

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

### **Applicable Standard**

According to subpart 15.247(i) 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>				
<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);

For simultaneously transmit system, the calculated power density should comply with:

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

**Calculated Data:**

Mode	Frequency Range (MHz)	Antenna Gain		Target Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BLE	2402~2480	3.28	2.13	-3.50	0.45	20	0.0002	1.00
WCDMA II	1850~1910	-4.39	0.36	24.00	251.189	20	0.0182	1.00
WCDMA IV	1710~1755	-4.14	0.39	24.00	251.189	20	0.0193	1.00
WCDMA V	824~849	-5.55	0.28	24.00	251.189	20	0.0139	0.55
LTE Band 2	1850~1910	-4.39	0.36	24.50	281.838	20	0.0204	1.00
LTE Band 4	1710~1755	-4.14	0.39	24.50	281.838	20	0.0216	1.00
LTE Band 5	824~849	-5.55	0.28	24.50	281.838	20	0.0156	0.55
LTE Band 12	699~716	-6.24	0.24	24.50	281.838	20	0.0133	0.47
LTE Band 13	777~787	-4.17	0.38	24.50	281.838	20	0.0215	0.52

**Note:**

- (1) The target output powers are all declared by the Manufacturer.  
 (2) The LTE/WCDMA module FCC ID: XMR201807EG91NA.  
 (3) BLE and WCDMA or LTE can transmit simultaneously; the worst condition was as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0002/1.00 + 0.0215/0.52 = 0.0002 + 0.0413 = 0.0415 < 1.0$$

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