

1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 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

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

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)			
Bluetooth	2402-2480	3.0	2.0	9.5	8.91	20	0.004	1
BLE	2402-2480	3.0	2.0	8.0	6.31	20	0.003	1
2.4G Wi-Fi	2412-2462	3.0	2.0	27.0	501.19	20	0.199	1
5G Wi-Fi	5150-5250	0	1.0	20.0	100	20	0.020	1
	5250-5350	0	1.0	19.0	79.43	20	0.016	1
	5470-5725	0	1.0	19.0	79.43	20	0.016	1
	5725-5850	0	1.0	19.0	79.43	20	0.016	1

- Note: 1. the tune up conducted power was declared by the applicant
 2. The Bluetooth can transmit at the same time with Wi-Fi, the 2.4G Wi-Fi can't transmit at the same time with the 5G Wi-Fi.

Simultaneous transmitting consideration:

The ratio=MPE_{Wi-Fi}/limit + MPE_{BT}/limit=0.199/1+0.004/1=0.203 < 1.0

So simultaneous exposure comply with the limit.

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

Result: Compliance