

FCC ID: 2BARM-XM1

Maximum Permissible Exposure (MPE)

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.

BLE:

Measurement Result

Operation Frequency: 2402MHz~2480MHz

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: FPC antenna

Antenna gain: 2.63dBi;

R=20cm

$\text{mW}=10^{(\text{dBm}/10)}$

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2.63/10)}=1.83$

Channel Freq. (MHz)	modulation	conducted pow er	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up pow er		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	BLE 1M	0.52	0.5±1	1.5	1.413	2.63	1.83	0.0005	1
2440		0.07	0.5±1	1.5	1.413	2.63	1.83	0.0005	1
2480		0.10	0.5±1	1.5	1.413	2.63	1.83	0.0005	1
2402	BLE 2M	0.53	0.5±1	1.5	1.413	2.63	1.83	0.0005	1
2440		0.04	0.5±1	1.5	1.413	2.63	1.83	0.0005	1
2480		0.08	0.5±1	1.5	1.413	2.63	1.83	0.0005	1

2.4GWIFI:

Measurement Result

Operation Frequency: 2412MHz~2462MHz (20M)

2422MHz~2452MHz (40M)

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: FPC antenna

Antenna gain: 2.63dBi;

R=20cm

$\text{mW}=10^{(\text{dBm}/10)}$

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2.63/10)}=1.83$

Channel Freq. (MHz)	modulation	conducted power	Tune-up pow er (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up pow er		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2412	11b	15.85	16±1	17	50.119	2.63	1.83	0.0183	1
2437		15.59	16±1	17	50.119	2.63	1.83	0.0183	1
2462		15.56	16±1	17	50.119	2.63	1.83	0.0183	1
2412	11g	12.43	13±1	14	25.119	2.63	1.83	0.0092	1
2437		12.24	13±1	14	25.119	2.63	1.83	0.0092	1
2462		12.02	13±1	14	25.119	2.63	1.83	0.0092	1
2412	11n20	11.37	11±1	12	15.849	2.63	1.83	0.0058	1
2437		11.22	11±1	12	15.849	2.63	1.83	0.0058	1
2462		10.96	11±1	12	15.849	2.63	1.83	0.0058	1
2422	11n40	11.15	11±1	12	15.849	2.63	1.83	0.0058	1
2437		10.80	11±1	12	15.849	2.63	1.83	0.0058	1
2452		10.96	11±1	12	15.849	2.63	1.83	0.0058	1

BLE+2.4GWIFI=0.0005+0.0183=0.0188≤ 1

Conclusion:

For the max result : 0.0188≤ 1.0 for Max Power Density, compliance RF exposure..

Signature: 

Date: 2025-04-25

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