RF EXPOSURE EVALUATION REPORT

Product Name:	WIFI Module
Trade Mark:	GSD
Model No. / HVIN:	WC0HR2611
Add. Model No. / HVIN:	WC0HR2601
Report Number:	191129020RFC-3
Test Standards:	FCC 47 CFR Part 1 Subpart I RSS-102 Issue 5
FCC ID:	2AC23-WC0HR2601
IC:	12290A-WC0HR2601
Test Result:	PASS
Date of Issue:	May 20, 2020

Prepared for:

Hui Zhou Gaoshengda Technology Co., LTD
NO.75 Zhongkai Development Area, Huizhou, Guangdong, China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by: Tony Kang, Project Engineer

Reviewed by: Kevin Liang, Assistant Manager

Approved by: Billy Li, Technical Director

Date: May 20, 2020

Version

Version No.	Date	Description
V1.0	May 20, 2020	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Hui Zhou Gaoshengda Technology Co., LTD
Address of Applicant:	NO.75 Zhongkai Development Area, Huizhou, Guangdong, China
Manufacturer:	Hui Zhou Gaoshengda Technology Co., LTD
Address of Manufacturer:	NO.75 Zhongkai Development Area, Huizhou, Guangdong, China

1.2 EUT INFORMATION

Product Name:	WIFI Module		
Model No. / HVIN:	WC0HR2611		
Add. Model No. / HVIN:	WC0HR2601		
Trade Mark:	GSD		
DUT Stage:	Identical Prototype		
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac
Sample Received Date:	November 30, 2019		
Sample Tested Date:	November 30, 2019 to January 5, 2020		
Note: The test model WCOHR2611 in this report has Class II Permissive Change (C2PC) comparing with the original model WCOHR2601,See the change description for details.			

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For 2.4 GHz ISM Band of Wi-Fi		
Frequency Band:	2400 MHz to 2483.5 MHz	
Frequency Range:	2412 MHz to 2462 MHz	
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40	
Type of Modulation:	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK)	
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7	
Number of Channels:	IEEE 802.11b: 11 IEEE 802.11g: 11 IEEE 802.11n-HT20: 11 IEEE 802.11n-HT40: 7	
Channel Separation:	5 MHz	
Antenna Type:	PIFA Antenna	
Antenna Gain:	Chain 0: 3 dBi; Chain 1: 3 dBi	
Directional gain:	6.01 dBi	
Maximum Peak Power:	SISO_ Chain 0	IEEE 802.11b: 21.10 dBm IEEE 802.11g: 24.64 dBm
	SISO_ Chain 1	IEEE 802.11b: 21.51 dBm IEEE 802.11g: 23.23 dBm
	MIMO_ Chain 0+1	IEEE 802.11n-HT20: 24.99 dBm IEEE 802.11n-HT40: 24.86 dBm

For 5 GHz U-NII Bands of Wi-Fi			
Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)		
	5 725 MHz to 5 850 MHz (U-NII-3)		
Frequency Ranges:	5180 MHz to 5240 MHz		
	5 745 MHz to 5 825 MHz		
Support Standards:	IEEE 802.11a/n/ac		
TPC Function:	Not Support		
DFS Operational mode:	N/A		
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)		
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)		
	IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)		
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz		
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz		
	IEEE 802.11ac-VHT80: 80 MHz		
Data Rate:	IEEE 802.11a: Up to 54 Mbps		
	IEEE 802.11n-HT20: Up to MCS15		
	IEEE 802.11n-HT40: Up to MCS15		
	IEEE 802.11ac-VHT20: Up to MCS8		
	IEEE 802.11ac-VHT40: Up to MCS9		
	IEEE 802.11ac-VHT80: Up to MCS9		
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80		
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80		
Antenna Type:	Chain 0	PIFA Antenna	
	Chain 1	PIFA Antenna	
Antenna Gain:	Chain 0	5150 MHz to 5250 MHz: 3 dBi	
		5725 MHz to 5850 MHz: 3 dBi	
	Chain 1	5150 MHz to 5250 MHz: 3 dBi	
		5725 MHz to 5850 MHz: 3 dBi	
Maximum conducted output power (dBm):	**SISO_Chain 0**	**U-NII-1**	**U-NII-3**
	IEEE 802.11a:	15.32	15.72
	SISO_Chain 1	**U-NII-1**	**U-NII-3**
	IEEE 802.11a:	14.43	14.91
	MIMO_Chain 0+1	**U-NII-1**	**U-NII-3**
	IEEE 802.11n-HT20:	17.55	15.45
	IEEE 802.11n-HT40:	14.43	16.11
	IEEE 802.11ac-VHT20:	17.25	14.40
	IEEE 802.11ac-VHT40:	14.06	14.72
	IEEE 802.11ac-VHT80:	13.71	15.76

1.4 OTHER INFORMATION

Test channels for 2.4 GHz ISM Band of Wi-Fi				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11b	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11g	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT20	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT40	2422 MHz to 2452 MHz	Channel 3	Channel 6	Channel 9
		2422 MHz	2437 MHz	2452 MHz

Test channels for 5 GHz U-NII Bands of Wi-Fi				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz
IEEE 802.11ac-VHT80	5150 MHz to 5250 MHz	--	Channel 42	--
		--	5210 MHz	--
	5725 MHz to 5850 MHz	--	Channel 155	--
		--	5775 MHz	--

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. MPE EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
3	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

3.2 MPE COMPLIANCE REQUIREMENT

3.2.1 Limits

3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	**1**	30

Note: f = frequency in MHz: * = Plane-wave equivalents power density.

