

RF EXPOSURE EVALUATION

According to FCC 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)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

Measurement Result

Module 1

Operation Frequency: WIFI: 2412-2462MHz for 802.11b/g/11n(HT20); 2422-2452MHz for 802.11n(HT40);

Power density limited: 1mW/ cm²

Antenna Type: External Antenna

Antenna gain: 5.5 dBi,

R=20cm

WIFI:

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	14.5	14±1	15	31.623	5.50	3.55	0.0223	1
2437		14.85	14±1	15	31.623	5.50	3.55	0.0223	1
2462		14.64	14±1	15	31.623	5.50	3.55	0.0223	1
2412	802.11g	13.54	13±1	14	25.119	5.50	3.55	0.0177	1
2437		13.45	13±1	14	25.119	5.50	3.55	0.0177	1
2462		13.28	13±1	14	25.119	5.50	3.55	0.0177	1
2412	802.11n HT20	13.6	13±1	14	25.119	5.50	3.55	0.0177	1
2437		13.46	13±1	14	25.119	5.50	3.55	0.0177	1
2462		13.25	13±1	14	25.119	5.50	3.55	0.0177	1
2412	802.11n HT40	13.37	13±1	14	25.119	5.50	3.55	0.0177	1
2437		12.77	13±1	14	25.119	5.50	3.55	0.0177	1
2452		13.01	13±1	14	25.119	5.50	3.55	0.0177	1

Module 2

Operation Frequency: WIFI: 2412-2462MHz for 802.11b/g/11n(HT20); 2422-2452MHz for 802.11n(HT40);

Power density limited: 1mW/ cm²

Antenna Type: External Antenna

Antenna gain: 5.5 dBi,

R=20cm

WIFI:

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	14.61	14.5±1	15.5	35.481	5.50	3.55	0.0250	1
2437		15.01	14.5±1	15.5	35.481	5.50	3.55	0.0250	1
2462		14.65	14.5±1	15.5	35.481	5.50	3.55	0.0250	1
2412	802.11g	13.61	13±1	14	25.119	5.50	3.55	0.0177	1
2437		13.47	13±1	14	25.119	5.50	3.55	0.0177	1
2462		13.3	13±1	14	25.119	5.50	3.55	0.0177	1
2412	802.11n HT20	13.65	13±1	14	25.119	5.50	3.55	0.0177	1
2437		13.48	13±1	14	25.119	5.50	3.55	0.0177	1
2462		13.25	13±1	14	25.119	5.50	3.55	0.0177	1
2412	802.11n HT40	13.4	13±1	14	25.119	5.50	3.55	0.0177	1
2437		12.5	13±1	14	25.119	5.50	3.55	0.0177	1
2452		13.1	13±1	14	25.119	5.50	3.55	0.0177	1

Conclusion:

For the max result : $0.0250 \leq 1.0$ for Max Power Density, compliance RF exposure.

Note: Module 1 and Module 2 cannot be transmitted at the same time.



Signature:

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