SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

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RF MPE REPORT

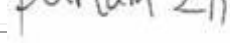
Application No.:	SHEM1804002467CR
Applicant:	iRay Technology Co. Ltd.
FCC ID:	2ACHK-01070189
Equipment Under Test (EUT): **NOTE:** The following sample(s) was/were submitted and identified by the client as	
Product Name:	WiFi Module
Model No.(EUT):	WIFI-2-V897EA1
Standards:	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06
Date of Receipt:	2018-04-04
Date of Test:	2018-04-04 to 2018-06-21
Date of Issue:	2018-07-20
Test Result:	**Pass***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Parlam Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2018-07-20	/

Authorized for issue by:				
				
		Vincent Zhu / Project Engineer		
				
		Parlam Zhan /Reviewer		

2 Contents

3 General Information

3.1 Client Information

Applicant:	iRay Technology Co. Ltd.
Address of Applicant:	RM 202, Building 7, No. 590, Ruiqing RD., Pudong, Shanghai, China
Manufacturer:	iRay Technology Co. Ltd.
Address of Manufacturer:	RM 202, Building 7, No. 590, Ruiqing RD., Pudong, Shanghai, China
Factory:	iRay Technology Co. Ltd.
Address of Factory:	RM 202, Building 7, No. 590, Ruiqing RD., Pudong, Shanghai, China

3.1 General Description of E.U.T.

Power supply:	DC 3.3V
Test voltage:	DC 3.3V

3.2 Technical Specifications

2.4GHz WiFi:

Antenna Gain	Antenna 0: 1.8dBi, Antenna 1: 2.4dBi
Antenna Type	Connector Antenna
Channel Spacing	5MHz
Modulation Type	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n(HT20 and HT40):
Number of Channels	802.11b/g/n(HT20):11 802.11n(HT40):7
Operation Frequency	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz

5GHz WiFi:

Antenna Gain	Antenna 0: 6dBi, Antenna 1: 6dBi
Antenna Type	Connector Antenna
Operation Frequency:	802.11a/n(HT20)/ac(HT20): 5180-5240MHz, 5745MHz-5825MHz 802.11n(HT40)/ac(HT40): 5190-5230MHz, 5755MHz-5795MHz
Modulation Technique:	OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK) Remark: 256QAM for 802.11 ac only
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-15 802.11ac: MCS0-9
Number of Channel:	802.11 a/n(HT20)/ac(HT20): 9 Channel 36, 40, 44, 48, 149, 153, 157, 161, 165 802.11 n(HT40)/ac(HT40): 4 Channel 38, 46, 151, 159

3.3 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China
Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• NVLAP (Certificate No. 201034-0)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program(NVLAP). Certificate No. 201034-0.

• FCC –Designation Number: CN5033

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.
Designation Number: CN5033. Test Firm Registration Number: 479755.

• Industry Canada (IC) – IC Assigned Code: 8617A

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1.

• VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to§1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm^2)	Averaging time(minutes)
300MHz~1.5GHz	f/1500	30
1.5GHz~100GHz	1.0	30

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHEM180400246701-2.4GHz.

Test Mode	Channel	Antenna 0 Power[dBm]	Antenna 1 Power[dBm]	MIMO Power[dBm]	Antenna 0 Power[mW]	Antenna 1 Power[mW]	MIMO Power[mW]
11B	2412	12.37	14.13	N/A	17.26	**25.88**	N/A
11B	2437	11.54	13.94	N/A	14.26	24.77	N/A
11B	2462	11.53	13.5	N/A	14.22	22.39	N/A
11G	2412	11.95	13.3	N/A	15.67	21.38	N/A
11G	2437	10.83	12.17	N/A	12.11	16.48	N/A
11G	2462	10.78	12.32	N/A	11.97	17.06	N/A
11N20SISO	2412	11.97	13.26	15.67	15.74	21.18	**36.90**
11N20SISO	2437	10.87	12.29	14.65	12.22	16.94	29.17
11N20SISO	2462	10.66	12.43	14.64	11.64	17.50	29.11
11N40SISO	2422	11.23	12.65	15.01	13.27	18.41	31.70
11N40SISO	2437	11.11	11.91	14.54	12.91	15.52	28.44
11N40SISO	2452	10.61	11.14	13.89	11.51	13.00	24.49

The Power Data is based on the RF Test Report SHEM180400246702-5GHz.

