

RF EXPOSURE EVALUATION REPORT

Product Name: WIFI Module
Trade Mark: GSD
Model No. / HVIN: W37M2510
Add. Model No. / HVIN: N/A
Report Number: 201027007RFC-2
Test Standards: FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5
FCC ID: 2AC23-W37
IC: 12290A-W37
Test Result: PASS
Date of Issue: December 10, 2020

Prepared for:

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Version

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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:	W37M2510	
Add. Model No. / HVIN:	N/A	
Trade Mark:	GSD	
DUT Stage:	Production Unit	
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n
Sample Received Date:	October 29, 2020	
Sample Tested Date:	November 6, 2020 to November 20, 2020	

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:	Chain 0	PIFA Antenna
	Chain 1	PIFA Antenna
Antenna Gain:	Chain 0	3.0 dBi
	Chain 1	3.0 dBi
Directional gain:	6.01 dBi	
Maximum Peak Power:	SISO_ Chain 0	IEEE 802.11b: 13.85 dBm IEEE 802.11g: 23.78 dBm
	SISO_ Chain 1	IEEE 802.11b: 13.88 dBm IEEE 802.11g: 23.89 dBm
	MIMO_ Chain 0+1	IEEE 802.11n-HT20: 22.71 dBm IEEE 802.11n-HT40: 21.69 dBm

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

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 MHz⁶ 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

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

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

3.4.1.1 Antenna Type:

Chain 0: PCB Antenna

Chain 1: PCB Antenna

3.4.1.2 Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 3.0 dBi

Chain 1: 2412MHz to 2462 MHz: 3.0 dBi

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.

$$\text{The directional gain} = G_{\text{ANT}} + 10 \log(N_{\text{ANT}}) \text{ dBi} = 3.0 + 10 \log(2) = 6.01 \text{ dBi}$$

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

$$\text{The antenna gain} = \text{Chain 0 or Chain 1} = 3.0 \text{ dBi}$$

3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I

For SISO (1TX/1RX) Mode

Operating Mode		Freq.	Declared maximum conducted 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/cm ²)	
SISO	IEEE 802.11b	2412	13	1	3	17	50.1187	1	0.0100
		2437	13	1	3	17	50.1187	1	0.0100
		2462	13	1	3	17	50.1187	1	0.0100
	IEEE 802.11g	2412	23	1	3	27	501.1872	1	0.0997
		2437	23	1	3	27	501.1872	1	0.0997
		2462	23	1	3	27	501.1872	1	0.0997

For MIMO (2TX/2RX) Mode

Operating Mode		Freq.	Declared maximum conducted 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/cm ²)	
MIMO (2TX/2RX)	IEEE 802.11n-HT20	2412	22	1	6.01	29.01	796.1594	1	0.1584
		2437	22	1	6.01	29.01	796.1594	1	0.1584
		2462	22	1	6.01	29.01	796.1594	1	0.1584
	IEEE 802.11n-HT40	2422	21	1	6.01	28.01	632.4119	1	0.1258
		2437	21	1	6.01	28.01	632.4119	1	0.1258
		2452	21	1	6.01	28.01	632.4119	1	0.1258

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 802.11b	2412	13	1	3	17	0.0501	2.6840
		2437	13	1	3	17	0.0501	2.7030
		2462	13	1	3	17	0.0501	2.7219
	IEEE 802.11g	2412	23	1	3	27	0.5012	2.6840
		2437	23	1	3	27	0.5012	2.7030
		2462	23	1	3	27	0.5012	2.7219

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	22	1	6.01	29.01	0.7962	2.6840
		2437	22	1	6.01	29.01	0.7962	2.7030
		2462	22	1	6.01	29.01	0.7962	2.7219
	IEEE 802.11n-HT40	2422	21	1	6.01	28.01	0.6324	2.6916
		2437	21	1	6.01	28.01	0.6324	2.7030
		2452	21	1	6.01	28.01	0.6324	2.7144

3.4.2 Simultaneous Multi-band Transmission MPE Analysis

Not support for Simultaneous Multi-band Transmission

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 ***

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