RF Exposure Requirements

General information:

Device category: Mobile per Part 2.1091
Environment: Uncontrolled Exposure

This device is a radar active responder that has a maximum conducted output of 4 dBm or 2.5 mW. The power is continuously variable depending on how much power is incident on the responder from the radar.

Antenna:

The manufacturer has a specific integral antenna with a gain of 11.9 dBi.

This device has provisions for operation in a fixed location.

Configuration	Antenna p/n	Type	Duty cycle	Max. Gain (dBi)
Fixed	Integral	Patch	100 %	11.9

Operating configuration and exposure conditions:

The conducted output power is 2.5 mWatts.

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 a uncontrolled / general population exposure environment above 1500 MHz is 1 mW/cm^2 .

Channel frequency: 9200 to 9300 MHz
The conducted power output is 2.5 mWatts
Antenna gain was taken as 11.9 dBi
100 % duty cycle.

$W := 0.025$ 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)

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

$Wexp = 0.025$ Watts

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

$PC = 100$ % on time

$Po := 25$ mWatts

$dBd := 09.75$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

$G1 = 11.9$ dBi

$CL := 0$ dB coax loss

$G := G1 - CL$

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

$Gn = 15.488$

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

$R = 5.551$ distance in centimeters required for compliance

$f := 1500$ Frequency in MHz

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

$$S = 1 \quad \frac{mW}{cm^2}$$

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)

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

$inches = 2.185$

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

$ft = 0.182$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 5.6 cm between the antenna, including any radiating structure, and any persons when normally operated .