

## 4 FCC §15.247(i) - & 1.1310 & 2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 4.1 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>				
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

$S = PG/4\pi R^2$  = 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:

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

**4.2 RF Exposure Evaluation Result**

3G Module FCC ID: R17HE910GL

Worse case:

**MPE evaluation for single transmission:**

Mode	Frequency Range (MHz)	Antenna Gain		Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
BT	2402-2480	1.927	1.558	6.5	4.467	20	0.00138	1.0
BLE	2402-2480	3.45	2.213	0	1.000	20	0.00044	1.0
3G	824-849	1.74	1.493	24.00	251.189	20	0.07460	0.56
3G	1850-1910	2.37	1.726	24.00	251.189	20	0.08624	1.0
3G	1710-1755	0.64	1.159	24.00	251.189	20	0.05791	1.0

**MPE evaluation for simultaneous transmission:**

BT ,BLE and 3G can transmit at the same time, MPE evaluation is as below formula:

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

**Worse case MPE evaluation**= MPE of BT/1 + MPE of 3G/0.56 = 0.00138/1+0.00044/1+ 0.07460/0.56=0.13503 < 1.0

**Result:** RF exposure evaluation of single and simultaneous transmission meet FCC limit at 20 cm distance.