

FCC ID:2AXHE-WD8822CS

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

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

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: PCB antenna

WIFI antenna gain:2dBi;

R=20cm

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

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2/10)}=1.58$

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		
2402	GFSK	8.365	8±1	9	7.943282	1.58	0.00250	1
2441		8.422	8±1	9	7.943282	1.58	0.00250	1
2480		8.457	8±1	9	7.943282	1.58	0.00250	1
2402	π/4-DQPSK,	8.692	9±1	10	10	1.58	0.00314	1
2441		8.3	9±1	10	10	1.58	0.00314	1
2480		9.669	9±1	10	10	1.58	0.00314	1
2402	8DPSK	9.246	9±1	10	10	1.58	0.00314	1
2441		8.598	9±1	10	10	1.58	0.00314	1
2480		9.875	9±1	10	10	1.58	0.00314	1
2402	BLE(GFSK)-1M	8.337	9±1	10	10	1.58	0.00314	1
2440		9.017	9±1	10	10	1.58	0.00314	1
2480		9.75	9±1	10	10	1.58	0.00314	1
2402	BLE(GFSK)-2M	8.364	9±1	10	10	1.58	0.00314	1
2440		9.058	9±1	10	10	1.58	0.00314	1
2480		9.593	9±1	10	10	1.58	0.00314	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,HT40:2422-2452MHz

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

Antenna Type: PCB antenna

WIFI antenna gain1/2: 2dBi

R=20cm

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

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2/10)}=1.58$

SISO ANT1

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	16.59	16±1	17	50.11872	1.58	0.01575	1
2437		16.12	16±1	17	50.11872	1.58	0.01575	1
2462		16.26	16±1	17	50.11872	1.58	0.01575	1
2412	802.11g	16.53	16±1	17	50.11872	1.58	0.01575	1
2437		16.29	16±1	17	50.11872	1.58	0.01575	1
2462		15.96	16±1	17	50.11872	1.58	0.01575	1
2412	802.11n H20	16.36	16±1	17	50.11872	1.58	0.01575	1
2437		15.94	16±1	17	50.11872	1.58	0.01575	1
2462		15.78	16±1	17	50.11872	1.58	0.01575	1
2422	802.11n H40	16.64	16±1	17	50.11872	1.58	0.01575	1
2437		16.22	16±1	17	50.11872	1.58	0.01575	1
2452		16.29	16±1	17	50.11872	1.58	0.01575	1

SISO ANT2

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	16.82	16±1	17	50.11872	1.58	0.01575	1
2437		15.89	16±1	17	50.11872	1.58	0.01575	1
2462		15.35	16±1	17	50.11872	1.58	0.01575	1
2412	802.11g	16.8	16±1	17	50.11872	1.58	0.01575	1
2437		16.05	16±1	17	50.11872	1.58	0.01575	1
2462		15.53	16±1	17	50.11872	1.58	0.01575	1
2412	802.11n H20	15.5	16±1	17	50.11872	1.58	0.01575	1
2437		16.04	16±1	17	50.11872	1.58	0.01575	1
2462		15.39	16±1	17	50.11872	1.58	0.01575	1
2422	802.11n H40	15.89	15±1	16	39.81072	1.58	0.01251	1
2437		15.42	15±1	16	39.81072	1.58	0.01251	1
2452		15.09	15±1	16	39.81072	1.58	0.01251	1

5G WIFI:

Operation Frequency: WIFI 802.11a/ac/n(HT20): 5180-5240MHz;5745-5825MHz;WIFI 802.11ac/n(HT40): 5190-5230MHz;5755-5795MHz; WIFI 802.11ac80:5210-5210MHz; 5775-5775MHz

Power density limited: 1mW/cm

Antenna Type: PCB antenna

WIFI antenna1/2 gain:2dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(2/10)}=1.58$

5.2G

SISO ANT1

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		
5180	802.11a	14.4	14±1	15	31.62	1.58	0.00994	1
5200		14.26	14±1	15	31.62	1.58	0.00994	1
5240		14.11	14±1	15	31.62	1.58	0.00994	1
5180	802.11n 20	14.49	14±1	15	31.62	1.58	0.00994	1
5200		14.3	14±1	15	31.62	1.58	0.00994	1
5240		14.09	14±1	15	31.62	1.58	0.00994	1
5190	802.11n 40	14.28	14±1	15	31.62	1.58	0.00994	1
5230		14.16	14±1	15	31.62	1.58	0.00994	1
5180		802.11ac 20	14.03	14±1	15	31.62	1.58	0.00994
5200	14.26		14±1	15	31.62	1.58	0.00994	1
5240	14.1		14±1	15	31.62	1.58	0.00994	1
5190	802.11ac 40	14.1	14±1	15	31.62	1.58	0.00994	1
5230		14.23	14±1	15	31.62	1.58	0.00994	1
5210	802.11ac 80	13.05	13±1	14	25.11886	1.58	0.00790	1

