RF Exposure Requirements

General information:

Device category: Mobile per Part 2.1091
Environment: Uncontrolled Exposure

Mobile 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 vehicle antenna has a gain of 0 dBi was used with this device.

This device has provisions for operation in a vehicle.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Passenger car	Any	omni	0

Operating configuration and exposure conditions:

The conducted output power is 50 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 1dB for a length of 15 feet.

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 occupation/controlled exposure environment below 300 MHz is 1 mW/cm^2 .

Channel frequency: 150-174 MHz
The conducted power output is 50 watt.
The coax loss was taken as 1 dB.
Antenna gain was taken as 3 dBi
50% talk time in 6 minutes

$W := 50.0$ power in Watts

$D := 1$ Duty Factor in decimal % (1=100%)

1 for FM
0.6 for SSB

$E := 15$ exposure time in minutes

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

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

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

$Wexp = 25$ Watts

$PC = 50$ % on time

$Po := 25000$ mWatts

$f := 300$ Frequency in MHz

$dBd := -2.15$ antenna gain in dBd

$G1 := dBd + 2.15$ gain in dBi

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

$G1 = 0$ dBi

$CL := 1$ dB coax loss

$S = 0.2$ $\dfrac{mW}{cm^2}$

$G := G1 - CL$

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

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

$Gn = 0.794$

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)

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

$R = 88.889$ distance in centimeters required for compliance

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

$inches = 34.996$

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

$ft = 2.916$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 89 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 1dB.
- For rear deck trunk and roof top installations, the antenna must be located at least 35 inches / 89 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.

Restricted to occupational use to satisfy
FCC RF energy exposure limits.
See user manual for awareness and
control info.

NOTICE!