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	㎡
Feed Flange Diameter	D_{fe}	9.1	cm
Area of Feed Flange	A_{fe}	65.039	㎠
Frequency	F	14250	MHz
Wavelength	λ	0.021	m
Antenna Flange Input Power	P	7	W
Antenna Gain (dBi)	G_{es}	46.5	dBi
Maximum EIRP	$EIRP_{max}$	53.99	dBW
Feed Loss	F_{Loss}	0.8	dB
Antenna Gain (Factor)	G	44668.359	
Pi	π	3.142	
Antenna Efficiency	η	0.619	

2) Far Field Distance Calculation

Distance to the Far field Regio	R_{ff}	92.34	m
On-Axis Power density in the F	S_{ff}	2.812	W/㎡
		0.281	mW/㎠

3) Near Field Calculation

Extent of the Near Field	R_{nf}	38.475	m
Near field Power Density	S_{nf}	6.564	W/㎡
		0.656	mW/㎠

4) Transition Region Calculation

	Rt	38.475	m
Transition Region Power Densi	St	0.6564	mW/㎠

5) Region between the Feed Assembly and the Antenna Reflector

Power Density at the Feed Fla	S_{fe}	414.818	mW/㎠

6) Main Reflector Region

Power Density at the Reflecto	$S_{surface}$	10.602	W/㎡
		1.060	mW/㎠

7) Region between the Reflector and the Ground

	S_g	2.651	W/㎡
		0.265	mW/㎠

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}	0.281 mW/㎠	
2	Near Field	R_{nf} = 38.475 m	S_{nf}	0.656 mW/㎠	
3	Transition Region	$R_{ff} < R_t < R_{ff}$	St	0.656 mW/㎠	
4	Between Feed Assembly and Abtenna Reflector		S_{fe}	414.818 mW/㎠	Potential Hazard
5	Main Reflector		Ssurface	1.060 mW/㎠	Potential Hazard
6	Between Reflector and Ground		S_g	0.265 mW/㎠	

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

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}	0.281 mW/㎠	
2	Near Field	R_{nf} = 38.475 m	S_{nf}	0.656 mW/㎠	
3	Transition Region	$R_{ff} < R_t < R_{ff}$	St	0.656 mW/㎠	
4	Between Feed Assembly and Abtenna Reflector		S_{fe}	414.818 mW/㎠	Potential Hazard
5	Main Reflector		Ssurface	1.060 mW/㎠	
6	Between Reflector and Ground		S_g	0.265 mW/㎠	

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

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 proposes to comply with the maximum Permissible Exposure(MPE) limits of 1.0mW/㎠ for the uncontrolled areas and the MPE limits of 5.0mW/㎠ 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 personal 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 QuaLinks E/S 2.5MHz BW)

1) Parameters

Antenna Diameter	D	1.2	m
Antenna Surface Area	$A_{surface}$	1.131	㎡
Feed Flange Diameter	D_{fa}	9.1	cm
Area of Feed Flange	A_{fa}	65.039	㎠
Frequency	F	14250	MHz
Wavelength	λ	0.021	m
Antenna Flange Input Power	P	12	W
Antenna Gain (dBi)	Ges	43.2	dBi
Maximum EIRP	$EIRP_{max}$	53.51	dBW
Feed Loss	F_{Loss}	0.48	dB
Antenna Gain (Factor)	G	20892.961	
Pi	π	3.142	
Antenna Efficiency	η	0.652	

2) Far Field Distance Calculation

Distance to the Far field Regio	Rff	41.04	m
On-Axis Power density in the F	Sff	11.840	W/㎡
		1.184	mW/㎠

3) Near Field Calculation

Extent of the Near Field	Rnf	17.100	m
Near field Power Density	Snf	27.639	W/㎡
		2.764	mW/㎠

4) Transition Region Calculation

	Rt	17.100	m
Transition Region Power Densi	St	2.7639	mW/㎠

5) Region between the Feed Assembly and the Antenna Reflector

Power Density at the Feed Fla	Sfa	737.662	mW/㎠

6) Main Reflector Region

Power Density at the Reflecto	Ssurface	42.421	W/㎡
		4.242	mW/㎠

7) Region between the Reflector and the Ground

	Sg	10.605	W/㎡
		1.061	mW/㎠

Table 1. Summary of Expected Radiation levels for UNCONTROLLED ENVIRONMENT

No.	Region		Calculated Maximum Radiation power Density Level		Hazard Assessment
1	Far Field	Rff = 41.04 m	Sff	1.184 mW/㎠	Potential Hazard
2	Near Field	Rnf = 17.100 m	Snf	2.764 mW/㎠	Potential Hazard
3	Transition Region	Rff < Rt < Rff	St	2.764 mW/㎠	Potential Hazard
4	Between Feed Assembly and Abtenna Reflector		Sfa	737.662 mW/㎠	Potential Hazard
5	Main Reflector		Ssurface	4.242 mW/㎠	Potential Hazard
6	Between Reflector and Ground		Sg	1.061 mW/㎠	Potential Hazard

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

Table 2. Summary of Expected Radiation levels for CONTROLLED ENVIRONMENT

No.	Region		Calculated Maximum Radiation power Density Level		Hazard Assessment
1	Far Field	Rff = 41.04 m	Sff	1.184 mW/㎠	
2	Near Field	Rnf = 17.100 m	Snf	2.764 mW/㎠	
3	Transition Region	Rff < Rt < Rff	St	2.764 mW/㎠	
4	Between Feed Assembly and Abtenna Reflector		Sfa	737.662 mW/㎠	Potential Hazard
5	Main Reflector		Ssurface	4.242 mW/㎠	
6	Between Reflector and Ground		Sg	1.061 mW/㎠	

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

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 proposes to comply with the maximum Permissible Exposure(MPE) limits of 1.0mW/㎠ for the uncontrolled areas and the MPE limits of 5.0mW/㎠ 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 personal 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.