

FCC ID: 2AU5UYC-112P

RF EXPOSURE EVALUATION

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

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

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

Operation Frequency: EDR: 2402MHz~2480MHz;
 BLE: 2402MHz~2480MHz;
 2.4GWIFI 802.11b/g/n HT20: 2412-2462MHz,
 5.2G WIFI 802.11a/n(HT20)/ac20 5180-5240MHz, 5190-5230MHz for
 802.11n(HT40)/ac40, 5210MHz for 802.11 ac80;
 5.8G WIFI 5745-5825 MHz for 802.11a/n(HT20)/ac20, 5755-5795
 MHz for 802.11a/n(HT40)/ac40, 5775MHz for 802.11 ac80;

Power density limited: 1mW/ cm²

Antenna Type: FPCB Antenna

Antenna gain: 2dBi,

R=20cm

EDR:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	2.099	2±1	3	1.995	2.00	1.58	0.0006	1
2441		2.495	2±1	3	1.995	2.00	1.58	0.0006	1
2480		2.95	2±1	3	1.995	2.00	1.58	0.0006	1
2402	π/4-DQPSK	2.296	2±1	3	1.995	2.00	1.58	0.0006	1
2441		2.605	2±1	3	1.995	2.00	1.58	0.0006	1
2480		2.782	2±1	3	1.995	2.00	1.58	0.0006	1
2402	8DPSK	2.223	2±1	3	1.995	2.00	1.58	0.0006	1
2441		2.586	2±1	3	1.995	2.00	1.58	0.0006	1
2480		2.974	2±1	3	1.995	2.00	1.58	0.0006	1

BLE:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	2.54	2±1	3	1.995	2.00	1.58	0.0006	1
2440		2.6921	2±1	3	1.995	2.00	1.58	0.0006	1
2480		2.9006	2±1	3	1.995	2.00	1.58	0.0006	1

2.4G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)
2412	802.11b	12.95	12.1±1	13.1	20.417	2.00	1.58	0.0064	1
2437		12.87	12.1±1	13.1	20.417	2.00	1.58	0.0064	1
2462		13.09	12.1±1	13.1	20.417	2.00	1.58	0.0064	1
2412	802.11g	12.36	12±1	13	19.953	2.00	1.58	0.0063	1
2437		12.17	12±1	13	19.953	2.00	1.58	0.0063	1
2462		12.48	12±1	13	19.953	2.00	1.58	0.0063	1
2412	802.11n H20	11.96	11±1	12	15.849	2.00	1.58	0.0050	1
2437		12	11±1	12	15.849	2.00	1.58	0.0050	1
2462		12	11±1	12	15.849	2.00	1.58	0.0050	1

5.2G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
5180	802.11a	7.75	7±1	8	6.310	2.00	1.58	0.0020	1
5200		7.99	7±1	8	6.310	2.00	1.58	0.0020	1
5240		7.86	7±1	8	6.310	2.00	1.58	0.0020	1
5180	802.11 n20	7.46	7±1	8	6.310	2.00	1.58	0.0020	1
5200		7.89	7±1	8	6.310	2.00	1.58	0.0020	1
5240		7.82	7±1	8	6.310	2.00	1.58	0.0020	1
5190	802.11 n40	7.37	7±1	8	6.310	2.00	1.58	0.0020	1
5230		7.56	7±1	8	6.310	2.00	1.58	0.0020	1
5180	802.11 ac20	7.37	7±1	8	6.310	2.00	1.58	0.0020	1
5200		7.81	7±1	8	6.310	2.00	1.58	0.0020	1
5240		7.74	7±1	8	6.310	2.00	1.58	0.0020	1
5190	802.11 ac40	7.49	7±1	8	6.310	2.00	1.58	0.0020	1
5230		7.62	7±1	8	6.310	2.00	1.58	0.0020	1
5210	802.11 ac80	7.15	7±1	8	6.310	2.00	1.58	0.0020	1

