

FCC RF Exposure Requirements

General information:

FCCID:

Device category: Mobile per Part 2.1091

Environment: Controlled 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. His typical installation uses a 2 dBi omnidirectional antenna.

This device has provisions for operation on a mobile, or a fixed location.

Configuration	Antenna p/n	Type	Max. Gain (dBi)
mobile	Any omni	Any	0
	Any	Any	16

Operating configuration and exposure conditions:

The conducted output power is 0.5 Watts. Typical use qualifies for a maximum duty cycle factor of 30%. This duty cycle is limited by design of the radio.

- Part 2.1091 states that devices are excluded from routine evaluation if the EIRP is less than 2.46Watt (or 1.5WERP).

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 $f/1500 \text{ mW/cm}^2$.

Channel frequency: 450-470 MHz
The conducted power output is 0.5 watt.
The coax loss was taken as 0 dB.
Antenna gain was taken as 2 dBi
30% talk time in 30 minutes

Power in Watts	Duty Factor in decimal % (1=100%)	
$W := 0.5$	$D := 1$	for an FM device $D=1$
Exposure time in minutes	$U := 30$ (use 6 for controlled and 30 for uncontrolled)	
$E := 10$		
$W_{exp} := W \cdot D \cdot \left(\frac{E}{U}\right)$	$PC := \frac{E}{U}$	percent on time
	$PC = 0.333$	
Time compensated power output		
$W_{exp} = 0.167$ Watts		
$W1_{exp} := W_{exp} \cdot 1000$		
$W1_{exp} = 166.667$	mWatts	

Antenna gain	Coax Loss	For all UHF frequencies	
$dBd := 0.0$	$CL := 0$ dB	$f := 460$	
$G := dBd + 2.15 - CL$			
$G = 2.15$	Net gain in dBi		
Gain Numeric		$S := \frac{f}{1500}$	$\frac{mW}{cm^2}$ from OET 65
$G_n := 10^{\frac{G}{10}}$		$S = 0.307$	
$G_n = 1.641$			

$R := \sqrt{\frac{(W1_{exp} \cdot G_n)}{(4 \cdot \pi \cdot S)}}$		$R_{inches} := \frac{R}{2.54}$
$R = 8.423$	distance in centimeters	
	required for compliance	$R_{inches} = 3.316$

$E := \frac{\sqrt{30 \cdot \frac{W1_{exp}}{1000} \cdot G_n}}{\frac{R}{100}}$	$E2 := \frac{\sqrt{30 \cdot \frac{W1_{exp}}{10} \cdot G_n}}{\frac{R}{10}}$
$E = 34.002$	$E2 = 34.002$
$\frac{V}{m}$	

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance of 20 cm between the antenna, including any radiating structure, and any persons when normally operated . Based on a 2 dBi antenna and 0 feet of associated coaxial cable.

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 30%.

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