

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

Applicable Standard

According to subpart 1.1310 and 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

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	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
BDR/EDR	2402-2480	5.0	3.16	7.0	5.01	20	0.003	1
BLE	2402-2480	5.0	3.16	1.5	1.41	20	0.001	1
Wi-Fi	2412-2462	5.0	3.16	16.5	44.67	20	0.028	1
WCDMA Band 2	1850-1910	0	1.0	23.0	200	20	0.040	1
WCDMA Band 4	1710-1755	0	1.0	23.0	200	20	0.040	1
WCDMA Band 5	824-849	0	1.0	23.0	200	20	0.040	0.549
LTE Band 2	1850-1910	0	1.0	23.0	200	20	0.040	1
LTE Band 4	1710-1755	0	1.0	23.0	200	20	0.040	1
LTE Band 5	824-849	0	1.0	23.0	200	20	0.040	0.549
LTE Band 7	2500-2570	0	1.0	23.0	200	20	0.040	1
LTE Band 12	699-716	0	1.0	23.0	200	20	0.040	0.466
LTE Band 13	777-787	0	1.0	23.0	200	20	0.040	0.518
LTE Band 17	704-716	0	1.0	23.0	200	20	0.040	0.469

Note: 1. the tune up conducted power was declared by the applicant
2. the Wi-Fi, WCDMA/LTE can transmit at the same time.

So the worst simultaneous transmitting consideration:

The ratio= $MPE_{Wi-Fi}/limit + MPE_{LTE}/limit = 0.028/1.0 + 0.040/0.466 = 0.114 < 1.0$

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

Result: Compliant