5.8G WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
5745	802.11a	10.4	10±1	11	12.589	2.00	1.58	0.0040	1
5785		10.62	10±1	11	12.589	2.00	1.58	0.0040	1
5825		10.85	10±1	11	12.589	2.00	1.58	0.0040	1
5745	802.11 n20	10.08	10±1	11	12.589	2.00	1.58	0.0040	1
5785		10.28	10±1	11	12.589	2.00	1.58	0.0040	1
5825		10.49	10±1	11	12.589	2.00	1.58	0.0040	1
5755	802.11 n40	10.02	10±1	11	12.589	2.00	1.58	0.0040	1
5795		10.22	10±1	11	12.589	2.00	1.58	0.0040	1
5745	802.11 ac20	10.03	10±1	11	12.589	2.00	1.58	0.0040	1
5785		10.11	10±1	11	12.589	2.00	1.58	0.0040	1
5825		10.5	10±1	11	12.589	2.00	1.58	0.0040	1
5755	802.11 ac40	10.04	10±1	11	12.589	2.00	1.58	0.0040	1
5795		10.21	10±1	11	12.589	2.00	1.58	0.0040	1
5775	802.11 ac80	9.62	10±1	11	12.589	2.00	1.58	0.0040	1

Conclusion:

For the max result : $0.0064 \leq 1.0$, compliance with FCC's RF Exposure.

Touch screen:

According to §15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to KDB447498 D01 General RF Exposure Guidance V06

The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

BT3.0

Modulation	Channel Freq. (GHz)	Conduct ed power (dBm)	Conducte d power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculatio n	SAR Exclusion threshold	SAR test exclusion
GFSK	2.402	2.099	1.62	2±1	3	2.00	<5	0.61847	3.00	YES
	2.441	2.495	1.78	2±1	3	2.00	<5	0.62347	3.00	YES
	2.480	2.95	1.97	2±1	3	2.00	<5	0.62843	3.00	YES
$\pi/4$ -DQPSK	2.402	2.296	1.70	2±1	3	2.00	<5	0.61847	3.00	YES
	2.441	2.605	1.82	2±1	3	2.00	<5	0.62347	3.00	YES
	2.480	2.782	1.90	2±1	3	2.00	<5	0.62843	3.00	YES
8-DPSK	2.402	2.223	1.67	2±1	3	2.00	<5	0.61847	3.00	YES
	2.441	2.586	1.81	2±1	3	2.00	<5	0.62347	3.00	YES
	2.480	2.974	1.98	2±1	3	2.00	<5	0.62843	3.00	YES

BLE

Modulation	Channel Freq. (GHz)	Conduct ed power (dBm)	Conducte d power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculatio n	SAR Exclusion threshold	SAR test exclusion
GFSK	2.402	2.54	1.79	2±1	3	2.00	<5	0.61847	3.00	YES
	2.440	2.692	1.86	2±1	3	2.00	<5	0.62334	3.00	YES
	2.480	2.901	1.95	2±1	3	2.00	<5	0.62843	3.00	YES

WIFI2.4G

Modulation	Channel Freq. (GHz)	Conduct ed power (dBm)	Conducte d power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculatio n	1g SAR Exclusion threshold	SAR test exclusion
802.11b	2.412	12.95	19.724	12±1	13	19.953	<5	6.19753	7.50	YES
	2.437	12.87	19.364	12±1	13	19.953	<5	6.22957	7.50	YES
	2.462	13.09	20.370	12±1	13	19.953	<5	6.26144	7.50	YES
802.11g	2.412	12.36	17.219	12±1	13	19.953	<5	6.19753	7.50	YES
	2.437	12.17	16.482	12±1	13	19.953	<5	6.22957	7.50	YES
	2.462	12.48	17.701	12±1	13	19.953	<5	6.26144	7.50	YES
802.11n HT20	2.412	11.96	15.704	11±1	12	15.849	<5	4.92287	7.50	YES
	2.437	12	15.849	11±1	12	15.849	<5	4.94832	7.50	YES
	2.462	12	15.849	11±1	12	15.849	<5	4.97364	7.50	YES

