

Section 11. Maximum Permissible Exposure

MPE estimate is given per 2.1091 of FCC Rules:

Given

$$E = \sqrt{30 * P * G} / d$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{(30 * P * G) / (3770 * S)}$$

Changing to units of Power to mW and Distance to cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{(30 * (P / 1000) * G) / (3770 * S)}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

Equation (1)

$$S = 0.0796 * 10^{((P + G) / 10)} / d^2$$

Equation (2)

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

Equation (2) and the measured peak power is used to calculate the Power density.

Limit:

S=1.0 mW/cm² for public (un-controlled environment)*.

S=5.0 mW/cm² for professional (controlled environment)

*1mW/ cm² is the reference level for general public exposure according to the OET Bulletin 65, Edition 97-01 Table 1.

Results:

This EUT shall comply with RF exposure requirements stated in FCC KDB865664 section 2. and KDB447498 section 7.

No Antenna is included in this application. As reference, typical max. gain of antenna is $G=3\text{dBi}$. With $P=+23\text{dBm}$ (3dB over rated power), using formula (1) or (2),

Minimum MPE distance $d= 2.5\text{ cm}$.

The intended and expected application for this product is for installation in a commercial base station (restricted access).

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.