RF Exposure Requirements

General information

Applicant: N. William Kostis D/B/A Southern Maine Communications
FCC ID: 2ABEE125MIIV

Device type: Part 90 RF transceiver designed for repeater service.
Device category: Fixed
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)
mobile mounted	Any	omni	3

Operating configuration and exposure conditions:

The conducted output power is 110 Watts. Typical use qualifies for a maximum duty cycle factor of 100%.

- Fixed operation: A typical installation consists of an antenna system with a coaxial cable of the type RG 213/ U type which has a loss of 1.0 dB for a length of 40 feet at VHF 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 general population/uncontrolled exposure environment below 300 MHz is 0.2 mW/cm^2 .

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Frequency: 150.8-162.0125 MHz
The conducted power output is 110 watt.
The coax loss was taken as 1.0 dB.
Antenna gain was taken as 3 dBi
100% talk time in 30 minutes

$W := 110.$ 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)

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

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

$Wexp = 110$ Watts

$PC = 100$ % on time

$Po := 110000$ mWatts

$f := 300$ 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

$CL := 1.0$ dB coax loss

$S = 0.2$ $\frac{mW}{cm^2}$

$G := G1 - CL$

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

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

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)

$Gn = 1.585$

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

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

$R = 263.376$ distance in centimeters required for compliance

$inches = 103.691$

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

$ft = 8.641$

Conclusion:

The MPE calculations show that based on the conditions presented a safe separation distance is 263 cm or 104 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 263 cm (104 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:

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