

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

### **Applicable Standard**

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

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:**

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11b	2412-2462	3.00	2.00	17.00	50.12	20	0.0199	1.0	0.0199
802.11g		3.00	2.00	16.00	39.81	20	0.0158	1.0	0.0158
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40	2422-2452	6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11a	5180-5240	3.00	2.00	15.00	31.62	20	0.0126	1.0	0.0126
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40		6.00	3.98	13.00	19.95	20	0.0158	1.0	0.0158
802.11a	5745-5825	3.00	2.00	15.00	31.62	20	0.0126	1.0	0.0126
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40		6.00	3.98	12.00	15.85	20	0.0126	1.0	0.0126

Note:

- (1) The target output powers are declared by the Manufacturer.
- (2) 2.4GWi-Fi and 5GWi-Fi cannot transmit simultaneously.
- (3) According to 662911 D01 Multiple Transmitter Output v02r01, for 802.11n:  
Directional gain = GANT + 10\*log(NANT) dBi=3dBi+10lg2=6.0dBi

**Result:** The device meet FCC MPE at 20 cm distance.