Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640
Fax: +86-755-26648637
Website: www.cqa-cert.com

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RF Exposure Evaluation Report

Report No.:	CQASZ20210100004EX-03
Applicant:	SHENZHEN AOME CO.,LTD
Address of Applicant:	Room301 workshop, Xinfeng Building, Yangguang Community, Xili subdustreet, Nanshan District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Projector
Model No.:	S350, S280, RODPJS450, RODPJS400
Test Model No.:	S350
Brand Name:	N/A
FCC ID:	2ARL5-S350RN
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2021-1-12
Date of Test:	2021-1-12 to 2021-1-29
Date of Issue:	2021-3-1
Test Result:	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: Jun Li

(Jun Li)

Reviewed By: Ares Liu

(Ares Liu)

Approved By: Sheek.Luo

(Sheek Luo)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20210100004EX-03	Rev.01	Initial report	2021-3-1

2 Contents

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3 General Information

3.1 Client Information

Applicant:	SHENZHEN AOME CO.,LTD
Address of Applicant:	Room301 workshop, Xinfeng Building, Yangguang Community, Xili subdustreet, Nanshan District, Shenzhen, China
Manufacturer:	SHENZHEN AOME CO.,LTD
Address of Manufacturer:	Room301 workshop, Xinfeng Building, Yangguang Community, Xili subdustreet, Nanshan District, Shenzhen, China

3.2 General Description of EUT

Product Name:	Projector
Model No.:	S350, S280, RODPJS450, RODPJS400
Test Model No.:	S350
Trade Mark:	N/A
Hardware Version:	1V1
Software Version:	V2.5.8
EUT Power Supply:	120V 60Hz

3.3 General Description of BT Classic

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Transfer Rate:	1Mbps/2Mbps/3Mbps
Hopping Channel Type:	Adaptive Frequency Hopping systems
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Antenna Type:	PCB antenna
Antenna Gain:	0dBi
EUT Power Supply:	DC 11.1V from battery

3.4 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422 MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n(HT40): 7 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11 g/n(HT20)/n(HT40) : OFDM
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type:	IPEX Antenna
Antenna Gain:	ANT1: 2dBi
	ANT2: 2dBi
	MIMO: 5.01dBi
EUT Power Supply:	DC 3.7V from battery
Adapter Information:	MODEL: FJ-SW1501500N INPUT:100-240 50/60Hz 0.6A Max OUTPUT:15V 1500mA

Note:

Model No.: S350, S280, RODPJS450, RODPJS400

Only the model S350 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limitst

According to FCC Part1.1310: 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 part1.1307(b)

TABLE 1—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 Exposures				
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
(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
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4* Pi * R^2)

Where

Pd = power density in mW/cm2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure

1) For BT Classic

Antenna Gain: 0 dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.0 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.195	1.0±1	2	1.585
Middle(2441MHz)	2.532	1.5±1	2.5	1.778
Highest(2480MHz)	2.597	1.5±1	2.5	1.778
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.947	2.0±1	3.0	1.995
Middle(2441MHz)	3.277	2.5±1	3.5	2.239
Highest(2480MHz)	3.289	2.5±1	3.5	2.239
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	2.912	2.0±1	3.0	1.995
Middle(2441MHz)	3.263	2.5±1	3.5	2.239
Highest(2480MHz)	3.311	2.5±1	3.5	2.239

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
2.239	0	0.00045	1.0	PASS

Note: 1) Refer to report No. CQASZ20210100004EX-01 for EUT test Max Conducted Peak Output Power value.

2) Pd = (Pout*G)/(4* Pi * R2)=(2.239*1.0)/(4*3.1416*202)=0.00045

3) EUT's Bluetooth module is more than 20cm away from the human body.

2) For 2.4G WIFI

Antenna Gain: Antenna 1: 2 dBi, Antenna 2: 2 dBi, MIMO: 5.01dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 and 3.17 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	14.76	14±1.0	15	31.623
2412	Ant2	15.88	15±1.0	16	39.811
2437	Ant1	15.14	14±1.0	15	31.623
2437	Ant2	16.78	16±1.0	17	50.119
2462	Ant1	15.47	14.5±1.0	15.5	35.481
3462	Ant2	15.31	14.5±1.0	15.5	35.481
802.11g mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	11.68	11±1.0	12	15.849
2412	Ant2	12.25	11.5±1.0	12.5	17.783
2437	Ant1	11.65	11±1.0	12	15.849
2437	Ant2	13.05	12±1.0	13	19.953
2462	Ant1	12.61	12±1.0	13	19.953
3462	Ant2	14.15	13±1.0	14	25.119
802.11n(HT20) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	10.18	9±1.0	10	10
2412	Ant2	11.05	10±1.0	11	12.589
2437	Ant1	10.96	10±1.0	11	12.589
2437	Ant2	11.50	10.5±1.0	11.5	14.125
2462	Ant1	11.06	10±1.0	11	12.589
3462	Ant2	12.55	11.5±1.0	12.5	17.783

802.11n(HT40) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2422	Ant1	9.54	9±1.0	10	10
2422	Ant2	10.83	10±1.0	11	12.589
2437	Ant1	9.58	9±1.0	10	10
2437	Ant2	11.15	10±1.0	11	12.589
2452	Ant1	10.30	9±1.0	10	10
2452	Ant2	11.73	11±1.0	12	15.849

802.11n(HT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1+2	13.647	13±1.0	14	25.119
2437	Ant1+2	14.249	13.5±1.0	14.5	28.184
2462	Ant1+2	14.879	14±1.0	15	31.623
802.11n(HT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2422	Ant1+2	13.243	12.5±1.0	13.5	22.387
2437	Ant1+2	13.446	12.5±1.0	13.5	22.387
2452	Ant1+2	14.084	13±1.0	14	25.119

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
50.119	2	0.0158	1.0	PASS

Note: 1) Refer to report No. CQASZ20210100004EX-02 for EUT test Max Conducted average Output Power value.

2) Pd = (Pout*G)/(4* Pi * R^2)=(50.119*1.58)/(4*3.1416*20^2)=0.0158