

## 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)

Operation Modes	Frequency (MHz)	Antenna Gain <sup>#</sup>		Tune up conducted power <sup>#</sup>		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Zigbee	2405-2480	2.44	1.75	-4	0.40	20	0.0001	1
2.4G Wi-Fi	2412-2462	2.02	1.59	11	12.59	20	0.0040	1

Note 1: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Note 2: The antenna gain<sup>#</sup> and Tune up conducted power<sup>#</sup> were declared and provided by the applicant. The 2.4G Wi-Fi and zigbee can transmit simultaneously:

$$=S_{2.4G\text{ Wi-Fi}}/S_{\text{limit-2.4G Wi-Fi}} + S_{\text{Zigbee}}/S_{\text{limit-Zigbee}}$$

$$=0.0001/1+0.0040/1$$

$$=0.0041 < 1.0$$

**Result: Compliant**