

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

Operation mode	Frequency (MHz)	Max Tune-up Average Power(dBm)	Antenna gain (dBi)	Power density at 20 cm(mW/cm²)	Limit (mW/cm²)		
802.11b	2 412 ~ 2 462	24.0	1.47	0.070 10	1		
802.11g		18.0		0.017 61			
802.11n_HT20		19.0		0.022 17			
802.11n_HT40	2 422 ~ 2 452	19.0		0.022 17			
802.11a	5 180 ~ 5 240	17.0	2.54	0.017 89		1	
802.11n_HT20		17.0		0.017 89			
802.11ac_VHT20		18.0		0.022 53			
802.11n_HT40	5 190 ~ 5 230	15.0		0.011 29			1
802.11ac_VHT40		16.0		0.014 21			
802.11ac_VHT80		5 210		16.0			
Simultaneous transmission (802.11b + 802.11ac_VHT20)				0.092 63	< 1 (Ratio)		

Note.

- When the sum of ratios of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the 1.0 the additional equipment approval is not required.
- Calculation : $(0.070\ 10 / 1) + (0.022\ 53 / 1) = 0.092\ 63$