

§1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to §1.1307 and § 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

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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

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/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:

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

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BT	2402-2480	1.8	1.51	1.5	1.41	20	0.0004	1
BLE	2402-2480	1.8	1.51	1.5	1.41	20	0.0004	1
2.4GHz Wi-Fi	2412-2462	1.8	1.51	17.0	50.12	20	0.015	1
5GHz Wi-Fi	5150-5250/ 5725-5850	1.8	1.51	16.0	39.81	20	0.012	1
WCDMA B2	1850-1910	2.6	1.82	24.0	251.19	20	0.091	1
WCDMA B5	824-849	1.9	1.55	24.0	251.19	20	0.077	0.55
LTE B2	1850-1910	2.6	1.82	24.0	251.19	20	0.091	1
LTE B5	824-849	1.9	1.55	24.0	251.19	20	0.077	0.55

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

2. The BT/Wi-Fi can transmit at the same time with the WWAN, the BT, BLE, 2.4GHz Wi-Fi and 5GHz Wi-Fi cannot transmit simultaneously.

Simultaneous transmitting consideration (worst case):

The ratio= $MPE_{2.4G\ Wi-Fi}/limit + MPE_{WWAN}/limit = 0.015/1 + 0.077/0.55 = 0.155 < 1.0$

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

Result: Compliant.