

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 Antennas with highest output power:

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

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Power input to the antenna (P) (dBm)</i>	<i>Power gain of the antenna (G) (dBi)</i>	<i>EIRP (P+G) (dBm)</i>	<i>EIRP $\text{Log}^{-1}(\text{dBm}/10)$ (mW)</i>
Yageo Shelby	2.4	24.76	2.82	27.58	572.80
Yageo Shelby	5	19.80	1.09	20.89	122.74

$$\text{EIRP} = P + G$$

Where

P = Power input to the antenna (mW).

G = Power gain of the antenna (dBi)

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

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Antenna Gain (G) (dBi)</i>	<i>Numeric Antenna Gain $\text{Log}^{-1}(\text{dBm}/10)$ (dB)</i>
Yageo Shelby	2.4	2.82	1.91
Yageo Shelby	5	1.09	1.29

$$G = \text{Log}^{-1} (\text{dB antenna gain}/10)$$

Power density at the specific separation:

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Power input to the antenna (P) (mW)</i>	<i>Numeric Power Gain of the Antenna (G) (dB)</i>	<i>Maximum Power Spectral Density $S=PG/(4R^2\pi)$ (mW/cm²)</i>	<i>Maximum Power Spectral Density Limit (mW/cm²)</i>
Yageo Shelby	2.4	299.23	1.91	0.114	1.00
Yageo Shelby	5	95.50	1.29	0.024	1.00

$$S = PG/(4R^2\pi)$$

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.