

MPE Calculations

Systems operating under the provision of 47 CFR 1.1307(b)(1) shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the FCC guidelines.

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). The MPE calculation for this exposure is shown below.

Using the Phycomp/Yageo Corp. Antennas:

The peak radiated output power (EIRP) is calculated as follows:

$$\begin{aligned} \text{EIRP} &= P + G \\ \text{EIRP} &= 17.36 \text{ dBm} + (-0.20) \text{ dBi} \\ \text{EIRP} &= 17.16 \text{ dBm} (52.00\text{mW}) \end{aligned}$$

Where

P = Power input to the antenna (mW).
G = Power gain of the antenna (dBi)

Power density at the specific separation:

$$\begin{aligned} S &= PG/(4R^2\pi) \\ S &= (52.00 \times 1.05) / (4 \times 20^2 \times \pi) \\ S &= 0.011 \text{ mW/cm}^2 \end{aligned}$$

Where

S = Maximum power density (mW/cm²)
P = Power input to the antenna (mW).
G = Numeric power gain of the antenna
R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)

The maximum permissible exposure (MPE) for the general population is 1mW/cm².

The power density at 20cm does not exceed the 1mW/cm² limit. Therefore, the exposure condition is compliant with FCC rules.

Estimated safe separation:

$$\begin{aligned} R &= \sqrt{PG/4\pi} \\ R &= \sqrt{(52.00 \times 1.05) / 4\pi} \\ R &= 2.08 \text{ cm} \end{aligned}$$

Where

P = Power input to the antenna (mW).
G = Numeric power gain of the antenna
R = The safe estimated separation that the user must maintain from the antenna (cm)

The numeric gain (G) of the antenna with a gain specified in dB is determined by:

$$\begin{aligned} G &= \text{Log}^{-1} (\text{dB antenna gain}/10) \\ G &= \text{Log}^{-1} (-0.20 \text{ dBi}/10) \\ G &= 1.05 \end{aligned}$$