

FCC §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 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)

Operation mode	Frequency (MHz)	Antenna Gain		Max Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
Wifi	2412-2462	1.5	1.41	21.0	125.89	20	0.0353	1.0
BLE	2402-2480	1.5	1.41	0	1	20	0.0003	1.0
Bluetooth	2402-2480	1.5	1.41	8.0	6.31	20	0.0018	1.0
GSM	824-849	-1.09	0.78	32.5	1778.28	20	0.2761	0.55
PCS	1850-1910	0.38	1.09	29.5	891.25	20	0.1934	1.0
WCDMA B2	1850-1910	0.38	1.09	22.0	158.49	20	0.0344	1.0
WCDMA B5	824-849	-1.09	0.78	22.5	177.83	20	0.0276	0.55
LTE B2	1850-1910	0.38	1.09	23.5	223.87	20	0.0486	1.0
LTE B4	1710-1755	0.54	1.13	23.5	223.87	20	0.0504	1.0
LTE B5	824-849	-1.09	0.78	23.5	223.87	20	0.0348	0.55
LTE B7	2500-2570	1.20	1.32	23.0	199.53	20	0.0524	1.0
LTE B66	1710-1780	0.54	1.13	23.0	199.53	20	0.0449	1.0

Simultaneously consider:

The worst case is wifi and Bluetooth and GSM cellular band transmitting simultaneously:

The rate= $0.0353/1.0+0.0018/1.0+0.2761/0.55=0.5392<1$

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

Result: compliance.