

Radiation Hazard Study (1.8m QuaLinks E/S 2.5MHz BW)

1) Parameters

Antenna Diameter	D	1.8 m
Antenna Surface Area	$A_{surface}$	2.545 m ²
Feed Flange Diameter	D_{fe}	9.1 cm
Area of Feed Flange	A_{fa}	65.039 cm ²
Frequency	F	14250 MHz
Wavelength	λ	0.021 m
Antenna Flange Input Power	P	5.0 W
Antenna Gain (dBi)	G_{es}	46.6 dBi
Maximum EIRP	EIRP _{max}	53.59 dBW
Feed Loss	F_{loss}	0.8 dB
Antenna Gain (Factor)	G	45708.819
π	π	3.142
Antenna Efficiency	η	0.634

2) Far Field Distance Calculation

Distance to the Far field Region	R_{ff}	92.34 m
On-Axis Power density in the F Srf	S_{ff}	2.133 W/m ²

3) Near Field Calculation

Extent of the Near Field	R_{nf}	38.475 m
Near field Power Density	S_{nf}	4.979 W/m ²

4) Transition Region Calculation

Transition Region Power Density	S_{tr}	38.475 m
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5) Region between the Feed Assembly and the Antenna Reflector

Power Density at the Feed Flange	S_{fa}	307.509 mW/cm ²
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6) Main Reflector Region

Power Density at the Reflector Surface	S_{sur}	7.860 W/m ²
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7) Region between the Reflector and the Ground

	S_g	1.965 W/m ²
		0.196 mW/cm ²

Table 1. Summary of Expected Radiation levels for UNCONTROLLED ENVIRONMENT

No.	Region	Calculated Maximum Radiation power Density Level	Hazard Assessment
1	Far Field $R_{ff} = 92.34$ m	S_{ff} 0.213 mW/cm ²	
2	Near Field $R_{nf} = 38.475$ m	S_{nf} 0.498 mW/cm ²	
3	Transition Region $R_{ff} < R_t < R_{ff}$	S_t 0.498 mW/cm ²	
4	Between Feed Assembly and Antenna Reflector	S_{fa} 307.509 mW/cm ²	Potential Hazard
5	Main Reflector	S_{sur} 0.786 mW/cm ²	
6	Between Reflector and Ground	S_g 0.196 mW/cm ²	

Power Density Limits for General Population/Uncontrolled Exposure (MPE) = 1.0mW/cm²

Table 2. Summary of Expected Radiation levels for CONTROLLED ENVIRONMENT

No.	Region	Calculated Maximum Radiation power Density Level	Hazard Assessment
1	Far Field $R_{ff} = 92.34$ m	S_{ff} 0.213 mW/cm ²	
2	Near Field $R_{nf} = 38.475$ m	S_{nf} 0.498 mW/cm ²	
3	Transition Region $R_{ff} < R_t < R_{ff}$	S_t 0.498 mW/cm ²	
4	Between Feed Assembly and Antenna Reflector	S_{fa} 307.509 mW/cm ²	Potential Hazard
5	Main Reflector	S_{sur} 0.786 mW/cm ²	
6	Between Reflector and Ground	S_g 0.196 mW/cm ²	

Power Density Limits for General Occupational/Controlled Exposure (MPE) = 5.0mW/cm²

8) Conclusions

Based on this analysis it is concluded that the FCC RF Guidelines have been exceeded in the specific regions of table 1 and 2. We propose to comply with the maximum Permissible Exposure(MPE) limits of 1.0mW/cm² for the uncontrolled areas and the MPE limits of 5.0mW/cm² for the controlled areas by one or more of following methods:

a. Means of Compliance Uncontrolled Areas

The area around this antenna will be roped off. The roped off area will be sufficient to prohibit access to the areas that exceed the MPE limits. The general public will not have access to areas within 1/2diameter removed from the edge of the antenna.

