

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

Applicable Standard

According to subpart 15.247 (i) and subpart 1.1310, 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				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	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

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:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1.0$$

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 radio
		(dBi)	(numeric)	(dBm)	(mW)				
2.4G WIFI	2412~2462	2.93	1.96	24.0	251.19	20	0.0979	1.0	0.0979
BLE	2402-2480	2.93	1.96	4.0	2.51	20	0.0010	1.0	0.0010
BT	2402-2480	2.93	1.96	7.50	5.62	20	0.0022	1.0	0.0022
LTE Band 2	1850-1910	3.01	2.00	25.0	316.23	20	0.1258	1.0	0.1258
LTE Band 4	1710-1755	1.59	1.44	25.0	316.23	20	0.0906	1.0	0.0906
LTE Band 5	824-849	0.05	1.01	25.0	316.23	20	0.0636	0.5493	0.1158
LTE Band 12	699-716	-3.80	0.42	25.0	316.23	20	0.0262	0.4660	0.0562
LTE Band 17	704-716	-3.80	0.42	25.0	316.23	20	0.0262	0.4693	0.0558
LTE Band 66	1710-1780	1.84	1.53	25.0	316.23	20	0.0962	1.0	0.0962

Note:

1. For the above tune up power were declared by the manufacturer.
2. The devices contain certified WWAN Module, FCC ID: 2AKAF-MDM01
3. 2.4G Wi-Fi , LTE can transmit simultaneously (worst case) .

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0979 + 0.1258 = 0.2237 < 1.0$$

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