

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

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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

Operation Frequency: BLE: 2402-2480MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC patch antenna

Antenna gain:2.53dBi,

R=20cm

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	BLE	8.16	8±1	9	7.943	2.53	1.79	0.0028	1
2440		7.62	7±1	8	6.310	2.53	1.79	0.0022	1
2480		6.99	6±1	7	5.012	2.53	1.79	0.0018	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: FPC patch antenna

Antenna gain:2.53dBi,

R=20cm

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	15.78	15±1	16	39.811	2.53	1.79	0.0142	1
2437		15.79	15±1	16	39.811	2.53	1.79	0.0142	1
2462		15.74	15±1	16	39.811	2.53	1.79	0.0142	1
2412	802.11g	17.51	17±1	18	63.096	2.53	1.79	0.0225	1
2437		17.49	17±1	18	63.096	2.53	1.79	0.0225	1
2462		17.56	17±1	18	63.096	2.53	1.79	0.0225	1
2412	802.11n HT20	15.65	15±1	16	39.811	2.53	1.79	0.0142	1
2437		15.65	15±1	16	39.811	2.53	1.79	0.0142	1
2462		15.74	15±1	16	39.811	2.53	1.79	0.0142	1
2422	802.11n HT40	16.26	16±1	17	50.119	2.53	1.79	0.0179	1
2437		16.27	16±1	17	50.119	2.53	1.79	0.0179	1
2452		16.4	16±1	17	50.119	2.53	1.79	0.0179	1

Operation Frequency: WIFI: U-NII-1: 5150 MHz ~5250MHz;

Power density limited: 1mW/ cm²

Antenna Type: FPC patch antenna

Antenna gain:3.39dBi,

R=20cm

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5180	802.11a	9.05	9±1	10	10.000	3.39	2.18	0.0043	1
5200		9.33	9±1	10	10.000	3.39	2.18	0.0043	1
5240		11.02	11±1	12	15.849	3.39	2.18	0.0069	1
5180	802.11HT20	10.67	10±1	11	12.589	3.39	2.18	0.0055	1
5200		10.92	10±1	11	12.589	3.39	2.18	0.0055	1
5240		11.11	11±1	12	15.849	3.39	2.18	0.0069	1
5190	802.11HT40	10.98	11±1	12	15.849	3.39	2.18	0.0069	1
5230		11.03	11±1	12	15.849	3.39	2.18	0.0069	1
5180	802.11AC20	10.73	10±1	10	10.000	3.39	2.18	0.0043	1
5200		10.71	10±1	10	10.000	3.39	2.18	0.0043	1
5240		10.88	10±1	10	10.000	3.39	2.18	0.0043	1
5190	802.11AC40	10.94	10±1	10	10.000	3.39	2.18	0.0043	1
5230		11	11±1	12	15.849	3.39	2.18	0.0069	1
5210	802.11AC80	11.4	11±1	12	15.849	3.39	2.18	0.0069	1

Operation Frequency: WIFI: U-NII-3: 5725 MHz ~5825 MHz ;

Power density limited: 1mW/ cm²

Antenna Type: FPC patch antenna

Antenna gain:3.39dBi,

R=20cm

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up pow er		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5745	802.11a	7.700	8±1	9	7.943	3.39	2.18	0.0034	1
5785		7.940	8±1	9	7.943	3.39	2.18	0.0034	1
5825		8.110	8±1	9	7.943	3.39	2.18	0.0034	1
5745	802.11HT20	7.860	8±1	9	7.943	3.39	2.18	0.0034	1
5785		8.330	8±1	9	7.943	3.39	2.18	0.0034	1
5825		8.420	8±1	9	7.943	3.39	2.18	0.0034	1
5755	802.11HT40	6.310	6±1	7	5.012	3.39	2.18	0.0022	1
5795		6.520	6±1	7	5.012	3.39	2.18	0.0022	1
5745	802.11AC20	7.780	8±1	9	7.943	3.39	2.18	0.0034	1
5785		8.240	8±1	9	7.943	3.39	2.18	0.0034	1
5825		8.440	8±1	9	7.943	3.39	2.18	0.0034	1
5755	802.11AC40	6.270	6±1	7	5.012	3.39	2.18	0.0022	1
5795		6.350	6±1	7	5.012	3.39	2.18	0.0022	1
5775	802.11AC80	8.670	8±1	9	7.943	3.39	2.18	0.0034	1

Conclusion:

For the max result : 0.0225≤ 1 for Max Power Density, compliance RF exposure.

Signature:



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