



1 Cover Page

# RF MPE REPORT

Application No.: SHEM2003001808CR  
 FCC ID: 2AVYF-M1  
 IC: 25954-M1  
 Applicant: Hangzhou Huacheng Network Technology Co.,Ltd.  
 Address of Applicant: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China.  
 Manufacturer: Hangzhou Huacheng Network Technology Co.,Ltd.  
 Address of Manufacturer: No.2930, Nanhuan Road, Binjiang District, Hangzhou, China.  
 Equipment Under Test (EUT):  
 EUT Name: Smart Home Center  
 Model No.: M1  
 Add Model No.: L1, M1S, L1S  
 FCC Rules 47 CFR §2.1091  
 Standard(s) : KDB447498 D01 General RF Exposure Guidance v06  
 RSS-102 Issue 5 (March 2015)  
 Date of Receipt: 2020-03-19  
 Date of Test: 2020-03-23 to 2020-04-10  
 Date of Issue: 2020-05-12

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

*Parlam Zhan*

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.



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**Attention: To check the authenticity of testing /inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com**

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

NO.588 West Jindu Road, Songjiang District, Shanghai, China 201612  
中国·上海·松江区金都西路588号 邮编: 201612

t(86-21) 61915666 f(86-21) 61915678 www.sgs.com.cn  
t(86-21) 61915666 f(86-21) 61915678 e sgs.china@sgs.com



Note:

For FCC Mode No: M1, L1, M1S, L1S

For IC Mode No:M1



Revision Record			
Version	Description	Date	Remark
00	Original	2020-05-12	/

Authorized for issue by:			
			
		<hr/>	
		Micheal Niu / Project Engineer	
			
		<hr/>	
		Parlam Zhan /Reviewer	



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### 3 General Information

#### General Description of E.U.T.

Power supply:	DC12V by Adapter Adapter1: Model: ADS-26FSG-12 12024EPCU INPUT: 100~240V 50/60Hz OUTPUT: DC 12V/2.0A Adapter2: Model: ESUA+24120-2000 INPUT: 100~240V 50/60Hz OUTPUT: DC 12V/2.0A
Serial Number:	6D01EC0PAG00001
Firmware Version:	1.000.0000002.5

#### BT

Antenna Gain:	Antenna 1: 2.68dBi
Antenna Type:	Antenna 1: Dipole Antenna
Bluetooth Version:	V5.0 Dual mode
Channel Spacing:	1MHz
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)

#### BLE

Antenna Gain:	Antenna 1: 2.68dBi
Antenna Type:	Antenna 1: Dipole Antenna
Bluetooth Version:	V5.0 Dual mode
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz

#### 2.4GHz

Antenna Gain:	Antenna 1: 2.68dBi; Antenna 2: 2.76dBi Directional gain: 5.73dBi
Antenna Type:	Antenna 1: Dipole Antenna Antenna 2: Dipole Antenna
Channel Spacing:	5MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz



5GHz

Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	Band 1	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	Band 4	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	5775	1
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Channel Spacing:	802.11a/n(HT20)/ac(HT20): 20MHz 802.11n(HT40)/ac(HT40): 40MHz 802.11ac(HT80): 80MHz			
Antenna Gain:	Antenna 1: 4.01dBi; Antenna 2: 3.26dBi Directional gain: 6.65dBi			
Antenna Type:	Antenna 1: Dipole Antenna Antenna 2: Dipole Antenna			
DFS Function:	Slave without Radar detection			



#### Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch  
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China  
Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

#### 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 17025:2017 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 (LAB CODE: 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

• **FCC (Designation Number: CN5033)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.

• **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

FCC Radiofrequency radiation exposure limits:

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

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

IC Radiofrequency radiation exposure limits:

According to RSS-102 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

For 2.4G device, the limit of worse case is 2.68 W

For 5G device, the limit of worse case is 4.53 W



## 5 Measurement and Calculation

Maximum transmit power

The Power Data is based on the RF Test Report SHEM200300180801 & SHEM200300180802 & SHEM200300180803 & SHEM200300180804.

BT

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
GFSK	2402	5.67	3.69
	2441	4.21	2.64
	2480	4.79	3.01
π /4DQPSK	2402	3.26	2.12
	2441	5.80	3.80
	2480	4.29	2.69
8DPSK	2402	3.57	2.28
	2441	6.04	<b>4.02</b>
	2480	4.45	2.79

BLE

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
1M	2402	10.58	11.43
	2442	11.11	12.91
	2480	11.48	14.06
2M	2402	11.04	12.71
	2442	11.40	13.80
	2480	11.71	<b>14.83</b>

2.4GHz

Test Mode	Frequency (MHz)	Measured Peak Output Power (dBm)			Measured Peak Output Power (mW)		
		Ant 1	Ant 2	MIMO	Ant 1	Ant 2	MIMO
802.11b	2412	14.67	16.17	/	29.31	41.40	/
	2437	13.40	12.75	/	21.88	18.84	/
	2462	16.74	16.38	/	<b>47.21</b>	<b>43.45</b>	/
802.11g	2412	14.67	13.91	/	29.31	24.60	/
	2437	15.01	14.65	/	31.70	29.17	/
	2462	15.08	14.93	/	32.21	31.12	/
802.11n(HT20)	2412	14.62	14.57	17.61	28.97	28.64	57.68
	2437	14.85	14.91	17.89	30.55	30.97	61.52
	2462	15.18	15.18	18.19	32.96	32.96	<b>65.92</b>

