RF Exposure Evaluation

General information:

Device category: Fixed per Part 2.1091/1.1307/1.1310
Environment: Uncontrolled Exposure

Fixed devices that operate under Part 101 of this chapter are subject to 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. Compliance with the power density limits of 1.1310 is required.

Antenna:

The manufacturer does not specify an antenna. A typical fix mounted antenna has a gain of anywhere from 3 dBi to 10 dBi.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Fixed mounted	Any	omni or directional	3-10

Operating configuration and exposure conditions:

The conducted output power is 13 Watts. Control of exposure is uncontrollable.

- 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 or hard line. The loss for these type of cables typically have a loss of 1dB for a length of 30 feet at 920 MHz frequencies.

MPE Calculation:

The minimum separation distance is calculated as follows:

The limit for uncontrolled exposure environment above 300 MHz is f/1500 mW/cm^2 .

Frequency: 940 MHz
The conducted power output is 13 watt.
The coax loss was taken as 1 dB.
Antenna gain was taken as 10 dBi

$W := 13.0$ power in Watts (conducted)

$D := 1$ 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)

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

$Wexp = 13$ Watts

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

$PC = 100$ % on time

$Po := 13000.0$ mWatts

$dBd := 7.85$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

$G1 = 10$ dBi

$CL := 1.$ dB coax loss

$G := G1 - CL$

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

$Gn = 7.943$

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

$R = 114.511$ distance in centimeters required for compliance

$ft = 3.757$ in Feet

$f := 940.0$

$$S := \frac{f}{1500}$$

See 47 CFR 1.1310

$S = 0.627$ $\frac{mW}{cm^2}$

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

$inches = 45.083$

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