

## 1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 1.1307 (b)(1), 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

a)

### 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:

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

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)			
2412-2462	6.5	4.47	25.5	354.81	20	0.315	1
5150-5250	6.5	4.47	20.5	112.20	20	0.100	1
5250-5350	6.5	4.47	20.5	112.20	20	0.100	1
5470-5725	6.5	4.47	20.5	112.20	20	0.100	1
5725-5850	6.5	4.47	20.5	112.20	20	0.100	1

Note: 1. The tune up conducted power was declared by the applicant.

2. The 2.4G Wi-Fi can transmit at the same time with the 5G Wi-Fi.

3. For the 2.4G Wi-Fi, as it can support the beam-forming function, so the directional antenna gain should add the  $10\lg 2$ ,  $3.5\text{dBi} + 10\lg 2 = 6.5\text{dBi}$ .

4. For the 5G Wi-Fi, as it can support the beam-forming function, so the directional antenna gain should add the  $10\lg 2$ ,  $3.5\text{dBi} + 10\lg 2 = 6.5\text{dBi}$ .

Simultaneous transmitting consideration (worst case):

The ratio =  $\text{MPE}_{2.4\text{G Wi-Fi}}/\text{limit} + \text{MPE}_{5\text{G Wi-Fi}}/\text{limit} = 0.315 + 0.100 = 0.415 < 1.0$ , so simultaneous exposure is compliant.

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

**Result: Compliant.**