

FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) 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 (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G Wi-Fi	2412-2472	3.0	2.00	28.0	630.96	20	0.25	1
5G Wi-Fi	5150-5250	6.0	3.98	24.0	251.19	20	0.20	1
	5725-5850	6.0	3.98	27.0	501.19	20	0.40	1

Note: 1. the tune up conducted power was declared by the applicant
 2. the 2.4G Wi-Fi can transmit at the same time with the 5G Wi-Fi.
 3. for 5G Wi-Fi, 802.11 ac20/ac40/ac80/ax20/ax40/ax80 mode support Beamforming
 $Directional\ Gain = G_{ANT} + 10\log(N_{ANT}/N_{SS})$,
 For the worst case, $N_{SS} = 1$, so: $Directional\ Gain = 3\text{dBi} + 10\log(2/1)\text{ dB} = 6\text{dBi}$

Simultaneous transmitting consideration:

The ratio = $MPE_{2.4G}/\text{limit} + MPE_{5G}/\text{limit} = 0.25/1 + 0.40/1 = 0.65 < 1.0$

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