RF Exposure evaluation

FCC ID:	2A4GN-N6
Product Description:	Projector
Model/Type reference:	N5
Power supply:	Input:100-240V~, 50/60Hz, 1.2A
Hardware version:	2800-A92637
Software version:	V5.02.28-110447
Applicant:	Shenzhen Ruiying Electronic Co., Ltd
Address:	R401, Building 3, TangweiFuyuan Industrial, Fengtang Road, Fuhai Street,Baoan District ShenzhenCity,Guangdong China

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

1. Reference

According to §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 §1.1310 and §2.1091 RF exposure is calculated.

KDB 447498 D01v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)

Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	$(180/f^2)$*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4. Antenna Information

N5 can only use antennas certificated as follows provided by manufacturer;

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
BT	/	FPC Antenna	4.01 dBi for 2400-2500MHz;	
2.4GWIFI	/	FPC Antenna	4.01 dBi for 2400-2500MHz for ANT 1&2	
5GWIFI	/	FPC Antenna	3.4 dBi for 5000-6000MHz for ANT 1&2	

5. Conducted Power

[BT]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	-0.2
	39	2441	0.2
	78	2480	0.37
π/4DQPSK	0	2402	-0.81
	39	2441	-0.42
	78	2480	-0.26
8DPSK	0	2402	-0.84
	19	2441	-0.45
	39	2480	-0.27

[BLE]

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
BLE 1M	0	2402	0.5
	19	2440	0.27
	39	2480	-0.57
BLE 2M	0	2402	0.35
	19	2440	0.09
	39	2480	-0.78

[2.4G WIFI]

Mode	Channel	Frequency (MHz)	Ant 1 Max Conducted Power(dBm)	Ant 2 Max Conducted Power(dBm)
11B	1	2412	14.65	15.03
	6	2437	14.74	13.94
	11	2462	15.01	14.41
11G	1	2412	14.8	13.9
	6	2437	13.83	14.07
	11	2462	14.15	14.41
11N20 SISO	1	2412	13.02	13.17
	6	2437	13.26	13.39
	11	2462	13.22	13.28
11N40 SISO	3	2422	13.27	13.66
	6	2437	13.47	13.81
	9	2452	13.05	13.47
11AX20 SISO	1	2412	13.8	13.97
	6	2437	13.8	13.92
	11	2462	13.08	13.42
11AX40 SISO	3	2422	13.32	13.48
	6	2437	13.15	13.36
	9	2452	13.96	13.86

[5.2G WIFI]

Mode	Channel	Frequency (MHz)	Ant 1 Max Conducted Power(dBm)	Ant 2 Max Conducted Power(dBm)
11A	36	5180	11.81	12.07
	40	5200	11.96	11.75
	48	5240	11.87	12
11N20 SISO	36	5180	11.51	11.39
	40	5200	11.3	11.15
	48	5240	11.41	11.31
11N40 SISO	38	5190	10.27	10.16
	46	5230	10.67	10.41
11AC20 SISO	36	5180	11.44	11.5
	40	5200	11.16	11.19
	48	5240	11.3	11.39
11AC40 SISO	38	5190	10.28	10.21
	46	5230	10.47	10.46
11AX20 SISO	36	5180	11.42	11.5
	40	5200	11.12	11.21
	48	5240	11.3	11.28
11AX40 SISO	38	5190	11.16	10.25
	46	5230	10.29	10.3

[5.3G WIFI]

Mode	Channel	Frequency (MHz)	Ant 1 Max Conducted Power(dBm)	Ant 2 Max Conducted Power(dBm)
IEEE 802.11a	52	5260	12.56	12.38
	60	5280	12.65	12.53
	64	5320	12.96	12.9
11N20 SISO	52	5260	11.73	11.72
	60	5280	11	10.91
	64	5320	11.29	11.24
11N40 SISO	54	5270	10.38	10.33
	62	5310	11.07	11.12
11AC20 SISO	52	5260	11.72	11.63
	60	5280	10.95	10.9
	64	5320	11.32	11.26
11AC40 SISO	54	5270	10.37	10.37
	62	5310	11.16	11.19
11AX20 SISO	52	5260	11.59	11.51
	60	5280	10.91	10.97
	64	5320	11.21	11.25
11AX40 SISO	54	5270	10.26	10.39
	62	5310	11.13	11.25

[5.5G WIFI]

