

# RF Exposure Requirements

## **General information:**

Device category: Mobile per Part 2.1091

Environment: Uncontrolled Exposure

Mobile devices that operate under Part 15.247 of this chapter are subject to environmental evaluation for RF exposure prior to equipment authorization.

## **Antenna:**

The transceiver has an integral antenna of nominally -2 dBi.

## **Operating configuration and exposure conditions:**

The conducted output power is 0.024 Watts (peak). The device inherently has a 72% duty cycle as described in the theory of operation.

## **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 above 1500 MHz is 1.0 mW/cm<sup>2</sup>.

Channel frequency: 2440 MHz (center of band)

The conducted power output is 24 mWatts.

Antenna gain was taken as -2 dBi

72% Duty cycle

$W := 0.024$  power in Watts

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

1 for FM  
0.6 for SSB

$E := 21.6$  exposure time in minutes

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

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

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

$W_{exp} = 0.017$  Watts

$PC = 72$  % on time

$P_o := 17$  mWatts

$f := 1500$  Frequency in MHz

$dBd := -4.15$  antenna gain in dBd

$$S := \frac{f}{1500} \quad \text{power density limit for uncontrolled exposure}$$

$G_1 := dBd + 2.15$  gain in dBi

$G_1 = -2$  dBi

$CL := 0$  dB coax loss

$$S = 1 \quad \frac{\text{mW}}{\text{cm}^2}$$

$G := G_1 - CL$

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

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

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)

$$R := \sqrt{\frac{(P_o \cdot G_n)}{(4 \cdot \pi \cdot S)}}$$

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

$R = 0.924$  distance in centimeters  
required for compliance

$$\text{inches} = 0.364$$

$$ft := \frac{\text{inches}}{12}$$

$$ft = 0.03$$

**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. .