

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/cm²)	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/cm^2

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/cm^2 . 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

ANTENNA #1 (Dipole antenna)

- 2.4G

Operation mode		Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm²)	Limit (mW/cm²)
802.11n(HT20)	SISO	10.00	3.67	0.004 63	1

- 5G_UNII-1

Operation mode		Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm²)	Limit (mW/cm²)
802.11n(HT20)	MIMO	10.00	5.62	0.007 26	1

ANTENNA #2 (PCB antenna)**- 2.4G**

Operation mode		Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
802.11n(HT20)	SISO	10.00	2.27	0.003 36	1

- 5G_UNII-1

Operation mode		Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm ²)	Limit (mW/cm ²)
802.11n(HT20)	MIMO	10.00	1.86	0.003 05	1