

**FCC §15.407(f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart 15.407(f) 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>				
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;

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

**Calculated Formulary:**

Predication of MPE limit at a given distance

S = PG/4πR<sup>2</sup> = 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:

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

**Calculated Data:  
MPE evaluation for single transmission:**

Frequency Range (MHz)	Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
			(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	2.4G-802.11b	2412	5.0	3.16	17.09	51.17	20	0.032	1.0
	2.4G-802.11g	2462	5.0	3.16	16.98	49.89	20	0.031	1.0
	2.4G-802.11n HT20	2462	5.0	3.16	16.82	48.08	20	0.030	1.0
	2.4G-802.11n HT40	2452	5.0	3.16	16.70	46.77	20	0.029	1.0
5150-5250	5G-802.11a	5180	5.0	3.16	18.03	63.53	20	0.040	1.0
	5G-802.11n HT20	5240	5.0	3.16	18.16	65.46	20	0.041	1.0
	5G-802.11n HT40	5230	5.0	3.16	15.08	32.21	20	0.020	1.0
	802.11ac80	5210	5.0	3.16	12.69	18.58	20	0.012	1.0
5725-5850	802.11a	5745	5.0	3.16	16.92	49.20	20	0.031	1.0
	5G-802.11n HT20	5825	5.0	3.16	15.14	32.66	20	0.021	1.0
	5G-802.11n HT40	5755	5.0	3.16	16.44	44.06	20	0.028	1.0
	802.11ac80	5775	5.0	3.16	17.30	53.70	20	0.034	1.0

**MPE evaluation for simultaneous transmission:**

2.4 G and 5G can transmit at the same time, MPE evaluation is as below formula:

$PD1/Limit1+PD2/Limit2+..... < 1$ , PD (Power Density)

**MPE evaluation**= Max MPE of 2.4G + Max MPE of 5G = 0.032/1+0.041/1=0.073 < 1

**Result:** MPE evaluation of single and simultaneous transmission meet the requirement of standard.