Test Mode	Test Channel	Antenna 0 Power[dBm]	Antenna 1 Power[dBm]	MIMO Power[dBm]	Antenna 0 Power[mW]	Antenna 1 Power[mW]	MIMO Power[mW]
11A	5180	13.12	12.93	N/A	20.51	19.63	N/A
11A	5220	12.14	12.51	N/A	16.37	17.82	N/A
11A	5240	12.20	12.15	N/A	16.60	16.41	N/A
11A	5745	13.30	12.38	N/A	21.38	17.30	N/A
11A	5785	13.81	12.84	N/A	**24.04**	19.23	N/A
11A	5825	13.71	13.57	N/A	23.50	22.75	N/A
11N20	5180	11.50	13.05	15.35	14.13	20.18	34.28
11N20	5220	10.18	10.77	13.50	10.42	11.94	22.39
11N20	5240	10.63	10.60	13.63	11.56	11.48	23.07
11N20	5745	12.10	11.05	14.62	16.22	12.74	28.97
11N20	5785	12.27	11.24	14.80	16.87	13.30	30.20
11N20	5825	12.04	11.91	14.99	16.00	15.52	31.55
11N40	5190	10.58	10.38	13.49	11.43	10.91	22.34
11N40	5230	10.30	10.17	13.25	10.72	10.40	21.13

11N40	5755	11.98	10.87	14.47	15.78	12.22	27.99
11N40	5795	12.60	11.29	15.00	18.20	13.46	31.62
11AC20	5180	11.62	11.62	14.63	14.52	14.52	29.04
11AC20	5220	10.49	10.84	13.68	11.19	12.13	23.33
11AC20	5240	10.54	10.45	13.51	11.32	11.09	22.44
11AC20	5745	12.24	11.10	14.72	16.75	12.88	29.65
11AC20	5785	12.95	11.37	15.24	19.72	13.71	33.42
11AC20	5825	12.91	11.99	15.48	19.54	15.81	**35.32**
11AC40	5190	10.56	10.29	13.44	11.38	10.69	22.08
11AC40	5230	10.03	10.46	13.26	10.07	11.12	21.18
11AC40	5755	12.14	10.83	14.54	16.37	12.11	28.44
11AC40	5795	12.97	11.35	15.25	19.82	13.65	33.50

5.2 MPE Calculation

For antenna 0:

The best case gain of the antenna is 1.8dBi for 2.4GHz, 6dBi for 5GHz, 1.8dB logarithmic terms convert to numeric result is nearly 1.51; 6dB logarithmic terms convert to numeric result is nearly 3.98.

For antenna 1:

The best case gain of the antenna is 2.4dBi for 2.4GHz, 6dBi for 5GHz, 2.4dB logarithmic terms convert to numeric result is nearly 1.74; 6dB logarithmic terms convert to numeric result is nearly 3.98.

The two antennas completely correlated with each other, so the best case gain of the two antenna in MIMO mode is 5.12dBi for 2.4GHz, 9.01dBi for 5GHz, 5.12dB logarithmic terms convert to numeric result is nearly 3.25; 9.01dB logarithmic terms convert to numeric result is nearly 7.96

For 2.4GHz WiFi:

The Max Conducted average Output Power is 14.13dBm (25.88 mW) of antenna 1;

The Max Conducted average Output Power in MIMO mode is 15.67dBm (36.90 mW);

For 5GHz WiFi:

The Max Conducted average Output Power is 13.81dBm (24.04 mW) of antenna 0;

The Max Conducted average Output Power in MIMO mode is 15.48dBm (35.32 mW);

For FCC:

According to the formula $S=\frac{PG}{4R^2\pi}$, we can calculate S which is MPE.

Note:

1) P (Watts) =Power Input to antenna $=10^{\frac{dBm}{10}}$ / 1000
2) G (Antenna gain in numeric) = 10^ (Antenna gain in dBi /10)
3) R = distance to the center of radiation of antenna (in meter) = 20cm
4) MPE limit = 1mW/cm²

For 2.4G WiFi:

$S=\frac{PG}{4R^2\pi}=\frac{25.88\times 1.74}{4\times 400\times 3.14}$ =0.009 mW/cm²

In MIMO mode:

$S=\frac{PG}{4R^2\pi}=\frac{36.90\times 3.25}{4\times 400\times 3.14}$ =0.024 mW/cm²

For 5G WiFi:

S= $\frac{PG}{4R^2\pi}$ = $\frac{24.04\times3.98}{4\times400\times3.14}$ =0.019 mW/cm^2

In MIMO mode:

S= $\frac{PG}{4R^2\pi}$ = $\frac{35.32\times7.96}{4\times400\times3.14}$ =0.056 mW/cm^2

2.4G WiFi and 5G WiFi modules can simultaneous transmitting, so the maximum rate of MPE is $\frac{0.024}{1.0}+\frac{0.056}{1.0}$ =0.08<=1.0. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

--End of the Report--