

**§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

**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:

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

For worst case:

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)			
BDR/EDR	2402-2480	1.53	1.42	1.0	1.26	20	0.0004	1
BLE	2402-2480	1.53	1.42	4.0	2.51	20	0.0007	1
2.4G Wi-Fi	2412-2462	1.53	1.42	17.0	50.12	20	0.0142	1
5.2G Wi-Fi	5180-5270	2.66	1.85	16.0	39.81	20	<b>0.0146</b>	1
5.8G Wi-Fi	5745-5825	2.66	1.85	10.5	11.22	20	0.0041	1
GSM 850	824-849	0.9	1.23	32	1584.89	20	<b>0.3879</b>	0.55
PCS 1900	1850-1910	2.39	1.73	28.5	707.95	20	0.2442	1
WCDMA B2	1850-1910	2.39	1.73	22	158.49	20	0.0547	1
WCDMA B5	824-849	0.9	1.23	23	199.53	20	0.0488	0.55
LTE B2	1850-1910	2.39	1.73	24	251.19	20	0.0866	1
LTE B4	1710-1755	0.93	1.24	24.5	281.84	20	0.0695	1
LTE B7	2500-2570	1.58	1.44	21.5	141.25	20	0.0404	1
LTE B12	699-716	0.88	1.22	25.5	354.81	20	0.0864	0.47
LTE B13	777-787	0.88	1.22	25.5	354.81	20	0.0784	0.52
LTE B17	704-716	0.88	1.22	25.5	354.81	20	0.0714	0.47
LTE B25	1850-1915	2.39	1.73	24	251.19	20	0.0655	1

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

Note 2: Bluetooth or Wi-Fi function can transmit at the same time with the WWAN.

So the worst simultaneous transmitting consideration:

$$\text{The ratio} = \text{MPE}_{5.2\text{GWi-Fi}}/\text{limit} + \text{MPE}_{\text{GSM } 850}/\text{limit} = 0.0146/1.0 + 0.3879/0.55 = 0.72 < 1.0$$

So simultaneous exposure is not required.

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

**Result: Compliance**