SISO ANT2

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna Gain Numeric	Evaluation result at 20cm Power density(mW/cm2)	Power density Limits (mW/cm2)
				tune-up power				
				(dBm)	(mW)			
5180	802.11a	14.66	14±1	15	31.62	1.58	0.00994	1
5200		14.32	14±1	15	31.62	1.58	0.00994	1
5240		14.5	14±1	15	31.62	1.58	0.00994	1
5180	802.11n 20	14.43	14±1	15	31.62	1.58	0.00994	1
5200		14.21	14±1	15	31.62	1.58	0.00994	1
5240		14.2	14±1	15	31.62	1.58	0.00994	1
5190	802.11n 40	14.28	14±1	15	31.62	1.58	0.00994	1
5230		14.61	14±1	15	31.62	1.58	0.00994	1
5180	802.11ac 20	14.43	14±1	15	31.62	1.58	0.00994	1
5200		14.1	14±1	15	31.62	1.58	0.00994	1
5240		14.1	14±1	15	31.62	1.58	0.00994	1
5190	802.11ac 40	14.36	14±1	15	31.62	1.58	0.00994	1
5230		14.69	14±1	15	31.62	1.58	0.00994	1
5210	802.11ac 80	14.37	14±1	15	31.62278	1.58	0.00994	1

5.3G SISO ANT1

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna Gain Numeric	Evaluation result at 20cm Power density(mW/cm2)	Power density Limits (mW/cm2)
				tune-up power				
				(dBm)	(mW)			
5260	802.11a	14.37	14±1	15	31.62	1.58	0.00994	1
5280		14.53	14±1	15	31.62	1.58	0.00994	1
5320		14.15	14±1	15	31.62	1.58	0.00994	1
5260	802.11n 20	14.52	14±1	15	31.62	1.58	0.00994	1
5280		14.52	14±1	15	31.62	1.58	0.00994	1
5320		14.07	14±1	15	31.62	1.58	0.00994	1
5270	802.11n 40	14.51	14±1	15	31.62	1.58	0.00994	1
5310		14.56	14±1	15	31.62	1.58	0.00994	1
5260	802.11ac 20	14.53	14±1	15	31.62	1.58	0.00994	1
5280		14.42	14±1	15	31.62	1.58	0.00994	1
5320		14.06	14±1	15	31.62	1.58	0.00994	1
5270	802.11ac 40	14.48	14±1	15	31.62	1.58	0.00994	1
5310		14.6	14±1	15	31.62	1.58	0.00994	1
5290	802.11ac 80	14.2	14±1	15	31.62278	1.58	0.00994	1

SISO ANT2

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		
5260	802.11a	14.58	14±1	15	31.62	1.58	0.00994	1
5280		14.62	14±1	15	31.62	1.58	0.00994	1
5320		14.02	14±1	15	31.62	1.58	0.00994	1
5260	802.11n 20	14.6	14±1	15	31.62	1.58	0.00994	1
5280		14.69	14±1	15	31.62	1.58	0.00994	1
5320		14.11	14±1	15	31.62	1.58	0.00994	1
5270	802.11n 40	14.4	14±1	15	31.62	1.58	0.00994	1
5310		14.08	14±1	15	31.62	1.58	0.00994	1
5260	802.11ac 20	14.12	14±1	15	31.62	1.58	0.00994	1
5280		14.19	14±1	15	31.62	1.58	0.00994	1
5320		14.03	14±1	15	31.62	1.58	0.00994	1
5270	802.11ac 40	14.5	14±1	15	31.62	1.58	0.00994	1
5310	40	14.62	14±1	15	31.62	1.58	0.00994	1
5290	802.11ac 80	13.88	13±1	14	25.11886	1.58	0.00790	1

5.6G

SISO ANT1

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)	Gain		
5500	802.11a	14.22	14±1	15	31.62278	1.58	0.00994	1
5600		14.38	14±1	15	31.62278	1.58	0.00994	1
5700		14.63	14±1	15	31.62278	1.58	0.00994	1
5500	802.11n20	14.04	14±1	15	31.62278	1.58	0.00994	1
5600		14.37	14±1	15	31.62278	1.58	0.00994	1
5700		14.71	14±1	15	31.62278	1.58	0.00994	1
5510	802.11n40	13.67	14±1	15	31.62278	1.58	0.00994	1
5590		14.29	14±1	15	31.62278	1.58	0.00994	1
5670		14.27	14±1	15	31.62278	1.58	0.00994	1
5500	802.11ac 20	14.17	14±1	15	31.62278	1.58	0.00994	1
5600		14.27	14±1	15	31.62278	1.58	0.00994	1
5700		14.63	14±1	15	31.62278	1.58	0.00994	1
5510	802.11ac 40	14.14	14±1	15	31.62278	1.58	0.00994	1
5590		14.68	14±1	15	31.62278	1.58	0.00994	1
5670		14.56	14±1	15	31.62278	1.58	0.00994	1
5530	802.11ac 80	13.17	14±1	15	31.62278	1.58	0.00994	1
5610	80	14.14	14±1	15	31.62278	1.58	0.00994	1

