RF Exposure Requirements

General information:

Device category: Fixed as described in Part 2.1091
Environment: Uncontrolled Exposure

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

Antenna:

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

This device has provisions for operation as fixed mounted, on permanent structure locations.

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 rated. Typical use qualifies for a maximum duty cycle factor of 60%. The manufacturer also markets this device only for occupation use.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).

- Fixed operation: A typical installation consists of an antenna system with a coaxial cable of the type ½ inch hard line which has a loss of 1dB for a length of 40 feet at UHF 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 above 300 MHz is f/1500 or 0.3 mW/cm^2 .

Frequency: 450-470 MHz
The conducted power output is 100 Watt.
The coax loss was taken as 1 dB.
Antenna gain was taken as 3 dBi
60% talk time in 30 minutes

$W := 100.0$ power in Watts

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

1 for FM
0.6 for SSB

$E := 18$ exposure time in minutes

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

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

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

$Wexp = 60$ Watts

$PC = 60$ % on time

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$Po := 60000$ mWatts

$f := 450$ Frequency in MHz

$dBd := 0.85$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

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

$G1 = 3$ dBi

$CL := 1.0$ dB coax loss

$S = 0.3$ $\dfrac{mW}{cm^2}$

$G := G1 - CL$

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

$Gn = 1.585$

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)

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

$R = 158.822$ distance in centimeters required for compliance

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

$inches = 62.528$

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

$ft = 5.211$

Proposed RF exposure safety information to include in User's Manual:

"FCC RF Exposure Requirements:

See user's manual.