FCC RF Exposure Requirements

General information:

FCCID:
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 only as a fixed mounted device, 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 75 Watts. In base station operation duty cycle can reach near 100 %. But, the inherent modulation characteristics of this type of modulation allows us to lower the Duty Factor to 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 1.0 dB for a length of 30 feet at UHF frequencies. A base station system typically uses outdoor structures for antenna mounting.

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: 409-430 MHz
The conducted power output is 75 watt.
The coax loss was taken as 1.0 dB.
Antenna gain was taken as 3 dBi
50% Duty Factor
Power Density = S= f/1500 mW/cm^2

$W := 75$ power in Watts $D := 0.5$ Duty Factor in decimal % (1=100%)

                                                        1 for FM

                                       $E := 30$ exposure time in minutes

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

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

$Wexp = 37.5$ Watts $PC = 100$ % on time

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$Po := 37500$ mWatts $f := 420$ 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 controlled exposure

$G1 = 3$ dBi $S = 0.28$ $\dfrac{mW}{cm^2}$

$CL := 1.0$ dB coax loss

$G := G1 - CL$ See 47 CFR 1.1310

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

$Gn = 1.585$ dB

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

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

$R = 129.967$ distance in centimeters
              required for compliance
                                          $inches = 51.168$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 2 m 78 inches) between the antenna, including any radiating structure, and any persons when normally operated .

The minimum safe operating distance between the public and the antenna should be at least 2 m (6 ft) when used with a 3 dBi antenna.