

RF Exposure Report

General information:

Device category: Mobile 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:

This device is typically used in fixed location service only.

Although the manufacturer does not specify an antenna. A typical antenna in this type of service has a gain of 0 dBi.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Fixed mounted	Any	omni	0

Operating configuration and exposure conditions:

The conducted output power is 45 Watts. Typical use qualifies for a maximum duty cycle factor of 50%. The manufacturer also markets this device only for occupation use.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).
- Vehicle Operation: A typical vehicle installation consists of an antenna system with a coaxial cable of the type RG 58 which has a loss of 2 dB for a length of 30 feet.

MPE Calculation:

The minimum separation distance is calculated as follows:

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

The limit for uncontrolled exposure environment above 300 MHz is f/1500 mW/cm².

Channel frequency: 406.1 - 470 MHz
 The conducted power output is 45 watt.
 The coax loss was taken as 2.0 dB (30 ft).
 Antenna gain was taken as 0 dBi
 50% talk time in 30 minutes

$$\begin{aligned}
 W &:= 45 \quad \text{power in Watts} & D &:= 1 \quad \text{Duty Factor in decimal \% (1=100\%)} \\
 &&& 1 \text{ for FM} \\
 &&& 0.6 \text{ for SSB} \\
 E &:= 15 \quad \text{exposure time in minutes} \\
 U &:= 30 \quad (\text{use 6 for controlled and 30 for uncontrolled}) \\
 W_{exp} &:= W \cdot D \cdot \left(\frac{E}{U} \right) & PC &:= \left(\frac{E}{U} \right) \cdot 100 \\
 W_{exp} &= 22.5 \quad \text{Watts} & PC &= 50 \quad \% \text{ on time}
 \end{aligned}$$

$$\begin{aligned}
 P_o &:= 22500 \quad \text{mWatts} & f &:= 406 \quad \text{Frequency in MHz} \\
 dBd &:= -2.15 \quad \text{antenna gain in dBd} \\
 G1 &:= dBd + 2.15 \quad \text{gain in dBi} & S &:= \frac{f}{1500} \quad \text{power density limit for} \\
 &&& \text{uncontrolled exposure} \\
 G1 &= 0 \quad \text{dBi} \\
 CL &:= 2.0 \quad \text{dB coax loss} & S &= 0.271 \quad \frac{\text{mW}}{\text{cm}^2} \\
 G &:= G1 - CL & & \text{General population} \\
 Gn &:= 10^{\frac{G}{10}} \quad \text{gain numeric} & S & \text{is 1 between 1500 and 100k MHz} \\
 &&& S \text{ is } f/1500 \text{ for 300 to 1500 MHz} \\
 &&& S \text{ is 0.2 between 30 and 300 MHz} \\
 Gn &= 0.631 & & \text{Occupational} \\
 &&& S \text{ is 1 between 30 and 300 MHz} \\
 &&& S \text{ is } f/300 \text{ between 300 and 1500 MHz} \\
 &&& S \text{ is 5 between 1500 and 100k MHz} \\
 R &:= \sqrt{\frac{(P_o \cdot Gn)}{(4\pi \cdot S)}} & & \text{(See 47 CFR 1.1310)} \\
 R &= 64.605 \quad \text{distance in centimeters} & \text{inches} &:= \frac{R}{2.54} \\
 &&& \text{inches} = 25.435 \\
 &&& ft := \frac{\text{inches}}{12} \\
 &&& ft = 2.12
 \end{aligned}$$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 64 cm 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%.

Vehicle – Antenna Installation:

- Antennas used for this transmitter must not exceed an antenna gain of 0 dBi with a minimum cable loss of 2 dB.
- For rear deck trunk and roof top installations, the antenna must be located at least 25 inches / 64 cm away from rear-seat passengers and bystanders in order to comply with the FCC RF exposure requirements.

The following label will be mounted in conspicuous view on the radio.

