Exhibit B

Radiation Hazard Analysis

Attached are the Radiation Hazard Analysis Reports for the 3.6m and 3.8m earth station antennas.

ANALYSIS OF NON-IONIZING RADIATION
FOR A 3.6 METER EARTH STATION
Completed: 10/30/2002

This report analyzes the non-ionizing radiation levels for a 3.6 meter earth station. It is the purpose of this report to determine the power flux densities of the earth station at the antenna surface, near field, far field, and the transition region. Results are summarized in Table 1 on page 4.

The Office Engineering & Technology Bulletin, No. 65, August 1997, specifies the following Maximum Permissible Exposure (MPE) levels for non-ionizing radiation :

1. Occupational/Controlled Exposure is 5mW/cm² (five milliwatts per centimeter squared) over an average time of 6 (six) minutes.

2. General Population/Uncontrolled Exposure is 1mW/cm² (one milliwatt per centimeter squared) over an average time of 30 (thirty) minutes.

The following parameters were used to calculate the various power flux densities for this earth station:

Location:	GCI Warehouse/Test Lab, Anchorage, Alaska	
Latitude:	61.18	°N
Longitude:	149.87	°W
Operating Frequency:	6175	MHz
Wavelength (λ)	0.0485	meters
Antenna Diameter (D):	3.6	meters
Antenna Area (A):	10.18	meters²
Transmit Antenna Gain:	45.6	dBi
Transmit Antenna Gain (G):	36307.8	numeric
1° Off Axis Gain	29.0	dBi
1° Off Axis Gain ($G_{1°}$)	794.3	numeric
Antenna Efficiency (η):	0.669	numeric
Feed Power (P):	50	Watts

1. Antenna Surface

The power density in the main reflector region can be estimated by:

Power Density at Reflector Surface, $S_{surface} = 4P/A$

$= 19.65$ W/m²

$=$ **1.96 mW/cm²**

$S_{surface}$ = maximum power density at antenna surface
P = power fed to the antenna
A = physical area of the antenna

2. Near Field Calculations

In the near field region, of the main beam, the power density can reach a maximum before it begins to decrease with distance. The magnitude of the on axis (main beam) power density varies according to location in the near-field.

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

Extent of Near Field, $R_{nf} = D^2/4(\lambda)$
$= 66.74$ meters

R_{nf}= extent of near field
D= maximum dimension of antenna (diameter if circular
λ= wavelength

The maximum near-field, on-axis, power density is determined by

On Axis Near Field Power Density, $S_{nf} = 16\eta P/D^2\pi$
$= 13.15$ W/m²
$=$ **1.31 mW/cm²**

The maximum near-field, 1° off-axis, power density is determined by

Power Density at 1° Off Axis $S_{nf\,1°} = (S_{nf}/G)*G_{1°}$
$=$ **0.0288 mW/cm²**

S_{nf}= maximum near-field power density
$S_{nf\,1°}$= maximum near-field power density (1° off axis)
η= aperture efficiency
P= power fed to antenna
D= maximum dimension of antenna (diameter if circular

3. Far Field Calculations

The power density in the far-field region decreases inversely with the square of the distanc

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

Distance to the Far Field Region, $R_{ff} = 0.6D^2/\lambda$
$= 160$ meters

R_{ff}= distance to beginning of far field
D= maximum dimension of antenna (diameter if circular
λ= wavelength

The maximum main beam power density in the far field can be calculated as follows

On-Axis Power Density in the Far Field, $S_{ff} = (P)(G)/4\pi(R_{ff})^2$
$= 5.63$ W/m²
$=$ **0.56 mW/cm²**

The maximum far-field, 1° off-axis, power density is determined by

Power Density at 1° Off Axis $Sff_{1°} = (Sff/G)*G_{1°}$
$=$ **0.0123 mW/cm²**

S_{ff}= power density (on axis)
$Sff_{1°}$= power density (1° off axis)

P= power fed to antenna
G= power gain of antenna in the direction of interest relative to an isotropic radiatc
R_{ff} = distance to beginning of far field

4. Transition Region Calculations

The transition region is located between the near and far field regions. The power density decreases inversely with distance in the transition region, while 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

S_t = 1.31 mW/cm².
$S_{t\,1°}$ = 0.0288 mW/cm².

Table 1

Summary of Expected Radiation Levels

Region	Calculated Maximum Radiation Level (mW/cm²)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$ = 1.96	Satisfies MPE	Potential Hazard
2. Near Field	S_{nf} = 1.31	Satisfies MPE	Potential Hazard
3. Far Field	S_{ff} = 0.56	Satisfies MPE	Satisfies MPE
4. Transition Region	S_t = 1.31	Satisfies MPE	Potential Hazard
5. Near Field 1° Off Axis	$S_{nf\,1°}$ = 0.0288	Satisfies MPE	Satisfies MPE
6. Far Field 1° Off Axis	$Sff_{1°}$ = 0.01	Satisfies MPE	Satisfies MPE
7. Transition Region 1° Off Axis	$S_{t\,1°}$ = 0.0288	Satisfies MPE	Satisfies MPE

7. Conclusions

Based on the above analysis it is concluded that the only risk of exposure to levels higher than the Maximum Permissible Exposure limit are at the surface of the antenna, in the near-field of the main beam, and in the transition region of the main beam . At 1° off axis the radiation levels are well within limits. A 5° minimum elevation angle and a secured facility restricting access to the antenna to occupational personnel will protect the public from exposure to high radiation levels. The transmitter will be turned off during antenna maintenance and the 5° minimum elevation angle will ensure safety of the earth station personnel.

