Exhibit B

Radiation Hazard Analysis

Per 47 C.F.R. Ch. 1 §1.1307, the earth stations associated with this application are subject to a Routine Environmental Evaluation. As such, separate Radiation Hazard Analyses/Studies for each of the following locations associated with FCC Call Sign E080229 are attached:

- Anchorage
- Cold bay
- Fort Yukon
- Galena
- Iliamna
- King Cove
- Nome
- St. Paul
- Sand Point
- Unalaska

Exhibit B

Radiation Hazard Analysis

Site: Anchorage

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: ANCHORAGE, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Anchorage, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Anchorage, Alaska**	
Latitude:	61.170417	°N
Longitude:	149.879973	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$S_{surface}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\,5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	Calculated Maximum Radiation Level (mW/cm²)	Distance to Region (m)	(ft)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Cold Bay

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: COLD BAY, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Cold Bay, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	Cold Bay, Alaska	
Latitude:	55.207254	°N
Longitude:	162.720019	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	meters²
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m²
	$S_{surface}$ =	**14.11**	**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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\,5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	Calculated Maximum Radiation Level (mW/cm²)	Distance to Region (m)	(ft)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Fort Yukon

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: FORT YUKON, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Fort Yukon, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	Fort Yukon, Alaska	
Latitude:	66.563670	°N
Longitude:	145.265858	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$S_{surface}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\,5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

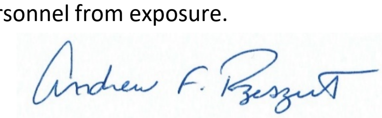
	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels					
3.8m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm²)**	**Distance to Region (m)**	**(ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**General Population**
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.



Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Galena

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: GALENA, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Galena, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Galena, Alaska**	
Latitude:	64.740243	°N
Longitude:	156.952217	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$S_{surface}$ =	**14.11**	mW/cm^2

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	$R_{nf} =$	$D^2/4(\lambda)$	
	$R_{nf} =$	**73.88**	**meters**

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

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

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	$S_{nf} =$	$16\eta P/\pi D^2$	
	$S_{nf} =$	98.54	W/m^2
	$S_{nf} =$	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°} =$	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°} =$	**0.0034**	**mW/cm^2**

$S_{nf} =$ maximum near-field power density
$S_{nf\,5°} =$ maximum near-field power density (5° off axis)
$\eta =$ 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	$R_{ff} =$	$0.6D^2/\lambda$	
	$R_{ff} =$	**177.30**	**meters**

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

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

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	$S_{ff} =$	$(P)(G)/4\pi(R_{ff})^2$	
	$S_{ff} =$	42.21	W/m^2
	$S_{ff} =$	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°} =$	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°} =$	**0.0014**	**mW/cm^2**

$S_{ff} =$ power density (on axis)
$Sff_{5°} =$ power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm^2**
$S_{t\,5°}$ =	**0.0034**	**mW/cm^2**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm^2)**	**Distance to Region (m)**	**(ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**General Population**
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Iliamna

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: ILIAMNA, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Iliamna, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Iliamna, Alaska**	
Latitude:	59.758057	°N
Longitude:	154.822586	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$\mathbf{S_{surface}}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\,5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm²)**	**Distance to Region (m)**	**(ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**General Population**
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Iliamna

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: ILIAMNA, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Iliamna, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Iliamna, Alaska**	
Latitude:	59.758057	°N
Longitude:	154.822586	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
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Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
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	$\mathbf{S_{surface}}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\ 5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\ 5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\ 5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\ 5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\ 5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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

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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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	Calculated Maximum Radiation Level (mW/cm²)	Distance to Region (m)	(ft)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: King Cove

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: KING COVE, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **King Cove, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**King Cove, Alaska**	
Latitude:	55.061428	°N
Longitude:	162.320999	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$S_{surface}$ =	**14.11**	mW/cm^2

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\ 5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\ 5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\ 5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\ 5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\ 5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
$S_t =$	$(S_{nf} * R_{nf})/R$	
$S_{t\,5°} =$	$(S_{nf\,5°} * R_{nf})/R$	
$S_t =$	**9.85**	**mW/cm²**
$S_{t\,5°} =$	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm²)**	**Distance to Region (m)**	**Distance to Region (ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**Maximum Permissible Exposure (MPE) General Population**
1. Antenna Surface	$S_{surface} =$ 14.11			Potential Hazard	Potential Hazard
2. Near Field	$S_{nf} =$ 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	$S_{ff} =$ 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	$S_t =$ 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°} =$ 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°} =$ 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°} =$ 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Nome

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: NOME COVE, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Nome, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	Nome, Alaska	
Latitude:	64.494850	°N
Longitude:	165.388351	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	meters²
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m²
	$S_{surface}$ =	**14.11**	**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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\ 5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\ 5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density
$S_{nf\ 5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\ 5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\ 5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)
$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

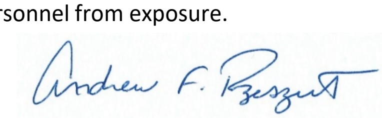
Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	Calculated Maximum Radiation Level (mW/cm²)	Distance to Region (m)	(ft)	Maximum Permissible Exposure (MPE) Occupational	General Population
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.



Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Saint Paul

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: SAINT PAUL, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Saint Paul, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Saint Paul, Alaska**	
Latitude:	57.120506	°N
Longitude:	170.278549	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$\mathbf{S_{surface}}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\ 5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\ 5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density

$S_{nf\ 5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\ 5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\ 5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)

$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
$S_t=$	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}=$	$(S_{nf\,5°}*R_{nf})/R$	
$S_t=$	**9.85**	**mW/cm²**
$S_{t\,5°}=$	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	Calculated Maximum Radiation Level (mW/cm²)	Distance to Region (m)	Distance to Region (ft)	Maximum Permissible Exposure (MPE) Occupational	Maximum Permissible Exposure (MPE) General Population
1. Antenna Surface	$S_{surface}=$ 14.11			Potential Hazard	Potential Hazard
2. Near Field	$S_{nf}=$ 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	$S_{ff}=$ 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	$S_t=$ 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}=$ 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}=$ 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}=$ 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

Andrew F. Rzeszut

Andrew F. Rzeszut (12/15/2020)
Senior Telecom Engineer
TelAlaska, Inc.

Exhibit B

Radiation Hazard Analysis

Site: Sand Point

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 3.8M EARTH STATION ANTENNA: SAND POINT, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **3.8m C-band** earth station antenna located in **Sand Point, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Sand Point, Alaska**	
Latitude:	55.342480	°N
Longitude:	160.494192	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	3.80	meters
Antenna Area (A):	11.34	$meters^2$
Transmit Antenna Gain:	46.2	dBi
Transmit Antenna Gain (G):	41686.9	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	11.5	ft
Antenna Efficiency (η):	0.698	numeric
Feed Power (P):	400	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		3.80	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	141.08	W/m^2
	$S_{surface}$ =	**14.11**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		3.80	meters
Extent of Near Field	R_{nf} =	$D^2/4(\lambda)$	
	R_{nf} =	**73.88**	**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:

		Antenna Diameter	
		3.80	meters
On Axis Near Field Power Density	S_{nf} =	$16\eta P/\pi D^2$	
	S_{nf} =	98.54	W/m^2
	S_{nf} =	**9.85**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{nf\,5°}$=	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°}$=	**0.0034**	**mW/cm^2**

S_{nf}= maximum near-field power density

$S_{nf\,5°}$ = maximum near-field power density (5° 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:

		Antenna Diameter	
		3.80	meters
Distance to the Far Field Region	R_{ff} =	$0.6D^2/\lambda$	
	R_{ff} =	**177.30**	**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:

		Antenna Diameter	
		3.80	meters
On-Axis Power Density in the Far Field	S_{ff} =	$(P)(G)/4\pi(R_{ff})^2$	
	S_{ff} =	42.21	W/m^2
	S_{ff} =	**4.22**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		3.80	meters
Power Density at 5° Off Axis	$S_{ff\,5°}$=	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°}$=	**0.0014**	**mW/cm^2**

S_{ff}= power density (on axis)

$Sff_{5°}$= power density (5° 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:

	Antenna Diameter	
	3.80	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**9.85**	**mW/cm²**
$S_{t\,5°}$ =	**0.0034**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

3.8m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm²)**	**Distance to Region (m)**	**(ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**General Population**
1. Antenna Surface	$S_{surface}$= 14.11			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 9.85	73.9	242.4	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 4.22	177.3	581.7	Satisfies MPE	Potential Hazard
4. Transition Region	S_t= 9.85			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0034			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0034			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

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Exhibit B

Radiation Hazard Analysis

Site: Unalaska

Radiation Hazard Analysis Report

ANALYSIS OF NON-IONIZING RADIATION
TELALASKA C-BAND 4.6M EARTH STATION ANTENNA: UNALASKA, ALASKA

This analysis provides the calculated non-ionizing radiation levels for the TelAlaska **4.6m C-band** earth station antenna located in **Unalaska, Alaska**. The methods and calculations performed in this analysis are based on the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of this analysis is to determine the power flux density levels of the earth station at the main reflector surface, in the near-field, the transition-region, and the far-field, and to compare these levels to the specified MPE limits. These MPE limits are also consistent with those specified in 47 C.F.R. Ch. 1 §1.1310 (2020). The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

