

# FCC RF Exposure Requirements

## General information:

FCC ID:

Device category: Mobile per Part 2.1091

Environment: Uncontrolled Exposure

Mobile devices that operate under Part 80 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 specify an antenna with a gain of 3 dBi to be used with this device.

This device has provisions for operation in a vehicle, or a fixed location.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
Boat	Any	omni	3

## Operating configuration and exposure conditions:

The conducted output power is 25 Watts. Typical use qualifies for a maximum duty cycle factor of 50%.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).
- Vehicle Operation: The maximum antenna gain that can be used is 3dBi. A coaxial cable of the type RG 58 has a loss of 1dB for a length of 15 feet.

## MPE Calculation:

The minimum separation distance is calculated as follows:

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

The limit for general uncontrolled exposure environment below 300 MHz is 0.2 mW/cm<sup>2</sup>.

Channel frequency: 156.025-157.425 MHz  
 The conducted power output is 25 watt.  
 The coax loss was taken as 1 dB.  
 Antenna gain was taken as 3 dBi  
 50% talk time in 30 minutes

W := 25 power in Watts D := 1 Duty Factor in decimal % (1=100%)  
 1 for FM  
 E := 15 exposure time in minutes  
 U := 30 (use 6 for controlled and 30 for uncontrolled)

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

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

$$W_{exp} = 12.5 \text{ Watts} \quad PC = 50 \text{ % on time}$$


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Po := 12500 mWatts f := 300 Frequency in MHz  
 dBd := .85 antenna gain in dBd  
 G1 := dBd + 2.15 gain in dBi  
 S :=  $\frac{f}{1500}$  power density limit for uncontrolled exposure  
 G1 = 3 dBi  
 CL := 1 dB coax loss  
 S = 0.2

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

$$Gn = 1.585 \text{ dB}$$

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

R = 88.784 distance in centimeters  
 required for compliance

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

$$\text{inches} = 34.954$$

**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%. The safe operating distance between the general population and the antenna when transmitting is 35 inches.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.