

RF Exposure – MPE Calculations

Calculations

The following results shall be assumed to be accurate for the far-field only. These predictions will over-estimate power density in the near-field. Based on the use of a ¼ wavelength radiator, a distance of 20 cm is considered to be in the far-field for all cases.

$$S = PG/4*PI*R^2$$

@ 806 – 825 MHz

P is 140 mW

G is 2 dB (Antenna gain – loss) or $10^{(2/20)}$ or 1.25

R is 20 cm

$$\underline{S = 0.028 \text{ mW/cm}^2}$$

For Occupational/Controlled Exposure

From 300 to 1500 MHz, power density limit is $f/300 \text{ mW/cm}^2$

@ 806 MHz, power density limit is **2.69 mW/cm² for 6 minutes.**

For General Population/Uncontrolled Exposure

From 300 to 1500 MHz, power density limit is $f/1500 \text{ mW/cm}^2$

@ 806 MHz, Power density limit is **0.54 mW/cm² for 30 minutes.**

Conclusion: Meets MPE limits

@ 1850 – 1910 MHz

P is 250 mW

G is 1 dB (Antenna gain – loss) or $10^{(1/20)}$ or 1.12

R is 20 cm

$$\underline{S = 0.044 \text{ mW/cm}^2}$$

For Occupational/Controlled Exposure

From 1,500 to 100,000 MHz, power density limit is **6.17 mW/cm² for 6 minutes.**

For General Population/Uncontrolled Exposure

From 1,500 to 100,000 MHz, power density limit is **1.23 mW/cm² for 30 minutes.**

Conclusion: Meets MPE limits

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Input

Transmitter Power: Lo band 140 mW Hi band 250mW

Antenna Gain: 3 dB

Cable loss: 1 dB @ 806 – 825 MHz
 2 dB @ 1850 – 1910 MHz

Frequency range: 806-825 MHz and 1850-1910 MHz

Assumptions

1. A single $\frac{1}{4}$ wavelength radiating antenna is assumed.
2. Closest exposure distance is assumed to be 20 cm

RF Exposure

The LMSWDJHNEX (800 / 1900 MHz) dual band RF Compensator is operated as a mobile device as defined in 2.1091(b) based on its design and installation. The compensator is installed into a vehicle such that it is physically secured and is generally located more than 20 cm from the end-user. This information is included in the user manual. It is suggested that the antenna be installed such that there is at least 20 cm of separation between the occupants of the vehicle and the antenna.

The LMSWDJHNEX (800 / 1900 MHz) dual band RF Compensator has a transmitted conducted power of 0.14 W in the low band and 0.25W in the high band. The mobile antenna supplied with the transceiver has a maximum gain of 3 dB, and minimum cable loss of -1.0 dB, together resulting in a maximum EIRP of 1 W. Since the transmit SMR band (806-824 MHz) (Part 90) is below 1.5 GHz and its EIRP with the supplied antenna is below 1.5 and transmit PCS band (1860-1910 MHz) (Part 24) is above 1.5 GHz and its EIRP with the supplied antenna is below 3W, the 800 / 1900 MHz RF Compensator is categorically excluded from routine environmental evaluation per 2.1091(c).