

FCC§15.247 (i), §1.1310& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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);

Calculated Data:

2412-2462 MHz

Mode	Frequency (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2462	6.0	3.981	17.41	55.08	20	0.044	1.0
802.11g	2462	6.0	3.981	17.46	55.72	20	0.044	1.0
802.11n HT20	2462	6.0	3.981	15.43	34.91	20	0.028	1.0
802.11n HT40	2422	6.0	3.981	10.74	11.86	20	0.009	1.0

5150-5250 MHz

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11a	5150-5250	6.0	3.99	19.87	97.05	20	0.0771	1.0
802.11n HT20		6.0	3.99	19.94	98.63	20	0.0783	1.0
802.11n HT40		6.0	3.99	19.19	82.99	20	0.0659	1.0
802.11ac20		6.0	3.99	20.21	104.95	20	0.0834	1.0
802.11ac40		6.0	3.99	19.16	82.41	20	0.0655	1.0
802.11ac80		6.0	3.99	18.05	63.83	20	0.0507	1.0

5725-5850 MHz

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11a	5725-5850	6.0	3.99	20.13	103.04	20	0.0818	1.0
802.11n HT20		6.0	3.99	19.95	98.86	20	0.0785	1.0
802.11n HT40		6.0	3.99	18.56	71.78	20	0.0570	1.0
802.11ac20		6.0	3.99	19.96	99.08	20	0.0787	1.0
802.11ac40		6.0	3.99	19.11	81.47	20	0.0647	1.0
802.11ac80		6.0	3.99	18.00	63.10	20	0.0501	1.0

So the Max MPE ratio at 20 cm distance is $0.044 + 0.0834 = 0.1274 < 1.0$

The device meets FCC MPE limit at 20 cm distance.