RF Exposure Evaluation

General information:

Device category: Fixed per Part
Environment: Uncontrolled Exposure

Fixed devices that operate under Part 15 of this chapter are subject to environmental evaluation for RF exposure prior to equipment authorization.

The antenna is integral to the device and consists of only a monopole wire.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Fixed mounted	Any	omni	< 2

Operating configuration and exposure conditions:

The conducted output power is 0.05 Watts. Control of exposure is uncontrollable.

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: 915 MHz
The conducted power output is 0.05 Watts.

Antenna gain was taken as 2 dBi

$W := 0.05$ 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)

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

$Wexp = 0.05$ Watts

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

$PC = 100$ % on time

$Po := 50$ mWatts

$dBd := 0$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

$G1 = 2.15$ dBi

$CL := 0.0$ dB coax loss

$G := G1 - CL$

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

$Gn = 1.641$

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

$R = 3.271$ distance in centimeters required for compliance

$f := 915$ Frequency in MHz

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

$S = 0.61$ $\frac{mW}{cm^2}$

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)

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

$inches = 1.288$

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

$ft = 0.107$