Mode	Channel	Frequency (MHz)	Ant 1 Max Conducted Power(dBm)	Ant 2 Max Conducted Power(dBm)
11A	100	5500	12.81	12.63
	116	5580	12.8	12.64
	140	5700	13.09	12.87
11N20 SISO	100	5500	11.16	11.98
	116	5580	11.33	10.91
	140	5700	11.5	11.2
11N40 SISO	102	5510	10.57	10.67
	110	5550	11.3	11.2
	134	5670	10.83	11.23
11AC20 SISO	100	5500	11.2	11.92
	116	5580	11.42	10.98
	140	5700	12.3	11.35
11AC40 SISO	102	5510	10.49	10.37
	110	5550	11.34	10.96
	134	5670	11.26	10.82
11AX20 SISO	100	5500	11.14	11.98
	116	5580	11.97	11.92
	140	5700	12.32	11.3
11AX40 SISO	102	5510	10.66	10.33
	110	5550	11.37	11.09
	134	5670	11.3	10.88

[5.8G WIFI]

Mode	Channel	Frequency (MHz)	Ant 1 Max Conducted Power(dBm)	Ant 2 Max Conducted Power(dBm)
11A	149	5745	12.32	11.68
	157	5785	11.55	12.06
	165	5825	11.66	12.21
11N20 SISO	149	5745	11.56	11.01
	157	5785	11.79	10.59
	165	5825	11.94	11.54
11N40 SISO	151	5755	10.78	10.27
	159	5795	10.26	10.53
11AC20 SISO	149	5745	11.62	11.04
	157	5785	11.08	10.65
	165	5825	11.65	11.36
11AC40 SISO	151	5755	10.81	10.32
	159	5795	10.28	10.59
11AX20 SISO	149	5745	11.55	11.0
	157	5785	11.51	10.62
	165	5825	11.65	11.27
11AX40 SISO	151	5755	10.86	10.34
	159	5795	10.19	10.54

6. Manufacturing Tolerance

Mode	Max. Peak Conducted Output Power (dBm)		Max. tune-up	
BT	0.37		0.0±1	
BLE	0.5		0.0±1	
Mode	Max. Peak Conducted Output Power (dBm)		Max. tune-up	
	Antenna1	Antenna2	Antenna1	Antenna2
2.4GWIFI	15.01	15.03	15.0±1	15.0±1

Mode	Max. Average Conducted Output Power (dBm)		Max. tune-up	
	Antenna1	Antenna2	Antenna1	Antenna2
5.2GWIFI	11.96	12.07	12.0±1	13.0±1
5.3GWIFI	12.96	12.9	13.0±1	13.0±1
5.5GWIFI	13.09	12.87	14.0±1	13.0±1
5.8GWIFI	12.32	12.21	13.0±1	13.0±1

7. Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna is refer to section 4, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
BT	1.0	1.2589	4.01	2.5177	0.0006	1.0000
BLE	1.0	1.2589	4.01	2.5177	0.0006	1.0000
2.4GWIFI ANT1	16.0	39.8107	4.01	2.5177	0.0200	1.0000
5.2GWIFI ANT1	13.0	19.9526	3.4	2.1878	0.0087	1.0000
5.3GWIFI ANT1	14.0	25.1189	3.4	2.1878	0.0109	1.0000
5.5GWIFI ANT1	15.0	31.6228	3.4	2.1878	0.0138	1.0000
5.8GWIFI ANT1	14.0	25.1189	3.4	2.1878	0.0109	1.0000

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
2.4GWIFI ANT2	16.0	39.8107	4.01	2.5177	0.0200	1.0000
5.2GWIFI ANT2	14.0	25.1189	3.4	2.1878	0.0109	1.0000
5.3GWIFI ANT2	14.0	25.1189	3.4	2.1878	0.0109	1.0000
5.5GWIFI ANT2	14.0	25.1189	3.4	2.1878	0.0109	1.0000
5.8GWIFI ANT2	14.0	25.1189	3.4	2.1878	0.0109	1.0000

Remark:

1. Output power including turn-up tolerance;

2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

8. simultaneous MPE Result

2.4GWIFI ANT1 MPE (Ratio)	2.4GWIFI ANT2 MPE (Ratio)	simultaneous MPE (Ratio)	MPE Limits (Ratio)
0.02	0.02	0.04	1.0000

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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