SISO ANT2

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)	Gain		
5500	802.11a	14.24	14±1	15	31.62278	1.58	0.00994	1
5600		14.3	14±1	15	31.62278	1.58	0.00994	1
5700		14.3	14±1	15	31.62278	1.58	0.00994	1
5500	802.11n20	14.22	14±1	15	31.62278	1.58	0.00994	1
5600		14.26	14±1	15	31.62278	1.58	0.00994	1
5700		14.32	14±1	15	31.62278	1.58	0.00994	1
5510	802.11n40	14.02	14±1	15	31.62278	1.58	0.00994	1
5590		14.26	14±1	15	31.62278	1.58	0.00994	1
5670		14.84	14±1	15	31.62278	1.58	0.00994	1
5500	802.11ac 20	14.27	14±1	15	31.62278	1.58	0.00994	1
5600		14.24	14±1	15	31.62278	1.58	0.00994	1
5700		14.22	14±1	15	31.62278	1.58	0.00994	1
5510	802.11ac 40	14.21	14±1	15	31.62278	1.58	0.00994	1
5590		14.22	14±1	15	31.62278	1.58	0.00994	1
5670		14.81	14±1	15	31.62278	1.58	0.00994	1
5530	802.11ac	13.77	14±1	15	31.62278	1.58	0.00994	1
5610	80	14.25	14±1	15	31.62278	1.58	0.00994	1

5.8G SISO ANT1

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		
5745	802.11a	14.42	14±1	15	31.62	1.58	0.00994	1
5785		14.26	14±1	15	31.62	1.58	0.00994	1
5825		14.35	14±1	15	31.62	1.58	0.00994	1
5745	802.11n20	14.33	14±1	15	31.62	1.58	0.00994	1
5785		14.27	14±1	15	31.62	1.58	0.00994	1
5825		14.21	14±1	15	31.62	1.58	0.00994	1
5755	802.11n40	14.3	14±1	15	31.62	1.58	0.00994	1
5795		14.14	14±1	15	31.62	1.58	0.00994	1
5745	802.11ac 20	14.33	14±1	15	31.62	1.58	0.00994	1
5785		14.17	14±1	15	31.62	1.58	0.00994	1
5825		14.3	14±1	15	31.62	1.58	0.00994	1
5755	802.11ac	14.29	14±1	15	31.62	1.58	0.00994	1
5795	40	14.23	14±1	15	31.62	1.58	0.00994	1
5775	802.11ac 80	13.97	13±1	14	25.12	1.58	0.00790	1

SISO ANT2

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		
5745	802.11a	14.37	14±1	15	31.62	1.58	0.00994	1
5785		14.73	14±1	15	31.62	1.58	0.00994	1
5825		14.51	14±1	15	31.62	1.58	0.00994	1
5745	802.11n20	14.27	14±1	15	31.62	1.58	0.00994	1
5785		14.7	14±1	15	31.62	1.58	0.00994	1
5825		14.48	14±1	15	31.62	1.58	0.00994	1
5755	802.11n40	14.76	14±1	15	31.62	1.58	0.00994	1
5795		14.53	14±1	15	31.62	1.58	0.00994	1
5745	802.11ac 20	14.38	14±1	15	31.62	1.58	0.00994	1
5785		14.79	14±1	15	31.62	1.58	0.00994	1
5825		14.5	14±1	15	31.62	1.58	0.00994	1
5755	802.11ac 40	14.79	14±1	15	31.62	1.58	0.00994	1
5795		14.54	14±1	15	31.62	1.58	0.00994	1
5775	802.11ac 80	14.69	14±1	15	31.62	1.58	0.00994	1

WLAN2.4G MIMO

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
Ant 1	16.64	2	18.64	73.11	20	0.014545	1	0.026873	Pass
Ant 2	15.89	2	17.89	61.52	20	0.012238	1		

WLAN5G MIMO

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
Ant 1	12.27	2	14.27	26.73	20	0.005318	1	0.009601	Pass
Ant 2	11.33	2	13.33	21.53	20	0.004283	1		

Conclusion:

The conclusion should be $0.01575 < 1$ for Max Power Density, Compliance the RF Exposure requirement.

The 2.4Gwifi has the maximum Power Density value 0.026873 mW/cm² in 2.4G MIMO transmitting mode;

The 5Gwifi has the maximum Power Density value 0.009601 mW/cm² in 5G MIMO transmitting mode;

Signature:

Date: 2023-03-30



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.