish equal to dish diameter:		0.0535	Satisfies ANSI

VIII. Conclusions

Based on the above analysis it is concluded that the ANSI standards of 5 mW/cm^2 or greater would not exist in regions normally occupied by the public or the earth station=s operating personnel.

In the area of the Main Reflector, personnel would only enter that area to perform maintenance functions and the transmitter would not be operational at that time, so the ANSI standard of 5 mW/cm^2 would be met.

In the area of the Near Field and Transition Region, since the antenna is mounted at a height of 2.7 meters above the ground, and will not be pointed in the direction of populated areas, the ANSI standards would again be met. Warning signs are attached to the surrounding fence to warn individuals of the potential for hazardous radiation.

In addition, the transmit power used in these calculations is greater than that which will typically be utilized by the earth station. During normal operation, the typical power level would generally not be more than 50 watts. A transmit power of 100 watts would only occur in conditions of extreme rain fade.