

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 110 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 RG 213 U which has a loss of 1dB for a length of 40 feet at VHF frequencies.

MPE Calculation:

The minimum separation distance is calculated as follows:

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

The limit for general population/uncontrolled exposure environment below 300 MHz is 0.2 mW/cm².

Frequency: 150-174 MHz
The conducted power output is 110 watt.
The coax loss was taken as 1 dB.
Antenna gain was taken as 3 dBi
60% talk time in 30 minutes

W := 110.0 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)

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

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

W_{exp} = 66 Watts

PC = 60 % on time

Po := 66000 mWatts

f := 300 Frequency in MHz

dBd := 0.85 antenna gain in dBd

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

G1 := dBd + 2.15 gain in dBi

G1 = 3 dBi

CL := 1.5 dB coax loss

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

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

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

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)

$$R := \sqrt{\frac{(P_o \cdot G_n)}{(4 \cdot \pi \cdot S)}}$$

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

R = 192.598 distance in centimeters
required for compliance

inches = 75.826

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

ft = 6.319

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

"FCC RF Exposure Requirements:

See user's manual.