

RADIATION HAZARD STUDY

This radiation hazard study describes the R.F. radiation environment of the permanent fixed Ku-band R/T earth station terminals operated by Family Stations, Inc. This fixed Ku-band R/T earth station terminals are to be located and operated at a latitude of 32d - 43m - 23s North and a longitude of 122d - 14m - 04s West, in Alameda, CA.

This study is done to comply with the requirements of Section 1.1307(b) of the rules of the Federal Communications Commission. All calculations conform to the procedures presented in OET Bulletin No. 65 for aperture antennas.

Transmit antenna: Prodelin 2.4 meter KU-band

Antenna Diameter $D := 2.4 \cdot \text{m}$

Antenna Efficiency $\eta := 67 \cdot \%$

Transmitter: 40 watt output flange SSPA, operated at 100% power

Transmit Power $P := 40 \cdot \text{watt} \cdot 100 \cdot \%$ $\text{mw} := \frac{\text{watt}}{1000}$
 $P = 40 \cdot \text{watt}$

	at 14.0 GHz	at 14.5 GHz
Antenna Gain	$G_1 := 49.10$	$G_2 := 49.30$
Wavelength	$\lambda_1 := 2.14285 \cdot \text{cm}$	$\lambda_2 := 2.06896 \cdot \text{cm}$

Calculations for the Near Field (Fresnel Region)

Extent of the Near Field

$$R_{n1} := \frac{D^2}{4 \cdot \lambda_1} \qquad R_{n2} := \frac{D^2}{4 \cdot \lambda_2}$$
$$R_{n1} = 67.2 \cdot \text{m} \qquad R_{n2} = 69.6 \cdot \text{m}$$

Maximum Near Field
Power Density

$$S_n := \frac{16 \cdot \eta \cdot P}{\pi \cdot D^2}$$
$$S_n = 2.37 \cdot \frac{\text{mw}}{\text{cm}^2}$$

	at 14.0 GHz	at 14.5 GHz
Distance to Far Field	$R_{f1} := \frac{0.6 \cdot D^2}{\lambda_1}$ $R_{f1} = 161.281 \cdot \text{m}$	$R_{f2} := \frac{0.6 \cdot D^2}{\lambda_2}$ $R_{f2} = 167.04 \cdot \text{m}$
Absolute Gain of Antenna	$G_{a1} := 10^{\frac{G_1}{10}}$	$G_{a2} := 10^{\frac{G_2}{10}}$
Maximum Far Field Power Density	$S_{f1} := \frac{P \cdot G_{a1}}{4 \cdot \pi \cdot R_{f1}^2}$ $S_{f1} = 0.995 \cdot \frac{\text{mw}}{\text{cm}^2}$	$S_{f2} := \frac{P \cdot G_{a2}}{4 \cdot \pi \cdot R_{f2}^2}$ $S_{f2} = 0.971 \cdot \frac{\text{mw}}{\text{cm}^2}$

Calculations for the Transition Zone

The farthest point in the near field is the beginning of the transition zone -

$$R_{t1} := R_{n2}$$

$$R_{t1} = 69.6 \cdot \text{m}$$

The end of the Transition Zone is the beginning of the Far Field -

$$R_{t2} := R_{f2}$$

$$R_{t2} = 167.04 \cdot \text{m}$$

	Beginning	End
Transition Zone Power Density	$S_{t1} := \frac{S_n \cdot R_{n2}}{R_{t1}}$ $S_{t1} = 2.37 \cdot \frac{\text{mw}}{\text{cm}^2}$	$S_{t2} := \frac{S_n \cdot R_{n2}}{R_{t2}}$ $S_{t2} = 0.987 \cdot \frac{\text{mw}}{\text{cm}^2}$

Area of Reflector

$$A := \pi \cdot \left(\frac{D}{2}\right)^2$$

$$A = 4.524 \cdot \text{m}^2$$

Power Density at the Reflector Surface

$$S_{\text{ref}} := \left(2 \cdot \frac{P}{A}\right)$$

$$S_{\text{ref}} = 1.768 \cdot \frac{\text{mw}}{\text{cm}^2}$$

Calculations between the Antenna and the Ground:

Power Density between Antenna and Ground

$$S_{\text{ga}} := \frac{P}{A}$$

$$S_{\text{ga}} = 0.884 \cdot \frac{\text{mw}}{\text{cm}^2}$$

Conclusions

The power densities in the Near Field, Far Field, Transition Zone, at the Surface of the Reflector, and between the Reflector and the Ground are all below the allowable limit. Nowhere do they exceed the level of 5 mw/cm² as listed in OET Bulletin No. 65. Thus, this transmit earth terminal meets FCC requirements for human exposure to radio frequency energy.

EXHIBIT B

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ENVIRONMENTAL IMPACT STATEMENT Transmit/Receive

In regard to Section 1.1307(a) of the Commission's rules:

This site is not in a designated wilderness area or wildlife preserve; it does not threaten endangered species or critical habitats; nor does it affect sites, structures, or habitats which are significant in American history, architecture, archeology, engineering or culture that are listed or are eligible for listing in the National Registry of Historic Places; it does not affect Indian religious sites or flood plains; nor does it cause significant change in wetland fill, deforestation, or water diversion.

In regard to section 1.1307(b) of the Commission's rules:

We have prepared the calculations of radio frequency radiation for this transmitter and antenna combination, under the operating conditions specified in this application, with these results:

Region	Radiation level (mw/cm ²)	Hazard assessment
Near field	2.37	Complies with guidelines
Far field	0.995	Complies with guidelines
Transition zone	2.37	Complies with guidances
At reflector surface	1.768	Complies with guidances
Between the rim of the antenna and the ground	0.884	Complies with guidances

Means of Compliance Controlled Areas. The earth station's operational staff will not have access to the areas that exceed the MPE levels while the earth station is in operation. The transmitters will be turned off during antenna maintenance. The applicant agrees to abide by the conditions specified in Condition 5208 provided below: Condition 5208 - The licensee shall take all necessary measures to ensure that the antenna does not create potential exposure of humans to radiofrequency radiation in excess of the FCC exposure limits defined in 47 CFR 1.1307(b) and 1.1310 wherever such exposures might occur. Measures must be taken to ensure compliance with limits for both occupational/controlled exposure and for general population/uncontrolled exposure, as defined in these rule sections. Compliance can be accomplished in most cases by appropriate restrictions such as fencing. Requirements for restrictions can be determined by predictions based on calculations, modeling or by field

measurements. The FCC's OET Bulletin 65 (available on-line at www.fcc.gov/oet/rfsafety) provides information on predicting exposure levels and on methods for ensuring compliance, including the use of warning and alerting signs and protective equipment for worker.

Conclusions: Based on the study, which is summarized above, we conclude that in the regions of concern, the radiation level complies with the guidance; the level is less than 5 milliwatts per square centimeter.

Accordingly, this action does not have a significant environmental impact as described in the Commission's rules and does not require the preparation of an environmental assessment.

04/25/18
(date)

EXHIBIT C

FAA INFORMATION

The proposed 2.4 meter Ku band R/T antenna, which is the subject of this application, is a fixed earth station that will be operated on the roof of an existing building structure. The existing building structure, and surrounding building structures, are higher in elevation (exceed the height) of the proposed antenna. The maximum height of this antenna will be about 2.4 meters above one of the roof lines. Therefore since the proposed antenna does **not** extend above the existing building structure, notice to the FAA is **not** required pursuant to Section 17.4 of the Commission's rules.