WIFI5.2G

Modulation	Channel Freq. (GHz)	Conduct ed power (dBm)	Conducte d power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculation	1g SAR Exclusion threshold	SAR test exclusion
802.11a	5.18	7.75	5.957	7±1	8	6.310	<5	2.87207	3.00	YES
	5.2	7.99	6.295	7±1	8	6.310	<5	2.87761	3.00	YES
	5.24	7.86	6.109	7±1	8	6.310	<5	2.88865	3.00	YES
802.11 n20	5.18	7.46	5.572	7±1	8	6.310	<5	2.87207	3.00	YES
	5.2	7.89	6.152	7±1	8	6.310	<5	2.87761	3.00	YES
	5.24	7.82	6.053	7±1	8	6.310	<5	2.88865	3.00	YES
802.11 n40	5.19	7.37	5.458	7±1	8	6.310	<5	2.87484	3.00	YES
	5.23	7.56	5.702	7±1	8	6.310	<5	2.88590	3.00	YES
802.11 ac20	5.18	7.37	5.458	7±1	8	6.310	<5	2.87207	3.00	YES
	5.2	7.81	6.039	7±1	8	6.310	<5	2.87761	3.00	YES
	5.24	7.74	5.943	7±1	8	6.310	<5	2.88865	3.00	YES
802.11 ac40	5.19	7.49	5.610	7±1	8	6.310	<5	2.87484	3.00	YES
	5.23	7.62	5.781	7±1	8	6.310	<5	2.88590	3.00	YES
802.11 ac80	5.21	7.15	5.188	7±1	8	6.310	<5	2.88037	3.00	YES

WIFI5.8G

Modulation	Channel Freq. (GHz)	Conduct ed power (dBm)	Conducte d power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculation	1g SAR Exclusion threshold	SAR test exclusion
802.11a	5.745	10.4	10.965	10±1	11	12.589	<5	6.03497	7.50	YES
	5.785	10.62	11.535	10±1	11	12.589	<5	6.05594	7.50	YES
	5.825	10.85	12.162	10±1	11	12.589	<5	6.07684	7.50	YES
802.11 n20	5.745	10.08	10.186	10±1	11	12.589	<5	6.03497	7.50	YES
	5.785	10.28	10.666	10±1	11	12.589	<5	6.05594	7.50	YES
	5.825	10.49	11.194	10±1	11	12.589	<5	6.07684	7.50	YES
802.11 n40	5.755	10.02	10.046	10±1	11	12.589	<5	6.04022	7.50	YES
	5.795	10.22	10.520	10±1	11	12.589	<5	6.06117	7.50	YES
802.11 ac20	5.745	10.03	10.069	10±1	11	12.589	<5	6.03497	7.50	YES
	5.785	10.11	10.257	10±1	11	12.589	<5	6.05594	7.50	YES
	5.825	10.5	11.220	10±1	11	12.589	<5	6.07684	7.50	YES
802.11 ac40	5.755	10.04	10.093	10±1	11	12.589	<5	6.04022	7.50	YES
	5.795	10.21	10.495	10±1	11	12.589	<5	6.06117	7.50	YES
802.11 ac80	5.775	9.62	9.162	10±1	11	12.589	<5	6.05071	7.50	YES

Conclusion:

For the max result : $6.26144 \leq 7.5$ for 10-g SAR, No SAR is required.

Signature:

Date: 2019-11-20



NAME AND TITLE (Please print or type): Fairy shi/Manager

COMPANY (Please print or type): Sunworld Technology Limited/ Floor 2, 14th, Wuhe Central Road, Bantian Street, Longgang District, Shenzhen, Guangdong, China