

FCC ID: 2A8TN-U-BOX-M2

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.

WIFI:

Operation Frequency: ble: 2402MHz~2480MHz

2.4g WIFI 802.11b/g/n HT20: 2412-2462MHz,

5.2gWIFI 802.11a/ac/n(HT20): 5180-5240MHz

WIFI 802.11ac/n(HT40): 5190-5230MHz

WIFI 802.11ac80:5210-5210MHz

5.8gWIFI 802.11a/ac/n(HT20): 5745-5825MHz

WIFI 802.11ac/n(HT40): 5755-5795MHz

WIFI 802.11ac80:5775MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna gain: ble: 3.23 dBi;

2.4G wifi: Ant 1:3.23 dBi; Ant 2:3.78dBi

5G wifi: Ant1:8.38 dBi; Ant2:8.91 dBi

R=20cm

mW=10^{^(dBm/10)}antenna gain Numeric=10^{^(dBi/10)}**ble**

Antenna	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		
Ant 1	2402	GFSK	4.825	5.5±1	6.5	4.467	3.23	2.10	0.0019	1
Ant 1	2440		4.619	5.5±1	6.5	4.467	3.23	2.10	0.0019	1
Ant 1	2480		6.331	5.5±1	6.5	4.467	3.23	2.10	0.0019	1

wifi

Band	Max Conducted	Antenna	Separation distance (cm)	Evaluation result	Power density Limits	Verdict
	(dBm)	Gain		(mW/cm2)	(mW/cm2)	
		(dBi)				
Wi-Fi 2.4G (Ant1)	16.63	3.23	20	0.019263	1	PASS
Wi-Fi 2.4G (Ant2)	16.27	3.78	20	0.020124	1	PASS
Wi-Fi 5.2G (Ant1)	9.79	8.38	20	0.013053	1	PASS
Wi-Fi 5.2G (Ant2)	10.87	8.91	20	0.018911	1	PASS
Wi-Fi 5.8G (Ant1)	10.53	8.38	20	0.015478	1	PASS
Wi-Fi 5.8G (Ant2)	10.08	8.91	20	0.015766	1	PASS

Note: This product does not support simultaneous transmission.

The conclusion should be 0.020124<1 for Max Power Density, Compliance the RF Exposure requirement.

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