

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	--	--	1	30

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		Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11b	SISO	12.00	-2.22	0.001 89	1
802.11g	SISO	3.00	-2.22	0.000 24	1
802.11n(HT20)	SISO	3.00	-2.22	0.000 24	1
802.11n(HT20)	MIMO	6.00	0.56	0.000 90	1

- 5.8G

Operation mode		Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	SISO	9.00	1.16	0.002 06	1
802.11an(HT20)	SISO	9.00	1.16	0.002 06	1
802.11an(HT20)	MIMO	11.00	3.16	0.005 18	1
802.11an(HT40)	SISO	9.00	1.16	0.002 06	1
802.11an(HT40)	MIMO	11.00	3.16	0.005 18	1

- 5.2G

Operation mode		Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	SISO	11.00	2.38	0.004 33	1
802.11an(HT20)	SISO	10.00	2.38	0.003 44	1
802.11an(HT20)	MIMO	13.00	4.80	0.011 99	1
802.11an(HT40)	SISO	10.00	2.38	0.003 44	1
802.11an(HT40)	MIMO	13.00	4.80	0.011 99	1

- 5.3G

Operation mode		Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	SISO	10.00	0.97	0.002 49	1
802.11an(HT20)	SISO	10.00	0.97	0.002 49	1
802.11an(HT20)	MIMO	12.00	3.36	0.006 83	1
802.11an(HT40)	SISO	9.00	0.97	0.001 98	1
802.11an(HT40)	MIMO	12.00	3.36	0.006 83	1

- 5.5G

Operation mode		Max tune-up power (dBm)	Antenna gain (dBi)	Power density at 20 cm (mW/cm ²)	Limit (mW/cm ²)
802.11a	SISO	10.00	2.02	0.003 17	1
802.11an(HT20)	SISO	10.00	2.02	0.003 17	1
802.11an(HT20)	MIMO	12.00	3.69	0.007 37	1
802.11an(HT40)	SISO	9.00	2.02	0.002 52	1
802.11an(HT40)	MIMO	12.00	3.69	0.007 37	1