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

Location:	**Unalaska, Alaska**	
Latitude:	53.868149	°N
Longitude:	166.521576	°W
Operating Frequency:	6135	MHz
Wavelength (λ)	0.04887	meters
Antenna Diameter (D):	4.60	meters
Antenna Area (A):	16.62	$meters^2$
Transmit Antenna Gain:	47.5	dBi
Transmit Antenna Gain (G):	56234.1	numeric
Maximum 5° Off Axis Gain:	11.5	dBi
Maximum 5° Off Axis Gain ($G_{5°}$):	14.2	numeric
Antenna Radiation Center Height:	7.8	ft
Antenna Efficiency (η):	0.643	numeric
Feed Power (P):	800	Watts

1. Antenna/Main Reflector Surface Calculation

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

		Antenna Diameter	
		4.60	meters
Power Density at Reflector Surface	$S_{surface}$ =	4P/A	
	$S_{surface}$ =	192.55	W/m^2
	$S_{surface}$ =	**19.26**	**mW/cm^2**

$S_{surface}$ = 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:

		Antenna Diameter	
		4.60	meters
Extent of Near Field	$R_{nf} =$	$D^2/4(\lambda)$	
	$R_{nf} =$	**108.26**	**meters**

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

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

		Antenna Diameter	
		4.60	meters
On Axis Near Field Power Density	$S_{nf} =$	$16\eta P/\pi D^2$	
	$S_{nf} =$	123.81	W/m^2
	$S_{nf} =$	**12.38**	**mW/cm^2**

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		4.60	meters
Power Density at 5° Off Axis	$S_{nf\,5°} =$	$(S_{nf}/G)*G_{5°}$	
	$S_{nf\,5°} =$	**0.0031**	**mW/cm^2**

$S_{nf} =$ maximum near-field power density
$S_{nf\,5°} =$ maximum near-field power density (5° off axis)
$\eta =$ 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:

		Antenna Diameter	
		4.60	meters
Distance to the Far Field Region	$R_{ff} =$	$0.6D^2/\lambda$	
	$R_{ff} =$	**259.81**	**meters**

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

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

		Antenna Diameter	
		4.60	meters
On-Axis Power Density in the Far Field	$S_{ff} =$	$(P)(G)/4\pi(R_{ff})^2$	
	$S_{ff} =$	53.03	W/m^2
	$S_{ff} =$	**5.30**	**mW/cm^2**

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		4.60	meters
Power Density at 5° Off Axis	$S_{ff\,5°} =$	$(S_{ff}/G)*G_{5°}$	
	$S_{ff\,5°} =$	**0.0013**	**mW/cm^2**

$S_{ff} =$ power density (on axis)
$Sff_{5°} =$ power density (5° 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:

	Antenna Diameter	
	4.60	meters
S_t=	$(S_{nf}*R_{nf})/R$	
$S_{t\,5°}$ =	$(S_{nf\,5°}*R_{nf})/R$	
S_t=	**12.38**	**mW/cm²**
$S_{t\,5°}$ =	**0.0031**	**mW/cm²**

Table 3

Summary of Calculations / Expected Radiation Levels

4.6m Earth Station Antenna Region	**Calculated Maximum Radiation Level (mW/cm²)**	**Distance to Region (m)**	**(ft)**	**Maximum Permissible Exposure (MPE) Occupational**	**General Population**
1. Antenna Surface	$S_{surface}$= 19.26			Potential Hazard	Potential Hazard
2. Near Field	S_{nf}= 12.38	108.3	355.2	Potential Hazard	Potential Hazard
3. Far Field	S_{ff}= 5.30	259.8	852.4	Potential Hazard	Potential Hazard
4. Transition Region	S_t= 12.38			Potential Hazard	Potential Hazard
5. Near Field 5° Off Axis	$S_{nf\,5°}$= 0.0031			Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff\,5°}$= 0.00			Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t\,5°}$ = 0.0031			Satisfies MPE	Satisfies MPE

5. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) could be excdeeded in certain circumstances. However, the General Population/Uncontrolled MPE limit is always satisifed at angles 5° off of boresite or greater. This earth station antenna will never be operated with an elevation angle less than the minimum specified in 47 C.F.R. Ch. 1 §25.205 (i.e. 5°). As such, the MPE associated with the General Population/Uncontrolled limits should always be satisfied. TelAlaska will post appropriate RF Radiation Hazard placards and other signage in the areas near this antenna and will restrict access to the antenna by means of fencing or other appropriate measures. Finally, the transmitter will be disabled during maintenance activities in the areas where the Occupational MPE is exceeded in order to protect personnel from exposure.

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