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ANALYSIS OF NON-IONIZING RADIATION
FOR A 3.6 METER EARTH STATION
Completed: 3/1/06

This report analyzes the non-ionizing radiation levels for a 3.8 meter earth station. It is the purpose of this report to determine the power flux densities of the earth station at the antenna surface, near field, far field, and the transition region. Results are summarized in Table 1 on page 4.

The Office Engineering & Technology Bulletin, No. 65, August 1997, specifies the following Maximum Permissible Exposure (MPE) levels for non-ionizing radiation :

1. Occupational/Controlled Exposure is 5mW/cm² (five milliwatts per centimeter squared) over an average time of 6 (six) minutes.

2. General Population/Uncontrolled Exposure is 1mW/cm² (one milliwatt per centimeter squared) over an average time of 30 (thirty) minutes.

The following parameters were used to calculate the various power flux densities for this earth station:

Location:	Wainwright, Alaska	
Latitude:	61.18	°N
Longitude:	149.87	°W
Mapping Datum:	NAD-83	
Operating Frequency:	6175	MHz
Wavelength (λ)	0.0485	meters
Antenna Diameter (D):	3.8	meters
Antenna Area (A):	11.34	meters²
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 1° Off Axis Gain	29.0	dBi
Maximum 1° Off Axis Gain ($G_{1°}$)	794.3	numeric
Antenna Efficiency (η):	0.689	numeric
Feed Power (P):	200	Watts

1. Antenna Surface

The power density in the main reflector region can be estimated by:

Power Density at Reflector Surface, $S_{surface} = 4P/A$
$= 70.54$ W/m²
$=$ **7.05 mW/cm²**

$S_{surface}$= maximum power density at antenna surface
P= power fed to the antenna
A= physical area of the antenna

2. Near Field Calculations

In the near field region, of the main beam, the power density can reach a maximum before it begins to decrease with distance. The magnitude of the on axis (main beam) power density varies according to location in the near-field.

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

Extent of Near Field, $R_{nf} = D^2/4(\lambda)$
$= 74.36$ meters

R_{nf}= extent of near field
D= maximum dimension of antenna (diameter if circular)
λ= wavelength

The maximum near-field, on-axis, power density is determined by:

On Axis Near Field Power Density, $S_{nf} = 16\eta P/D^2\pi$
$= 48.63$ W/m²
$=$ **4.86 mW/cm²**

The maximum near-field, 1° off-axis, power density is determined by:

Power Density at 1° Off Axis $S_{nf\ 1°} = (S_{nf}/G)*G_{1°}$
$=$ **0.0927 mW/cm²**

S_{nf}= maximum near-field power density
$S_{nf\ 1°}$= maximum near-field power density (1° off axis)
η= aperture efficiency
P= power fed to antenna
D= maximum dimension of antenna (diameter if circular)

3. Far Field Calculations

The power density in the far-field region decreases inversely with the square of the distance.

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

Distance to the Far Field Region, $R_{ff} = 0.6D^2/\lambda$
$= 178$ meters

R_{ff} = distance to beginning of far field
D= maximum dimension of antenna (diameter if circular)
λ= wavelength

The maximum main beam power density in the far field can be calculated as follows:

On-Axis Power Density in the Far Field, $S_{ff} = (P)(G)/4\pi(R_{ff})^2$
$= 20.83$ W/m²
$=$ **2.08 mW/cm²**

The maximum far-field, 1° off-axis, power density is determined by:

Power Density at 1° Off Axis $Sff_{1°} = (Sff/G)*G_{1°}$
$=$ **0.0397 mW/cm²**

S_{ff}= power density (on axis)
$Sff_{1°}$= power density (1° off axis)
P= power fed to antenna
G= power gain of antenna in the direction of interest relative to an isotropic radiator
R_{ff} = distance to beginning of far field

4. Transition Region Calculations

The transition region is located between the near and far field regions. The power density decreases inversely with distance in the transition region, while 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:

S_t= **4.86 mW/cm².**
$S_{t\,1°}$ = **0.0927 mW/cm².**

Table 1

Summary of Expected Radiation Levels

Region	Calculated Maximum Radiation Level (mW/cm²)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$= 7.05	Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 4.86	Satisfies MPE	Potential Hazard
3. Far Field	S_{ff}= 2.08	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 4.86	Satisfies MPE	Potential Hazard
5. Near Field 1° Off Axis	$S_{nf\ 1°}$= 0.0927	Satisfies MPE	Satisfies MPE
6. Far Field 1° Off Axis	Sff $_{1°}$= 0.04	Satisfies MPE	Satisfies MPE
7. Transition Region 1° Off Axis	$S_{t\ 1°}$ = 0.0927	Satisfies MPE	Satisfies MPE

7. Conclusions

Based on the above analysis it is concluded that there is a potential hazard to the public and earth station personnel. This is due to the parabolic antenna's highly directional nature and high power densities in the main beam. The general public's likelihood of being exposed to the radiation levels in the main beam are greatly reduced due to the elevation angle of the site and physical barriers that will prevent the public from accessing the site. At 1° off axis the radiation levels are well within limits. Earth station personnel will be taught safe working procedures including turning off the transmitter during antenna maintenance.

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