

# FCC ID: 2AW68-W8919B

## 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	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

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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

### BT:

Operation Frequency: 2402MHz~2480MHz

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

Antenna Type: FPCB antenna

BT antenna gain: 3.08dBi;

R=20cm

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

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm <sup>2</sup> )	Power density (mW/cm <sup>2</sup> )
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	6.54	6±1	7	5.012	3.08	2.03	0.0020	1
2441		5.56	6±1	7	5.012	3.08	2.03	0.0020	1
2480		5.14	6±1	7	5.012	3.08	2.03	0.0020	1
2402	π/4-DQPSK	10.54	11±1	12	15.849	3.08	2.03	0.0064	1
2441		10.08	11±1	12	15.849	3.08	2.03	0.0064	1
2480		11.24	11±1	12	15.849	3.08	2.03	0.0064	1
2402	8-DPSK	10.88	11±1	12	15.849	3.08	2.03	0.0064	1
2441		10.37	11±1	12	15.849	3.08	2.03	0.0064	1
2480		11.46	11±1	12	15.849	3.08	2.03	0.0064	1
2402	BLE	7.08	7±1	8	6.310	3.08	2.03	0.0026	1
2440		6.09	7±1	8	6.310	3.08	2.03	0.0026	1
2480		6.72	7±1	8	6.310	3.08	2.03	0.0026	1

### 2.4G/5G WIFI:

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

WIFI 802.11n HT40:2422-2452MHz

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

Operation Frequency: WIFI 802.11a/ac/n(HT20): 5180-5240MHz;5260-5320MHz,5500-5700MHz,5745-5825MHz;WIFI 802.11ac/n(HT40): 5190-5230MHz;5270-5310MHz,5510-5670MHz5755-5795MHz; WIFI 802.11ac80:5210-5210MHz;5290-5290MHz;5530-5610MHz; 5775-5775MHz

Power density limited: 1mW/cm

Antenna Type: FPCB antenna

2.4G WIFI antenna1 gain: 3.08dBi; WIFI antenna2 gain: 4.05dBi

5G WIFI antenna1 gain: 4.15dBi; WIFI antenna2 gain: 4.33dBi

R=20cm

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

### WLAN2.4G SISO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(c m)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
Ant 1	12.96	3.08	16.04	40.179	20	0.0080	1	Pass
Ant 2	12.77	4.05	16.82	48.084	20	0.0096	1	

### WLAN5.2G SISO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
Ant 1	9.89	4.15	14.04	25.351	20	0.0050	1	Pass
Ant 2	10.08	4.33	14.41	27.606	20	0.0055	1	

### WLAN5.3G SISO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
Ant 1	10.01	4.15	14.16	26.062	20	0.0052	1	Pass
Ant 2	10.82	4.33	15.15	32.734	20	0.0065	1	

### WLAN5.6G SISO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
Ant 1	8.37	4.15	12.52	17.865	20	0.0036	1	Pass
Ant 2	8.62	4.33	12.95	19.724	20	0.0039	1	

### WLAN5.8G SISO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
Ant 1	11.63	4.15	15.78	37.844	20	0.0075	1	Pass
Ant 2	11.44	4.33	15.77	37.757	20	0.0075	1	

### SIMULTANEOUS TRANSMISSIONS

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of E<sup>2</sup>, H<sup>2</sup> (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

### WLAN2.4G MIMO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
Ant 1	11.06	3.08	14.14	25.942	20	0.0052	1	0.0108	Pass
Ant 2	10.45	4.05	14.5	28.184	20	0.0056	1		

### WLAN5.2G MIMO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
Ant 1	9.84	4.15	13.99	25.061	20	0.0050	1	0.0094	Pass
Ant 2	9.13	4.33	13.46	22.182	20	0.0044	1		

### WLAN5.3G MIMO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
Ant 1	9.54	4.15	13.69	23.388	20	0.0047	1	0.0091	Pass
Ant 2	9.11	4.33	13.44	22.080	20	0.0044	1		

### WLAN5.6G MIMO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
Ant 1	7.21	4.15	11.36	13.677	20	0.0027	1	0.0047	Pass
Ant 2	5.79	4.33	10.12	10.280	20	0.0020	1		

### WLAN5.8G MIMO MODE

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
Ant 1	10.8	4.15	14.95	31.261	20	0.0062	1	0.0124	Pass
Ant 2	10.58	4.33	14.91	30.974	20	0.0062	1		

This product does not support the requirements under multiple sources.

**Conclusion:**

The conclusion for MIMO mode should be  $0.0124 < 1$  for Max Power Density, Compliance the

**Signature:**  
**Date:** 2021-05-10



**NAME AND TITLE** (Please print or type): alex li/Manager

**COMPANY** (Please print or type): Shenzhen NTEK Testing Technology Co., Ltd./ 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen P.R. China.