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

- Bluetooth 4.0 (1Mbps)

Operation mode	Frequency (㎒)	Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 ㎝(㎽/㎠)	Limit (㎽/㎠)
BLE	2402	1.50	1.49	0.000 40	1
	2442	1.00	1.49	0.000 35	1
	2480	-0.50	1.49	0.000 25	1

- UNII 1

Operation mode	Max tune-up Average power (dBm)	Antenna gain (dBi)	Power density at 20 ㎝(㎽/㎠)	Limit (㎽/㎠)
802.11an(HT20)	-4.00	2.07	0.000 13	1
802.11ac(VHT20)	-4.00	2.07	0.000 13	1

Results – SUM (Worst case)

Maximum Power density at 20 ㎝(㎽/㎠) (Bluetooth 4.0 (1Mbps))	Maximum Power density at 20 ㎝(㎽/㎠) (UNII 1)	Sum (㎽/㎠)	Limit (㎽/㎠)
0.000 40	0.000 13	0.000 53	1