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 (㎒)	Electric field strength(V/m)	Magnetic field strength (A/m)	Power density (㎽/㎠)	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 ㎒

Friis transmission formula: $Pd = (Pout \times G)/(4 \times pi \times R^2)$

Where,

Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd the limit of MPE, 1 ㎽/㎠. 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

<Wireless Lan>

Operation mode / Data Rate	Frequency (㎒)	Peak output power (dBm)	Antenna gain (dBi)	Power density at 20 ㎝(㎽/㎠)	Limit (㎽/㎠)
802.11n(HT20) / MCS6 (2 412 ㎒ ~ 2 462 ㎒)	2462	18.391	0.9	0.016 90	1
802.11n(HT40) / MCS5 (2 422 ㎒ ~ 2 452 ㎒)	2437	18.950	0.9	0.019 22	1

<Bluetooth BDR & EDR>

Operation mode / Data Rate	Frequency (㎒)	Peak output power (dBm)	Antenna gain (dBi)	Power density at 20 ㎝(㎽/㎠)	Limit (㎽/㎠)
GFSK/ 1Mbps	2480	8.92	0.9	0.001 91	1
8-DPSK / 3Mbps	2480	9.71	0.9	0.001 82	1

WLAN(2 422 ㎒ ~ 2 452 ㎒) **:** Power = 18.950 dBm, Antenna Gain = 0.9 dBi, Power density = 0.019 22 ㎽/㎠
Bluetooth(2 402 ㎒ ~ 2 480 ㎒) : Power = 8.92 dBm, Antenna Gain = 0.9 dBi, Power density = 0.001 91 ㎽/㎠
Maximum simultaneous MPE is 0.019 22 ㎽/㎠ + 0.001 91 ㎽/㎠ = 0.021 13 × 100% = 2.113% which is less than 100%.