

FCC ID: 2A2P9-EFCP100DIY

KDB447498 D01 General RF Exposure Guidance v06

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: 5.05dBi;

R=20cm

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

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(5.05/10)}=3.2$

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
2402	BLE1M	6.07	7±1	8	6.310	5.05	3.20	0.0040	1
2440		6.3	7±1	8	6.310	5.05	3.20	0.0040	1
2480		7.06	7±1	8	6.310	5.05	3.20	0.0040	1
2402	BLE2M	6.18	7±1	8	6.310	5.05	3.20	0.0040	1
2440		6.51	7±1	8	6.310	5.05	3.20	0.0040	1
2480		7.32	7±1	8	6.310	5.05	3.20	0.0040	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,

WIFI 802.11n HT40:2422-2452MHz

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

Antenna Type: FPC antenna

WIFI antenna gain: 5.05dBi;

R=20cm

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

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(5.05/10)}=3.2$

Channel Freq. (MHz)	modulation	conducted power	Tune-up power	Max		Antenna	Evaluation result at 20cm	Power density Limits
		(dBm)	(dBm)	tune-up power		Gain	Power density(mW/cm2	(mW/cm2)
				(dBm)	(mW)	Numeric		
2412	802.11b	19.36	19±1	20	100	3.2	0.06366	1
2437		18.79	19±1	20	100	3.2	0.06366	1
2462		19.16	19±1	20	100	3.2	0.06366	1
2412	802.11g	18.14	18±1	19	79.43	3.2	0.05057	1
2437		17.94	18±1	19	79.43	3.2	0.05057	1
2462		18.26	18±1	19	79.43	3.2	0.05057	1
2412	802.11n H20	17.12	17±1	18	63.10	3.2	0.04017	1
2437		16.88	17±1	18	63.10	3.2	0.04017	1
2462		17.23	17±1	18	63.10	3.2	0.04017	1
2422	802.11n H40	17.08	17±1	18	63.10	3.2	0.04017	1
2437		16.78	17±1	18	63.10	3.2	0.04017	1
2452		16.97	17±1	18	63.10	3.2	0.04017	1

Conclusion:

For the max result : $0.06366 \leq 1.0$ for Max Power Density, compliance RF exposure..

Note:BT and WIFI 2.4G do not support simultaneous transmission.



Signature:

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