

RF exposure

According to FCC part 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in § 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength(V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Average time
(A) Limits for Occupational / Control Exposures				
300 – 1 500	--	--	f/300	6
1 500 - 100000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300 – 1 500	--	--	f/1500	6
1 500 – 100 000	--	--	<u>1</u>	<u>30</u>

f= frequency in MHz

Friis transmission formula: $P_d = (P_{out} \times G) / (4 \times \pi \times R^2)$

Where,

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Results - Worst case

- 2.4G

Operation mode	Frequency (MHz)	Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
802.11b	2 412 ~ 2 462	16.00	2.74	0.014 88	1
802.11g	2 412 ~ 2 462	12.50	2.74	0.006 65	1
802.11n(HT20)	2 412 ~ 2 462	12.50	2.74	0.006 65	1
802.11n(HT40)	2 422 ~ 2 452	11.50	2.74	0.005 28	1

- 5.8G

Operation mode	Frequency (MHz)	Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
802.11a	5 745 ~ 5 825	10.00	3.39	0.004 34	1
802.11an(HT20)	5 745 ~ 5 825	8.00	3.39	0.002 74	1
802.11an(HT40)	5 745 ~ 5 825	8.00	3.39	0.002 74	1
802.11ac(VHT20)	5 745 ~ 5 825	8.00	3.39	0.002 74	1
802.11ac(VHT40)	5 745 ~ 5 825	8.00	3.39	0.002 74	1
802.11ac(VHT80)	5 745 ~ 5 825	8.00	3.39	0.002 74	1

- 5.2G

Operation mode	Frequency (MHz)	Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	5 180 ~ 5 240	12.00	1.39	0.004 34	1
802.11an(HT20)	5 180 ~ 5 240	10.00	1.39	0.002 74	1
802.11an(HT40)	5 180 ~ 5 240	9.00	1.39	0.002 18	1
802.11ac(VHT20)	5 180 ~ 5 240	10.00	1.39	0.002 74	1
802.11ac(VHT40)	5 180 ~ 5 240	9.00	1.39	0.002 18	1
802.11ac(VHT80)	5 180 ~ 5 240	9.00	1.39	0.002 18	1

- 5.3G

Operation mode	Frequency (MHz)	Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	5 260 ~ 5 320	13.00	1.95	0.006 22	1
802.11an(HT20)	5 260 ~ 5 320	10.00	1.95	0.003 12	1
802.11an(HT40)	5 260 ~ 5 320	10.00	1.95	0.003 12	1
802.11ac(VHT20)	5 260 ~ 5 320	11.00	1.95	0.003 92	1
802.11ac(VHT40)	5 260 ~ 5 320	10.00	1.95	0.003 12	1
802.11ac(VHT80)	5 260 ~ 5 320	10.00	1.95	0.003 12	1

- 5.5G

Operation mode	Frequency (MHz)	Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	5 500 ~ 5 720	13.00	3.91	0.009 77	1
802.11an(HT20)	5 500 ~ 5 720	11.00	3.91	0.006 16	1
802.11an(HT40)	5 500 ~ 5 720	11.00	3.91	0.006 16	1
802.11ac(VHT20)	5 500 ~ 5 720	11.00	3.91	0.006 16	1
802.11ac(VHT40)	5 500 ~ 5 720	10.00	3.91	0.004 89	1
802.11ac(VHT80)	5 500 ~ 5 720	10.00	3.91	0.004 89	1