Educational Communications Center
Kansas State University
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Exhibit A

ANALYSIS OF NON-IONIZING RADIATION FOR A 5.5 METER KU-BAND EARTH STATION

Location: 128 Dole Hall, Kansas State University Campus, Manhattan, KS

This report analyzes the non-ionizing radiation levels for an earth station antenna. The OET Bulletin 65, Edit. 97-01, August 1997, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields specifies that the maximum level of non-ionizing radiation that a person may be exposed to cover a six-minute period is an average power density equal to 5 mw/cm^2 in a controlled environment. For the general population, a maximum level a person may be exposed to over a thirty-minute period is an average power density equal to 1mw/cm^2 in an uncontrolled environment. It is the purpose of this report to determine the power flux densities of the proposed earth station surface area, in the near field, transition region and far field.

Type: Cassegrain (Aperature Antenna)

P=Antenna Power(watts), G=Antenna Gain(db), D=Antenna Diameter(meters)
F=Ctr Frequency(GHz), Wl=WaveLength(meters)

Antenna Surface(m^2)	$A=3.14*D^2/4$
Antenna Surface Density (w/m^2)	$S_s=4*P/A$
Wavelength	$Wl\ (m)=3/(F*10)$
Near Field Region	$R_{nf}\ (m)=D^2/(4*Wl)$
Near Field Region Density	$S_{nf}\ (w/m^2)=16*.6*P/(3.14*D^2)$
Transition Region	$R_{ff}\ (m)=.6*D^2/Wl$
Transition Region Density	$S_t\ (w/m^2)=S_{nf}*R_{nf}/R_{ff}$
Far Field Region Density	$S_{ff}\ (m)=P*G/(4*3.14*R_{ff})$

EARTH STATION RADIATION HAZARD CALCULATIONS

Freq(GHz)=14.250 Power(w)=499 Ant. Gain(db)=56.2 Ant. Size(m)=5.5
Wavelength(m)= .021 Antenna Aperature (m^2)= 23.76

Ant. Surface Density S_s (w/m^2)=	84.01	S_s (mw/cm^2)= 8.40
Near-Field Region R_{nf} (m)=	360.12	

Near-Field Density S_{nf} (w/m^2)=	50.41	S_{nf} (mw/cm^2)=5.04
Transition Region R_{ff} (m)=	864.29	
Trans. Region Density S_t (w/cm^2)=	21.00	S_t (mw/cm^2)= 2.10
Far Field Region Density S_{ff} (w/cm^2)=	2.58	S_{ff} (mw/cm^2)= 0.26

ANALYSIS RESULTS
LIMITS - 1mw/cm^2-Uncontrolled, 5mw/cm^2-Controlled

Antenna Surface Density S_s (mw/cm^2)	8.40	**Potential Hazard > Limit**
Near Field Density S_{nf} (mw/cm^2)	5.04	**Potential Hazard > Limit**
Transition Region S_t (mw/cm^2)	2.10	**Potential Hazard > Limit**
Far Field Density S_{ff} (mw/cm^2)	0.26	No Potential Hazard < Limit

Antenna Surface

RF energy will be turned off during any antenna maintenance that may require personnel to occupy the hazardous conical region of the main reflector. All technical and maintenance personnel will be trained regarding the potential RF hazard that may exist in this region during operation. An RF Safety Officer will be designated with authority to prevent operation of the station during maintenance activities and procedures established and communicated to personnel of the ECC and others involved in the maintenance of the earth station.

Near Field Region

RF energy will be turned off during any antenna maintenance that may require maintenance personnel to occupy space near the edge of the reflector where RF energy levels exceed 5 mw/cm^2 and all technical personnel will be trained in proper safety procedures regarding non-ionizing radiation. A fence is to be constructed to limit uncontrolled access to the near field region of the earth station where any region may exceed 1 mw/cm^2 RF density. The fencing will be clearly marked per ANSI standards advising of the potential radiation hazard. Access to the interior of this area will be controlled. All employees will be trained to remain outside this area during earth station operations.

Prepared by:

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