

RF Exposure Report

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:

This device is typically used in mobile 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. In typical use the duty cycle is 50%.

The manufacturer also markets this device only for occupation use. But in mobile use the exposure isn't always controllable.

A typical installation consists of an antenna system with a coaxial cable of the type RG 58/U or 223/U which has a loss of 1dB for a length of 10 feet at these frequencies.

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 uncontrolled exposure environment above 300 MHz is $f/1500$ mW/cm².

Channel frequency: 450-512 MHz

The conducted power output is 45 watt.

The coax loss was taken as 1.0 dB (10 ft).

Antenna gain was taken as 0 dBi

$W := 45$	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)
$W_{exp} = W \cdot D \cdot \left(\frac{E}{U}\right)$		$PC := \left(\frac{E}{U}\right) \cdot 100$	
$W_{exp} = 22.5$	Watts	$PC = 50$	% on time
$P_o := 22500$	mWatts	$f := 450$	Frequency in MHz
$dBd := -2.15$	antenna gain in dBd	$S := \frac{f}{1500}$	power density limit for uncontrolled exposure
$G1 := dBd + 2.15$	gain in dBi	$S = 0.3$	$\frac{mW}{cm^2}$
$G1 = 0$	dBi	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	
$CL := 1.0$	dB coax loss	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)	
$G := G1 - CL$		$inches := \frac{R}{2.54}$	
$G_n := 10^{\frac{G}{10}}$	gain numeric	$inches = 27.108$	
$G_n = 0.794$		$ft := \frac{inches}{12}$	
$R := \sqrt{\frac{(P_o \cdot G_n)}{(4 \cdot \pi \cdot S)}}$		$ft = 2.259$	
$R = 68.853$	distance in centimeters required for compliance		

Proposed RF exposure safety information to include in User's Manual:

RF Exposure Requirements:

CAUTION:

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other transmitter/antenna system. The antenna should be mounted so as to maintain a distance of at least 2.26 ft (0.68m) between the antenna and bystanders, when operated in a typical installation and a 0 dBi antenna.

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