

FCC ID:2AX5VKEYPADTF1

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)

According to KDB447498 D01 General RF Exposure Guidance V06

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.

BT:

Measurement Result

Operation Frequency: 2402MHz~2480MHz

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

Antenna Type: PCB Antenna

Antenna gain: -4.6 dBi;

R=20cm

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

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

Channel Freq. (MHz)	Band	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK BLE1M	-4.26	-4±1	-3	0.501	-4.6	0.35	0.000035	1
2440		-4.69	-4±1	-3	0.501	-4.6	0.35	0.000035	1
2480		-4.98	-4.5±1	-3.5	0.447	-4.6	0.35	0.000031	1
2402	GFSK BLE2M	-4.3	-4±1	-3	0.501	-4.6	0.35	0.000035	1
2440		-4.74	-4±1	-3	0.501	-4.6	0.35	0.000035	1
2480		-5.01	-4.5±1	-3.5	0.447	-4.6	0.35	0.000031	1

NFC

Operation Frequency: ASK: 13.56MHz

Antenna Type: Induction coil

Antenna Gain: -7 dBi

R=20cm

Transmit power:

Frequency (MHz)	EIRP power (dBuV/m)	EIRP power (dBm)
13.56	76.48	-18.78

$$\text{EIRP} = E - 104.8 + 20 \log(D)$$

$$\text{EIRP} = \text{conducted power} + \text{antenna gain}$$

Channel Freq. (MHz)	ANT	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
			(dBm)		tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric		
13.56	ANT1	ASK	-11.78	-11.5±1	-10.5	0.089	-7	0.20	0.000004	0.98

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