Since one diameter removed from the main beam of the antenna or 1/2diameter removed from the edge of the antenna the RF levels are reduced by a factor of 100 or 20dB. None of the areas exceeding the MPE levels will be accessible by the general public.

Radiation hazard signs will be posted while this earth station is in operation.

We will ensure that no buildings or other obstacles will be in the areas that exceed the MPE levels.

b. Means of Compliance Controlled Areas

The earth station's operational personnel will not have access to the areas that exceed the MPE levels while the earth station is in operation.

The transmitters will be turned off during antenna maintenance.

Radiation Hazard Study (1.2m QualLinks E/S 2.5MHz BW)

1) Parameters

Antenna Diameter	D	1.2 m
Antenna Surface Area	A _{surface}	1.131 m ²
Feed Flange Diameter	D _{fa}	9.1 cm
Area of Feed Flange	A _{fa}	65.039 cm ²
Frequency	F	14250 MHz
Wavelength	λ	0.021 m
Antenna Flange Input Power	P	10.7 W
Antenna Gain (dBi)	G _{es}	43.0 dBi
Maximum EIRP	EIRP _{max}	53.31 dBW
Feed Loss	F _{loss}	0.48 dB
Antenna Gain (Factor)	G	19952.623
PI	π	3.142
Antenna Efficiency	η	0.622

2) Far Field Distance Calculation

Distance to the Far field Region	R _{ff}	41.04 m
On-Axis Power density in the F S _{ff}		10,124 W/m ²
		1.012 mW/cm ²

3) Near Field Calculation

Extent of the Near Field	R _{nf}	17,100 m
Near field Power Density	S _{nf}	23,634 W/m ²
		2,363 mW/cm ²

4) Transition Region Calculation

Transition Region Power Density	R _t	17,100 m
	St	2,3634 mW/cm ²

5) Region between the Feed Assembly and the Antenna Reflector

Power Density at the Feed Flange	F _{fa}	660.476 mW/cm ²
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6) Main Reflector Region

Power Density at the Reflector surface	S _{surface}	37,982 W/m ²
		3,798 mW/cm ²

7) Region between the Reflector and the Ground

	S _g	9,495 W/m ²
		0,950 mW/cm ²

Table 1. Summary of Expected Radiation levels for UNCONTROLLED ENVIRONMENT

No.	Region	Calculated Maximum Radiation power Density Level	Hazard Assessment
1	Far Field	R _{ff} = 41.04 m	Potential Hazard
2	Near Field	R _{nf} = 17,100 m	Potential Hazard
3	Transition Region	R _t < R _t < R _{ff}	Potential Hazard
4	Between Feed Assembly and Abtenna Reflector	S _{fa}	Potential Hazard
5	Main Reflector	S _{surface}	Potential Hazard
6	Between Reflector and Ground	S _g	Potential Hazard

Power Density Limits for General Population/Uncontrolled Exposure (MPE) = 1.0mW/cm²

Table 2. Summary of Expected Radiation levels for CONTROLLED ENVIRONMENT

No.	Region	Calculated Maximum Radiation power Density Level	Hazard Assessment
1	Far Field	R _{ff} = 41.04 m	Potential Hazard
2	Near Field	R _{nf} = 17,100 m	Potential Hazard
3	Transition Region	R _t < R _t < R _{ff}	Potential Hazard
4	Between Feed Assembly and Abtenna Reflector	S _{fa}	Potential Hazard
5	Main Reflector	S _{surface}	Potential Hazard
6	Between Reflector and Ground	S _g	Potential Hazard

Power Density Limits for General Occupational/Controlled Exposure (MPE) = 5.0mW/cm²

8) Conclusions

Based on this analysis it is concluded that the FCC RF Guidelines have been exceeded in the specific regions of table 1 and 2. We propose to comply with the maximum Permissible Exposure(MPE) limits of 1.0mW/cm² for the uncontrolled areas and the MPE limits of 5.0mW/cm² for the controlled areas by one or more of following methods:

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b. Means of Compliance Controlled Areas

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The transmitters will be turned off during antenna maintenance.