RF Exposure Evaluation Report

Application No.:	SZEM2001000644CR
Applicant:	Sichuan AI-Link Technology Co., Ltd.
Address of Applicant:	Anzhou, Industrial park, Mianyang, Sichuan, china
Manufacturer:	Sichuan AI-Link Technology Co., Ltd.
Address of Manufacturer:	Anzhou, Industrial park, Mianyang, Sichuan, china
Product Name:	WIFI module
Model No.:	WF-R12B-UWD1, WF-R12B-UWD2, WF-R12B-UWD3 ♣
♣	Please refer to section 4.1 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID:	2AOKI-WFR12BUWD1
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 47 CFR Part 2.1091
Date of Receipt:	2020-01-19
Date of Test:	2020-02-26 to 2020-03-17
Date of Issue:	2020-03-24
Test Result :	**PASS***

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

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EMC Laboratory Manager

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2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020-03-24		Original

Authorized for issue by:				
				
		Edison Li /Project Engineer		
				
		Eric Fu /Reviewer		

3 Contents

4 General Information

4.1 General Description of EUT

Power supply:	DC3.3V			
Internal source:	More than 108MHz			
For 2.4G WiFi:				
Type of Modulation:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n (HT20/HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)			
Operating Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz			
Channel Number:	802.11b/g/11n(HT20): 11 Channels 802.11n(HT40): 7 Channels			
Channels Step:	Channels with 5MHz step			
Sample Type:	Fixed production			
Antenna Type:	Please refer to section 4.1 of this report.			
Antenna Gain:	Please refer to section 4.1 of this report. Note: The two antennas can simultaneous transmission.			
For 5G WiFi:				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	UNII Band II-A	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
		802.11ac(HT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(HT20)	5500-5700	11
		802.11n(HT40)/ac(HT40)	5510-5670	5
		802.11ac(HT80)	5530, 5610MHz	2
	UNII Band III	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)			
DFS Function:	Slave without radar detection			
Sample Type:	Fixed production			
Antenna Type:	Please refer to section 4.1 of this report.			

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Antenna Gain:	Please refer to section 4.1 of this report. Note: two antennas can simultaneous transmission.

Remark:

Model No.: WF-R12B-UWD1, WF-R12B-UWD2, WF-R12B-UWD3

Only the model WF-R12B-UWD1 was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only the model WF-R12B-UWD1 and WF-R12B-UWD2 difference on the connector part and model No., WF-R12B-UWD2 and WF-R12B-UWD3 difference on overall dimension and model No. and for all the above models difference on the cable length of antennas, other details as below:

Antenna Type Code	Antenna Project Code	Max Antenna Gain(dBi)	Cable Length (Unit: cm)	Part No.	Antenna
Walsin RF Device	Metal Antenna	2.4G WiFi Ant1: 4.51dBi Ant2: 4.93dBi 5G WiFi: Ant1: 4.78dBi Ant2: 4.94dBi	10cm	RFMTA370610IMLB701	Antenna1
			15cm	RFMTA370615IMLB701	Antenna2
			20cm	RFMTA370620IMLB702	Antenna3
			25cm	RFMTA370625IMLB701	Antenna4
			27cm	RFMTA370627IMLB701	Antenna5
			30cm	RFMTA370630IMLB702	Antenna6
			35cm	RFMTA370635IMLB702	Antenna7
			40cm	RFMTA370640IMLB701	Antenna8
			45cm	RFMTA370645IMLB701	Antenna9
			50cm	RFMTA370650IMLB701	Antenna10
			55cm	RFMTA370655IMLB702	Antenna11
			60cm	RFMTA370660IMLB702	Antenna12

4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.3 Test Facility

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

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

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/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

For Uncontrolled Environment, the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm^2 , the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2 . 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.

5.1.2 Test Procedure

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

5.1.3 EUT RF Exposure Evaluation

1) Test Results

Note: The 2.4G WiFi and 5G WiFi can't synchronous transmission at the same time.

For 2.4G WiFi:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
Ant1+2	4.93	3.11	14.84	30.48	0.189	1	0.189	PASS

Note: Refer to report No. SZEM200100064402 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 5G WiFi:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
Ant1+2	4.94	3.12	14.96	31.33	0.0194	1	0.0194	PASS

Note: Refer to report No. SZEM200100064403 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

End of Report

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