5GHz for FCC:

Test Mode	Frequency (MHz)	Tx Type	Measured Output Power (dBm)			Measured Output Power (mW)			Limits (dBm)	Verdict
			Ant 1	Ant 2	Total	Ant 1	Ant 2	Total		
802.11a	5180	SISO	12.67	12.15	/	18.49	16.41	/	≤24	PASS
	5200	SISO	12.67	11.78	/	18.49	15.07	/	≤24	PASS
	5240	SISO	12.36	11.38	/	17.22	13.74	/	≤24	PASS
	5745	SISO	16.99	14.74	/	50.00	29.79	/	≤30	PASS
	5785	SISO	16.78	15.01	/	47.64	31.70	/	≤30	PASS
	5825	SISO	16.65	15.07	/	46.24	32.14	/	≤30	PASS
802.11n	5180	MIMO	11.48	11.14	14.32	14.06	13.00	27.04	≤23.35	PASS
	5190	MIMO	11.17	10.35	13.79	13.09	10.84	23.93	≤23.35	PASS
	5200	MIMO	11.51	10.87	14.21	14.16	12.22	26.36	≤23.35	PASS
	5230	MIMO	11.82	10.65	14.28	15.21	11.61	26.79	≤23.35	PASS
	5240	MIMO	11.35	10.45	13.93	13.65	11.09	24.72	≤23.35	PASS
	5745	MIMO	16.73	14.43	18.74	47.10	27.73	74.82	≤29.35	PASS
	5755	MIMO	17.08	15.04	19.19	51.05	31.92	82.99	≤29.35	PASS
	5785	MIMO	16.30	14.55	18.52	42.66	28.51	71.12	≤29.35	PASS
	5795	MIMO	16.62	14.88	18.85	45.92	30.76	76.74	≤29.35	PASS
802.11ac	5825	MIMO	16.54	14.58	18.68	45.08	28.71	73.79	≤29.35	PASS
	5180	MIMO	11.57	11.17	14.38	14.35	13.09	27.42	≤23.35	PASS
	5190	MIMO	11.95	11.08	14.55	15.67	12.82	28.51	≤23.35	PASS
	5200	MIMO	11.49	10.82	14.18	14.09	12.08	26.18	≤23.35	PASS
	5210	MIMO	11.52	10.63	14.11	14.19	11.56	25.76	≤23.35	PASS
	5230	MIMO	11.64	10.63	14.17	14.59	11.56	26.12	≤23.35	PASS
	5240	MIMO	11.28	10.43	13.89	13.43	11.04	24.49	≤23.35	PASS
	5745	MIMO	16.37	14.44	18.52	43.35	27.80	71.12	≤29.35	PASS
	5755	MIMO	17.15	15.00	19.22	51.88	31.62	83.56	≤29.35	PASS
	5775	MIMO	15.70	13.88	17.89	37.15	24.43	61.52	≤29.35	PASS
	5785	MIMO	16.45	14.52	18.60	44.16	28.31	72.44	≤29.35	PASS
5795	MIMO	16.53	14.43	18.62	44.98	27.73	72.78	≤29.35	PASS	
5825	MIMO	16.55	14.57	18.68	45.19	28.64	73.79	≤29.35	PASS	



5GHz EIPR for IC:

