

**FCC §1.1310& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
<b>Frequency Range (MHz)</b>	<b>Electric Field Strength (V/m)</b>	<b>Magnetic Field Strength (A/m)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Averaging Time (minutes)</b>
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

**Calculated Formulary:**

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

**Calculated Data:**

<b>Mode</b>	<b>Frequency Range (MHz)</b>	<b>Antenna Gain</b>		<b>Tune-up Conducted Power</b>		<b>Evaluation Distance (cm)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>MPE Limit (mW/cm<sup>2</sup>)</b>
		<b>(dBi)</b>	<b>(numeric)</b>	<b>(dBm)</b>	<b>(mW)</b>			
Zigbee	2405~2480	3.44	2.21	10.50	11.22	20	0.0049	1.0
BLE(1Mbps)	2402~2480	3.44	2.21	7.00	5.01	20	0.0022	1.0
BLE(2Mbps)	2402~2480	3.44	2.21	7.00	5.01	20	0.0022	1.0

**Note:**

- (1) The tune-up Conducted power was declared by the manufacturer.
- (2) Zigbee and BLE can’t transmit simultaneously.

**Conclusion:** The device meets FCC MPE at 20 cm distance.