

CALHOUN SATELLITE COMMUNICATIONS  
 TEMPORARY, TRANSPORTABLE EARTH STATION

ANALYSIS OF NON-IONIZING RADIATION  
 FOR A 2.4 METER C-BAND EARTH STATION

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<sup>2</sup> in a controlled environment. For the general population, a person may be exposed to cover a thirty minute period is an average power density equal to 1mw/cm<sup>2</sup> in an uncontrolled environment. It is the purpose of this report to determine the power flux densities of the earth station surface area, in the near field, transition region and far field.

P=Antenna Power(watts/4khz), G=Antenna Gain(db), D=Antenna Diameter(meters)  
 F=Ctr Frequency(gHz), Wl=WaveLength(meters)  
 Antenna Surface(m<sup>2</sup>) A=3.14\*D<sup>2</sup>/4  
 Antenna Surface Density(w/m<sup>2</sup>) Ss=4\*P/A

Wavelength Wl(m)=3/(F\*10)

Near Field Region Rnf(m)=D<sup>2</sup>/(4\*Wl)

Near Field Region Density Snf(m/m<sup>2</sup>)=16\*.6\*P/(3.14\*D<sup>2</sup>)

Transition Region Rff(m)=.6\*d<sup>2</sup>/Wl

Transition Region Density St(w/m<sup>2</sup>)=Snf\*Rnf/Rff

Far Field Region Sff(m)=P\*G/(4\*3.14\*Rff)

Earth Station Radiation Hazard Calculations

Freq(ghz)= 6.1 Power(w)=-12.6 AntGain(db)= 41.6 AntSize(m)= 2.4  
 Wavelength(m)= .049 Antenna surface(m<sup>2</sup>)= 4.5

AntSurfDen Ss(w/m <sup>2</sup> )=	-11.10	Ss(mw/cm <sup>2</sup> )=	-1.11
Near-Field Region Rnf(m)=	29.28		
Near-Field Den Snf(w/m <sup>2</sup> )=	-7.22	Snf(mw/cm <sup>2</sup> )=	-.72
Transition Region Rff(m)=	70.3		
Tran Region Den St(w/cm <sup>2</sup> )=	-3.01	St(mw/cm <sup>2</sup> )=	-.30
Far Field Region Sff(w/cm <sup>2</sup> )=	-.01	Sff(mw/cm <sup>2</sup> )=	.00

ANALYSIS RESULTS

LIMITS - 1mw/cm<sup>2</sup> Uncontrolled, 5mw/cm<sup>2</sup> Controlled

Antenna Surface Density	Ss(mw/cm <sup>2</sup> )	-1.110	No Potential Hazard, < Limit
Near Field Density	Snf(mw/c	-.722	
Transition Region	St(mw/cm	-.301	
Far Field Density	Sff(mw/c	-.001	

For a minimum elevation angle of 5.0(deg) and a object height of 15.0(ft)  
 For radiation non-hazard, the minimum distance to object=179.3(ft)

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CALHOUN SATELLITE COMMUNICATIONS  
 TEMPORARY TRANSPORTABLE EARTH STATION

ANALYSIS OF NON-IONIZING RADIATION  
 FOR A 2.4 METER KU BAND EARTH STATION

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<sup>2</sup> in a controlled environment. For the general population, a person may be exposed to cover a thirty minute period is an average power density equal to 1mw/cm<sup>2</sup> in an uncontrolled environment. It is the purpose of this report to determine the power flux densities of the earth station surface area, in the near field, transition region and far field.

P=Antenna Power(watts/4khz), G=Antenna Gain(db), D=Antenna Diameter(meters)  
 F=Ctr Frequency(ghz), Wl=WaveLength(meters)

Antenna Surface(m<sup>2</sup>) A=3.14\*D<sup>2</sup>/4

Antenna Surface Density(w/m<sup>2</sup>) Ss=4\*P/A

Wavelength Wl(m)=3/(F\*10)

Near Field Region Rnf(m)=D<sup>2</sup>/(4\*Wl)

Near Field Region Density Snf(m/m<sup>2</sup>)=16\*.6\*P/(3.14\*D<sup>2</sup>)

Transition Region Rff(m)=.6\*d<sup>2</sup>/Wl

Transition Region Density St(w/m<sup>2</sup>)=Snf\*Rnf/Rff

Far Field Region Sff(m)=P\*G/(4\*3.14\*Rff)

Earth Station Radiation Hazard Calculations

Freq(ghz)= 14.1 Power(w)=-15.6 AntGain(db)= 48.9 AntSize(m)= 2.4  
 Wavelength(m)= .021 Antenna surface(m<sup>2</sup>)= 4.5

AntSurfDen Ss(w/m <sup>2</sup> )=	-13.77	Ss(mw/cm <sup>2</sup> )=	-1.38
Near-Field Region Rnf(m)=	67.68		
Near-Field Den Snf(w/m <sup>2</sup> )=	-8.95	Snf(mw/cm <sup>2</sup> )=	-.89
Transition Region Rff(m)=	162.4		
Tran Region Den St(w/cm <sup>2</sup> )=	-3.73	St(mw/cm <sup>2</sup> )=	-.37
Far Field Region Sff(w/cm <sup>2</sup> )=	.00	Sff(mw/cm <sup>2</sup> )=	.00

ANALYSIS RESULTS

LIMITS - 1mw/cm<sup>2</sup> Uncontrolled, 5mw/cm<sup>2</sup> Controlled

Antenna Surface Density	Ss(mw/cm <sup>2</sup> )=1.377	No Potential Hazard, < Limit
Near Field Density	Snf(mw/c)=.895	
Transition Region	St(mw/cm)=.373	
Far Field Density	Sff(mw/c)=.000	

For a minimum elevation angle of 5.0(deg) and a object height of 15.0(ft)  
 For radiation non-hazard, the minimum distance to object=179.3(ft)

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