

§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

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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		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BT	2402-2480	1.5	1.41	2	1.58	20	0.00044	1.0
BLE	2402-2480	1.5	1.41	6.5	4.47	20	0.0013	1.0
2.4GHz Wi-Fi	2412-2472	1.5	1.41	24.5	281.84	20	0.079	1.0
	2422-2462	1.5	1.41	22.5	177.83	20	0.050	1.0
5GHz Wi-Fi	5150-5250	5.7	3.72	15	31.62	20	0.023	1.0
	5250-5350	5.7	3.72	15	31.62	20	0.023	1.0
	5470-5725	5.7	3.72	14	25.12	20	0.019	1.0
	5725-5850	5.7	3.72	15	31.62	20	0.023	1.0

Note:

1) The conducted power is the tune-up power of the Max Conducted Output Power.

2) BT and Wi-Fi can transmit simultaneously, 2.4GHz Wi-Fi and 5GHz Wi-Fi can't transmit simultaneously for this device.

Simultaneous transmitting consideration:

The ratio= $MPE_{Wi-Fi}/limit + MPE_{BT}/limit = 0.079/1 + 0.0013/1 = 0.0803 < 1.0$

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