RF Exposure Requirements

General information:

Device category: Fixed as decribed in Part 2.1091/1.1307/1.1310
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 or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more.

Antenna:

The manufacturer does not specify an antenna. A typical installation for this type of product is fixed mounted on permanent structures and as such the antenna type is at the discretion of the licensee. We believe a typical gain would be anywhere from 0 to 5 dBi.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Fixed mounted	Any	omni or directional	5

Operating configuration and exposure conditions:

The conducted output power is 3 Watts. Although the device is fixed mounted the control of exposure would be in an uncontrolled environment. The duty cycle can go to approximately 100% and is controlled thru the software of the system.

- Fixed operation: A typical installation consists of an antenna system with a coaxial cable of the type RG 8U which has a loss of 1dB for a length of 30 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 uncontrolled exposure environment above 300 MHz is f/1500 mW/cm^2 .

Frequency: 450 MHz
The conducted power output is 3 watt.
The coax loss was taken as 1 dB (30 ft RG-8 type).
Antenna gain was taken as 5 dBi

$W := 3$ 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)

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

$Wexp = 3$ Watts

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

$PC = 100$ % on time

$Po := 3000$ mWatts

$dBd := 2.85$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

$G1 = 5$ dBi

$CL := 1$ dB coax loss

$G := G1 - CL$

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

$Gn = 2.512$

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

$R = 44.709$ distance in centimeters required for compliance

$f := 450$ Frequency in MHz

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

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

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)

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

$inches = 17.602$

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

$ft = 1.467$

“FCC RF Exposure Requirements:

See Users Manual