

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

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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 Modes	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)			
Zigbee	2405-2480	2.44	1.75	-4	0.40	20	0.0001	1
2.4G Wi-Fi	2412-2462	2.02	1.59	11	12.59	20	0.0040	1

Note 1: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Note 2: The antenna gain[#] and Tune up conducted power[#] were declared and provided by the applicant. The 2.4G Wi-Fi and zigbee can transmit simultaneously:

$$= S_{2.4G \text{ Wi-Fi}} / S_{\text{limit-2.4G Wi-Fi}} + S_{\text{Zigbee}} / S_{\text{limit-Zigbee}}$$

$$= 0.0001/1 + 0.0040/1$$

$$= 0.0041 < 1.0$$

Result: Compliant