

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

Applicable Standard

According to subpart §2.1091 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) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	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/cm²);

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		★Tune-up Output Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
2.4G Wi-Fi	2412~2462	0.32	1.08	20.5	112.20	20	0.0241	1.0	0.0241
	2422-2452	0.32	1.08	20.5	112.20	20	0.0241	1.0	0.0241
BLE	2402-2480	0.32	1.08	1.5	1.41	20	0.0003	1.0	0.0003
5G Wi-Fi	5150-5250	-0.12	0.97	12.0	15.85	20	0.0031	1.0	0.0031
	5725-5850	-0.12	0.97	10.5	11.22	20	0.0022	1.0	0.0022
Classic BT	2402-2480	0.32	1.08	4.0	2.51	20	0.0005	1.0	0.0005
LTE Band 2	1850-1910	1.79	1.51	25	316.23	20	0.0950	1.0	0.0950
LTE Band 4	1710-1755	1.79	1.51	25	316.23	20	0.0950	1.0	0.0950
LTE Band 5	824-849	-0.78	0.84	25	316.23	20	0.0526	0.5493	0.0958
LTE Band 7	2500-2570	3.37	2.17	25	316.23	20	0.1365	1.0	0.1365
LTE Band 12	699-716	-3.24	0.47	25	316.23	20	0.0298	0.466	0.0639
LTE Band 13	777-787	-3.24	0.47	25	316.23	20	0.0298	0.518	0.0575
LTE Band 25	1850-1915	1.79	1.51	25	316.23	20	0.0950	1.0	0.0950
LTE Band 26	814-824	-0.78	0.84	25	316.23	20	0.0526	0.5427	0.0969
	824-849	-0.78	0.84	25	316.23	20	0.0526	0.5493	0.0958
LTE Band38	2570-2620	3.37	2.17	25	316.23	20	0.1365	1.0	0.1365
LTE Band41	2496-2690	3.37	2.17	25	316.23	20	0.1365	1.0	0.1365

Note:

1. For the above tune up power were declared by the manufacturer.
2. This device contains module (model No.: EG25-G) is the same with the certified device (Product Name: LTE Module, model: EG25-G, FCC ID: XMR201903EG25G, Grant: 03/29/2019).
3. LTE and 2.4G Wi-Fi/5G WIFI/ BLE/ Classic BT can transmit simultaneously.

$$\sum_i \frac{S_i}{S_{Limit,i}} = S_{LTE}/S_{limitLTE} + S_{2.4G Wi-Fi}/S_{limit2.4G Wi-Fi}$$

$$= 0.1365 + 0.0241$$

$$= 0.1606$$

$$< 1.0$$

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