Test Mode	Frequency (MHz)	Tx Type	Measured Output Power (dBm)			EIRP(dBm)			EIRP(mW)			Limits (dBm)	Verdict
			Ant 1	Ant 2	Total	Ant 1	Ant 2	Total	Ant 1	Ant 2	Total		
802.11 a	5180	SISO	12.67	12.15	/	16.68	15.41	/	46.56	34.75	/	≤23	PASS
	5200	SISO	12.67	11.78	/	16.68	15.04	/	46.56	31.92	/	≤23	PASS
	5240	SISO	12.36	11.38	/	16.37	14.64	/	43.35	29.11	/	≤23	PASS
	5745	SISO	16.99	14.74	/	/	/	/	/	/	/	≤30	PASS
	5785	SISO	16.78	15.01	/	/	/	/	/	/	/	≤30	PASS
	5825	SISO	16.65	15.07	/	/	/	/	/	/	/	≤30	PASS
802.11 n	5180	MIMO	11.48	11.14	14.32	18.13	17.79	20.97	65.01	60.12	125.13	≤22.35	PASS
	5190	MIMO	11.17	10.35	13.79	17.82	17.00	20.44	60.53	50.12	110.65	≤22.35	PASS
	5200	MIMO	11.51	10.87	14.21	18.16	17.52	20.86	65.46	56.49	121.96	≤22.35	PASS
	5230	MIMO	11.82	10.65	14.28	18.47	17.30	20.93	70.31	53.70	124.01	≤22.35	PASS
	5240	MIMO	11.35	10.45	13.93	18.00	17.10	20.58	63.10	51.29	114.38	≤22.35	PASS
	5745	MIMO	16.73	14.43	18.74	/	/	/	/	/	/	≤29.35	PASS
	5755	MIMO	17.08	15.04	19.19	/	/	/	/	/	/	≤29.35	PASS
	5785	MIMO	16.30	14.55	18.52	/	/	/	/	/	/	≤29.35	PASS
	5795	MIMO	16.62	14.88	18.85	/	/	/	/	/	/	≤29.35	PASS
	5825	MIMO	16.54	14.58	18.68	/	/	/	/	/	/	≤29.35	PASS
802.11 ac	5180	MIMO	11.57	11.17	14.38	18.22	17.82	21.03	66.37	60.53	126.91	≤22.35	PASS
	5190	MIMO	11.95	11.08	14.55	18.6	17.73	21.20	72.44	59.29	131.74	≤22.35	PASS
	5200	MIMO	11.49	10.82	14.18	18.14	17.47	20.83	65.16	55.85	121.01	≤22.35	PASS
	5210	MIMO	11.52	10.63	14.11	18.17	17.28	20.76	65.61	53.46	119.07	≤22.35	PASS
	5230	MIMO	11.64	10.63	14.17	18.29	17.28	20.82	67.45	53.46	120.91	≤22.35	PASS
	5240	MIMO	11.28	10.43	13.89	17.93	17.08	20.54	62.09	51.05	113.14	≤22.35	PASS
	5745	MIMO	16.37	14.44	18.52	/	/	/	/	/	/	≤29.35	PASS
	5755	MIMO	17.15	15.00	19.22	/	/	/	/	/	/	≤29.35	PASS
	5775	MIMO	15.70	13.88	17.89	/	/	/	/	/	/	≤29.35	PASS
	5785	MIMO	16.45	14.52	18.60	/	/	/	/	/	/	≤29.35	PASS
	5795	MIMO	16.53	14.43	18.62	/	/	/	/	/	/	≤29.35	PASS
	5825	MIMO	16.55	14.57	18.68	/	/	/	/	/	/	≤29.35	PASS

**MPE Calculation**

For FCC:

According to the formula  $S=P/4\pi R^2$ , we can calculate S which is MPE.

Note:

- 1) P (mW)
- 2) R = distance to the center of radiation of antenna (in meter) = 20cm
- 3) MPE limit = 1mW/cm<sup>2</sup>

For BT&BLE

The max. antenna gain is 2.68 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
14.83	1.854	20	0.00547	1	Pass

For 2.4GHz WiFi SISO mode:

Antenna 1:

The max. antenna gain is 2.68 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
47.21	1.854	20	0.01741	1	Pass

Antenna 2:

The max. antenna gain is 2.76 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
43.45	1.888	20	0.01632	1	Pass

For 2.4GHz WiFi MIMO mode:

The max. antenna gain is 5.73 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
65.92	3.741	20	0.04906	1	Pass



For 5GHz WiFi SISO mode:

Antenna 1:

The max. antenna gain is 4.01 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
51.88	2.518	20	0.02599	1	Pass

Antenna 2:

The max. antenna gain is 3.26 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
32.14	2.118	20	0.01354	1	Pass

For 5GHz WiFi MIMO mode:

The max. antenna gain is 6.65 dBi

Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
83.56	4.624	20	0.07686	1	Pass

2.4G WiFi and 5G WIFI can simultaneous transmitting. But the maximum rate of MPE is  $0.05/1.0+0.08/1.0=0.13 \leq 1.0$ . according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

For IC:

For BT&BLE

$$E.I.R.P.= P \cdot G = 0.01483 \times 1.854 = 0.027W < 2.68W$$

For 2.4GHz WiFi SISO mode:

$$\text{Antenna 1: } E.I.R.P.= P \cdot G = 0.04721 \times 1.854 = 0.088W < 2.68W$$

$$\text{Antenna 2: } E.I.R.P.= P \cdot G = 0.04345 \times 1.888 = 0.082W < 2.68W$$

$$\text{For 2.4GHz WiFi MIMO mode: } E.I.R.P.= P \cdot G = 0.06592 \times 3.741 = 0.247W < 2.68W$$

For 5GHz WiFi SISO mode:

$$\text{Antenna 1: } E.I.R.P.= P \cdot G = 0.05188 \times 2.518 = 0.131W < 4.53W$$

$$\text{Antenna 2: } E.I.R.P.= P \cdot G = 0.03414 \times 2.118 = 0.072W < 4.53W$$

$$\text{For 5GHz WiFi MIMO mode: } E.I.R.P.= P \cdot G = 0.08356 \times 4.624 = 0.386W < 4.53W$$

2.4G WiFi and 5G WIFI can simultaneous transmitting. But the maximum rate of MPE is  $0.25/2.68+0.39/4.53=0.18 \leq 1.0$ . the device is exclusion from SAR test.

**--End of the Report--**