

FCC RF Exposure Requirements

General information:

FCC: CWWP15XXUL1

Device category: Fixed per 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 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. However, compliance with the power density limits of 1.1310 is not required.

Antenna:

The manufacturer does not specify an antenna. A typical fix mounted antenna has a gain of 3 dBi.

This device has provisions for operation in a vehicle, or a fixed location.

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

Operating configuration and exposure conditions:

The conducted output power is 150 Watts. Typical use qualifies for a maximum duty cycle factor of 50%. The manufacturer also markets this device only for occupation use. But, typical installations do not control exposure.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).
- A typical fixed installation consists of an antenna system with a coaxial cable of the type RG 213U which has a loss of 1.5 dB for a length of 30 feet at UHF frequencies.

MPE Calculation:

The minimum separation distance is calculated as follows:

The limit for uncontrolled exposure environment above 300 MHz is $f/1500 \text{ mW/cm}^2$.

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

Frequency: 406.1 – 470 MHz.

The conducted power output is 150 watt.

The coax loss was taken as 1.5 dB.

Antenna gain was taken as 3 dBi

50% talk time in 30 minutes

Power Density = $S = f/1500 \text{ mw/cm}^2$

Power in Watts

Duty Factor in decimal % (1=100%)

$W := 150$

$D := 1$

for an FM device $D=1$

Exposure time in minutes

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

$E := 15$

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

$$PC := \frac{E}{U} \quad \text{percent on time}$$

$$PC = 0.5$$

Time compensated power output

$$W_{\text{exp}} = 75 \quad \text{Watts}$$

$$W_{1\text{exp}} := W_{\text{exp}} \cdot 1000$$

$$W_{1\text{exp}} = 7.5 \times 10^4 \quad \text{mWatts}$$

Antenna gain

Coax Loss

$\text{dBd} := .85$

$CL := 1.5 \text{ dB}$

$$G := \text{dBd} + 2.15 - CL$$

$$f := 460$$

$G = 1.5$ Net gain in dBi

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

$Gn = 1.413$ Gain Numeric

$$S := \frac{f}{1500} \quad \text{from 47 CFR}$$

1.1310

$$S = 0.307 \quad \frac{\text{mW}}{\text{cm}^2}$$

$$R := \sqrt{\frac{(W_{1\text{exp}} \cdot Gn)}{(4 \cdot \pi \cdot S)}}$$

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

$R = 165.803$ distance in centimeters
required for compliance

$$R_{\text{inches}} = 65.277$$

$$ft1 := \frac{R_{\text{inches}}}{12}$$

$$ft1 = 5.44$$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 5.4 ft (65 inches) between the antenna, including any radiating structure, and any persons when normally operated .

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

“FCC RF Exposure Requirements:

CAUTION:

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device is approved with emissions having a source-based time-averaging duty factor not exceeding 50%.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.

The minimum safe operating distance between the public and the antenna should be at least

5 1/2 ft when used with a 3 dBi antenna.