

## FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

#### Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (Minutes)
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

### Result

#### Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = 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)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BT	2402-2480	3.87	2.44	2.0	1.58	20	0.0008	1
BLE	2402-2480	3.87	2.44	0	1.00	20	0.0005	1
2.4GHz Wi-Fi	2412-2472	3.87	2.44	15.0	31.62	20	0.0153	1
5GHz Wi-Fi	5150-5250	6.65	4.62	14.0	25.12	20	0.0231	1
	5725-5850	6.48	4.45	14.0	25.12	20	0.0222	1

Note: 1. The tune up conducted power was declared by the applicant.  
 2. The BT, 2.4GHz Wi-Fi and 5GHz Wi-Fi can transmit at same time.

Simultaneous transmitting consideration (worst case):

The ratio=MPE<sub>BT</sub>/limit+MPE<sub>2.4G Wi-Fi</sub>/limit+MPE<sub>5G Wi-Fi</sub>/limit=0.0008/1+0.0153/1+0.0231/1=0.0392<1.0

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

### Result: Compliance