3.2.1.2 RSS-102 Issue 5

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.
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[6] 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).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

3.2.2 Test Procedure

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

3.3 MPE CALCULATION METHOD

FCC 47 CFR Part 1 Subpart I
S = PG/4πR^2= EIRP/4πR^2
S = power density (in appropriate units, e.g., mw/cm2)
P = power input to the antenna (in appropriate units, e.g., mw)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.
R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

3.4 MPE CALCULATION RESULTS

Note: *For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.*

3.4.1 For WLAN

For Wi-Fi function, operating at 2412MHz to 2472 MHz for IEEE802.11b/g/n and
operating at 5150 MHz to 5250 MHz for IEEE802.11a/n/ac and
operating at 5725 MHz to 5850 MHz for IEEE802.11a/n/ac.

3.4.1.1 Antenna Type:

Chain 0: PIFA Antenna
Chain 1: PIFA Antenna

3.4.1.2 Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 3 dBi
5150 MHz to 5250 MHz: 3 dBi
5725 MHz to 5850 MHz: 3 dBi

Chain 1: Same as chain 0

For MIMO mode (2Tx/2Rx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The Chain 0 and Chain 1 antenna ports can be used alone. The transmit signals are correlated with each other.

The directional gain = G_{ANT} + 10 log(N_{ANT}) dBi = 3 + 10 log(2) = 6.01 dBi

For SISO mode (1Tx/1Rx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The Chain 0 and Chain 1 antenna ports cannot be used alone

The antenna gain = Chain 0 or Chain 1 = 3 dBi

3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I

For SISO (1TX/1RX) Mode

Operating Mode		Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
		(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm²)	
SISO	IEEE 802.11b IEEE 802.11g	2412-2462	17	2	3	22	158.489	1	0.0315
	IEEE 802.11a	5180-5240	14	2	3	19	79.433	1	0.0158
		5745-5825	14	2	3	19	79.433	1	0.0158

For MIMO (2TX/2RX) Mode

Operating Mode		Freq.	Declared maximum conducted average output power	Max. positive Tolerance according manufacturer	Directional Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
		(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm²)	
MIMO (2TX/2RX)	IEEE 802.11n-HT20	2412-2462	12	2	6.01	20.01	100.231	1	0.0199
	IEEE 802.11n-HT40	2422-2452	10	2	6.01	18.01	63.241	1	0.0126
	IEEE 802.11n-HT20	5180-5240	13	2	6.01	21.01	126.183	1	0.0251
		5745-5825	11	2	6.01	19.01	79.616	1	0.0158
	IEEE 802.11n-HT40	5190-5230	10	2	6.01	18.01	63.241	1	0.0126
		5755-5795	11	2	6.01	19.01	79.616	1	0.0158
	IEEE 802.11ac-VHT20	5180-5240	13	2	6.01	21.01	126.183	1	0.0251
		5745-5825	11	2	6.01	19.01	79.616	1	0.0158
	IEEE 802.11ac-VHT40	5190-5230	10	2	6.01	18.01	63.241	1	0.0126
		5755-5795	11	2	6.01	19.01	79.616	1	0.0158
	IEEE 802.11ac-VHT80	5210	9	2	6.01	17.01	50.234	1	0.0100
		5775	12	2	6.01	20.01	100.231	1	0.0199

3.4.1.4 Results for RSS-102 Issue 5

For SISO (1TX/1RX) Mode

Operating Mode		Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
		(MHz)	(dBm)		(dBi)	(dBm)	(W)	(W)
SISO	IEEE 802.11g	2412-2462	17	2	3	22	0.1585	2.6840
	IEEE 802.11b	2412-2462	14	2	3	19	0.0794	2.6840
	IEEE 802.11a	5180-5240	14	2	3	19	0.0794	4.5253
		5745-5825	17	2	3	22	0.1585	4.8570

For MIMO (2TX/2RX) Mode

Operating Mode		Freq.	Declared maximum conducted average output power	Max. positive Tolerance according manufacturer	Directional Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
		(MHz)	(dBm)		(dBi)	(dBm)	(W)	(W)
MIMO (2TX/2RX)	IEEE 802.11n-HT20	2412-2462	12	2	6.01	20.01	0.1002	2.6840
	IEEE 802.11n-HT40	2422-2452	10	2	6.01	18.01	0.0632	2.6916
	IEEE 802.11n-HT20	5180-5240	13	2	6.01	21.01	0.1262	4.5253
		5745-5825	11	2	6.01	19.01	0.0796	4.8570
	IEEE 802.11n-HT40	5190-5230	10	2	6.01	18.01	0.0632	4.5312
		5755-5795	11	2	6.01	19.01	0.0796	4.8628
	IEEE 802.11ac-VHT20	5180-5240	13	2	6.01	21.01	0.1262	4.5253
		5745-5825	11	2	6.01	19.01	0.0796	4.8570
	IEEE 802.11ac-VHT40	5190-5230	10	2	6.01	18.01	0.0632	4.5312
		5755-5795	11	2	6.01	19.01	0.0796	4.8628
	IEEE 802.11ac-VHT80	5210	9	2	6.01	17.01	0.0502	4.5432
		5775	12	2	6.01	20.01	0.1002	4.8743

3.4.2 Simultaneous Multi-band Transmission MPE Analysis

N/A

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***