

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

Applicable Standard

According to §2.1091 and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

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/cm²)	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:

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11b	2412-2462	3.00	2.00	17.00	50.12	20	0.0199	1.0	0.0199
802.11g		3.00	2.00	16.00	39.81	20	0.0158	1.0	0.0158
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40	2422-2452	6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250

Mode	Frequency (MHz)	Antenna Gain		Conducted output power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11a	5180-5240	3.00	2.00	15.00	31.62	20	0.0126	1.0	0.0126
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40		6.00	3.98	13.00	19.95	20	0.0158	1.0	0.0158
802.11a	5745-5825	3.00	2.00	15.00	31.62	20	0.0126	1.0	0.0126
802.11n-HT20		6.00	3.98	15.00	31.62	20	0.0250	1.0	0.0250
802.11n-HT40		6.00	3.98	12.00	15.85	20	0.0126	1.0	0.0126

Note:

- (1) The target output powers are declared by the Manufacturer.
- (2) 2.4GWi-Fi and 5GWi-Fi cannot transmit simultaneously.
- (3) According to 662911 D01 Multiple Transmitter Output v02r01, for 802.11n:
Directional gain = GANT + 10*log(NANT) dBi=3dBi+10lg2=6.0dBi

Result: The device meet FCC MPE at 20 cm distance.