RF Exposure Report

General information:

Applicant: N. William Kostis D/B/A Southern Main Communications
FCC ID: 2ABEE125MIIU

Device type: Part 90 RF transceiver designed for repeater service.
Device category: Fixed per Part 2.1091
Environment: Uncontrolled Exposure

Fixed devices that operate under Part 90 of this chapter are subject to RF exposure evaluation prior to equipment authorization or use.

Antenna:

The manufacturer does not specify an antenna, but a typical fixed mounted antenna has a gain of 3 dBi.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
fixed mounted	Any	omni	3

Operating configuration and exposure conditions:

The conducted output power is 100 Watts. In typical use the duty cycle would typically be 100%.

A typical installation consists of an antenna system with a coaxial cable of the type RG 213/U which has a loss of 1.5dB for a length of 60 feet at these frequencies.

MPE Calculation:

The minimum separation distance is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for controlled exposure environment at 450 MHz is 0.3 mW/cm^2.

Channel frequency: 450 to 470 MHz
The conducted power output is 100 watt.
The coax loss was taken as 1.5 dB (60 ft).
Antenna gain was taken as 3 dBi

$W := 100.$ power in Watts

$D := 1$ Duty Factor in decimal % (1=100%)

1 for FM
0.6 for SSB

$E := 30$ exposure time in minutes

$U := 30$ (use 6 for controlled and 30 for uncontrolled)

$$Wexp := W \cdot D \cdot \left(\frac{E}{U}\right)$$

$$PC := \left(\frac{E}{U}\right) \cdot 100$$

$Wexp = 100$ Watts

$PC = 100$ % on time

$Po := 100000$ mWatts

$f := 450$ Frequency in MHz

$dBd := 0.85$ antenna gain in dBd

$$S := \frac{f}{1500}$$ power density limit for uncontrolled exposure

$G1 := dBd + 2.15$ gain in dBi

$G1 = 3$ dBi

$CL := 1.5$ dB coax loss

$$S = 0.3 \quad \frac{mW}{cm^2}$$

$G := G1 - CL$

General population
S is 1 between 1500 and 100k MHz
S is f/1500 for 300 to 1500 MHz
S is 0.2 between 30 and 300 MHz

Occupational
S is 1 between 30 and 300 MHz
S is f/300 between 300 and 1500 MHz
S is 5 between 1500 and 100k MHz
(See 47 CFR 1.1310)

$$Gn := 10^{\frac{G}{10}}$$ gain numeric

$Gn = 1.413$

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}}$$

$R = 193.568$ distance in centimeters required for compliance

$$inches := \frac{R}{2.54}$$

$inches = 76.208$

$$ft := \frac{inches}{12}$$

$ft = 6.351$

Conclusion:

The MPE calculations show that based on the conditions presented a safe separation distance is 194 cm or 76 inches between the antenna (including any radiating structure), and any persons complies with the FCC limits for RF exposure.

Proposed RF exposure safety information to include in the User Manual:

"FCC RF Exposure Requirements:

The antennas for this device are designed to be mounted on permanent outdoor structures which usually provide a separation distance greater than 194 cm (76 inches) for a typical installation consisting a 3 dBi antenna and a 100% duty cycle as stated in the RF exposure report. RF exposure is usually also addressed at the time of licensing.

Prepared by:

Nam Nguyen
Engineering Project Manager