

RF Exposure – MPE Calculations

Within Building

Input

Transmitter Power: 160 mW

Antenna Gain: 3 dB

Cable loss: 2 dB @ 806– 830 MHz
2 dB @ 851 – 870 MHz

Frequency range: 806-830 MHz and 851-870 MHz

Assumptions

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

Roof Mount

Input

Transmitter Power: 160 mW

Antenna Gain: 12 dB

Cable loss: 2 dB @ 806– 830 MHz
2 dB @ 851 – 870 MHz

Frequency range: 806-830 MHz and 851-870 MHz

Assumptions

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

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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 $\frac{1}{4}$ wavelength radiator, a distance of 20 cm is considered to be in the far-field for all cases.

$$S = PG/4 \cdot \pi \cdot R^2$$

Within Building

@ 806 – 830 MHz

P is 160 mW

G is 3 dB (Antenna gain – loss) or $10^{(2/20)}$ or 1.25

R is 20 cm

$$\underline{S = 0.045 \text{ mW/cm}^2}$$

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/cm^2

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/cm^2

Conclusion: **Meets MPE limits**

@ 851 – 870 MHz

P is 160 mW

G is 3 dB (Antenna gain – loss) or $10^{(1/20)}$ or 1.12

R is 20 cm

$$\underline{S = 0.045 \text{ mW/cm}^2}$$

For Occupational/Controlled Exposure

From 1,500 to 100,000 MHz, power density limit is **5 mW/cm^2 for 6 minutes.**

For General Population/Uncontrolled Exposure

From 1,500 to 100,000 MHz, power density limit is **1 mW/cm^2 for 30 minutes.**

Conclusion: **Meets MPE limits**

Roof Mount

@ 806 – 830 MHz

P is 160 mW

G is 12 dB (Antenna gain – loss) or $10^{(2/20)}$ or 1.25

R is 20 cm

$$\underline{\mathbf{S = 0.1.27 \text{ mW/cm}^2}}$$

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 2.84 mW/cm^2

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 0.57 mW/cm^2

Conclusion: **Meets MPE limits**

@ 851 – 870 MHz

P is 160 mW

G is 12 dB (Antenna gain – loss) or $10^{(1/20)}$ or 1.12

R is 20 cm

$$\underline{\mathbf{S = 0.127 \text{ mW/cm}^2}}$$

For Occupational/Controlled Exposure

From 1,500 to 100,000 MHz, power density limit is **5 mW/cm^2 for 6 minutes.**

For General Population/Uncontrolled Exposure

From 1,500 to 100,000 MHz, power density limit is **1 mW/cm^2 for 30 minutes.**

Conclusion: **Meets MPE limits**