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RADIATION HAZARD STUDY

SITE: State of South Dakota Temporary Fixed Earth Station

APPLICANT: State of South Dakota

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RADIATION HAZARD STUDY

REGION	RADIATION LEVEL mw/cm ²	HAZARD ASSESSMENT
Far Field, RF=41.14 meters	0.161	Complies with guidelines
Near Field, RN=17.14meters	0.424	“ “ “
Transition Region, RT Rn<Rt<Rf	0.424	“ “ “
Reflector Surface	0.177	“ “ “
Between Antenna and Ground	0.00177	“ “ “
Between Main Reflector and Feed	43.86	Potential Hazard
CONCLUSION: Based on the above analysis it is concluded that harmful levels of radiation will not exist in regions normally occupied by the public or the earth station's operating personnel. The earth station will be marked with the standard radiation hazard warnings, on the antenna itself, warning personnel to avoid the area in front of the reflector when the transmitter is operational. To ensure compliance with the safety limits, the earth station transmitter will be turned off whenever maintenance and repair personnel are required to work in an area where the radiation level exceeds the level recommended by applicable guidelines. Additionally, the earth station is secured and access is controlled.		

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SUPPORTING CALCULATIONS
REF: FCC BULLETIN #65

A. Far Field:

$$R_f = \frac{0.6D^2}{\lambda} = \frac{0.6 \times (1.2)^2}{.021} = 41.14 \text{ meters}$$

$$S = \frac{PG}{4\pi R^2} = \frac{2 \times 1.710^{4*}}{4 \times 3.14 (41.14)^2} = 1.61 \text{ W} / \text{m}^2$$

$$S = 0.161 \text{ mW} / \text{cm}^2$$

B. Near Field

$$R_n = \frac{D^2}{4\lambda} = \frac{(1.2)^2}{(4) \times (.021)} = 17.14 \text{ meters}$$

$$S = 0.424 \text{ mW} / \text{cm}^2$$

C. Transition Region:

Since the transition extends between R_n and R_f the power density can never exceed the power density in the near field.

$$S = \frac{S(nf) \times R(nf)}{R}$$

D. Reflector Surface:

Assuming an even distribution of energy over the surface of the dish:

$$S = \frac{P}{\pi r^2} = \frac{2 \times 10^3}{\pi (60)^2} = .177 \text{ mW} / \text{cm}^2$$

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E. Between Antenna and Ground:

Nearest point is more than 1 diameter removed from the center of the main beam.

$$S = \frac{S(\text{reflector surface})}{100} = 0.0017 \text{ mW} / \text{cm}^2$$

F. Between Main Reflector and Feed:

The diameter of the feed aperture is 7.62 cm. The highest density will be at the aperture.

$$S = \frac{P}{\pi r^2} = \frac{2 \times 10^3}{\pi (3.81)^2} = 43.86 \text{ mW} / \text{cm}^2$$