

MPE Evaluation Report

Product : WIFI Module
Trade mark : Haier
Model/Type reference : MK-QTWIFI-04(A)
Add. Model No. : MK-QTWIFI-04(B)
Report Number : 1609260375RFC-2
Date of Issue : February 24, 2017
FCC ID : 2AGDJ-MKQTWIFI04
Test Standards : FCC 47 CFR Part 1.1307
 FCC 47 CFR Part 1.1310
Test result : PASS

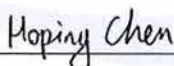
Prepared for:

Qingdao Haier Intelligent Home Appliance Technology Co., Ltd
No.1 Haier Road Hi-tech Zone Qingdao, China

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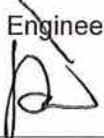
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Version

Version No.	Date	Description
V1.0	February 24, 2017	Original



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1 General Information

1.1 Client Information

Applicant:	Qingdao Haier Intelligent Home Appliance Technology Co., Ltd
Address of Applicant:	No.1 Haier Road Hi-tech Zone Qingdao, China
Manufacturer:	Qingdao Haier Intelligent Home Appliance Technology Co., Ltd
Address of Manufacturer:	No.1 Haier Road Hi-tech Zone Qingdao, China

1.2 General Description of EUT

Product Name:	WIFI Module
Model No.(EUT):	MK-QTWIFI-04(A)
Add. Mode No.:	MK-QTWIFI-04(B) (Both model with same module circuit, the difference is connector, peripheral circuit and PCB layout have little changes, MK-QTWIFI-04(B) with USB terminal (model: USBA-A-02M).)
Trade Mark:	Haier
EUT Supports Radios application:	Wlan 2400MHz-2483.5MHz 802.11b/g/n(HT20&HT40)
Power Supply:	DC 5V
Sample Received Date:	January 23, 2017
Sample Tested Date:	January 23, 2017 ~ February 22, 2017

1.3 Product Specification subjective to this standard

Operation Frequency:	2400MHz-2483.5MHz
Channel Numbers:	802.11b/g/n(HT20): 13 Channels 802.11n(HT40): 9 Channels
Channel Separation:	Channels with 5MHz step
Transmit Data Rate:	802.11b: 1M/ 2M/ 5.5M/ 11M bps 802.11g: 6M/ 9M/ 12M/ 18M/ 24M/ 36M/ 48M/ 54M bps 802.11n: up to MCS7
Type of Modulation:	802.11b: DSSS(CCK,DQPSK,DBPSK) 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Test Software of EUT:	Provided by the manufacturer
Sample Type:	Portable device
Antenna Type	PCB Antenna
Antenna Gain:	4 dBi
Normal Test Voltage:	5Vdc
Software Version:	N/A
Hardware Version:	HAIER_UPluq_8711AF_2.1

Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	5	2432MHz	9	2452MHz	13	2472MHz
2	2417MHz	6	2437MHz	10	2457MHz	--	--
3	2422MHz	7	2442MHz	11	2462MHz	--	--

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4	2427MHz	8	2447MHz	12	2467MHz	--	--
Operation Frequency each of channel(802.11n HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency		
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz	10	2457MHz		
5	2432MHz	8	2447MHz	11	2462MHz		

1.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
PC	Lenovo	E450	SL10G10780	UnionTrust

2) Cable

Cable No.	Description	Connector Type	Cable Type/Length	Supplied by
1	Antenna Cable	SMA	0.3m(Shielded)	UnionTrust
2	USB cable	-	0.4m(Shielded)	Applicant

1.5 Test Location

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888 Fax: +86 (0) 755 2823 0886

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

Shenzhen UnionTrust Quality and Technology Co., Ltd.

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

1.6 Deviation from Standards

None.

1.7 Abnormalities from Standard Conditions

None.

1.8 Other Information Requested by the Customer

None.

2 MPE Evaluation

2.1 MPE Compliance Requirement

2.1.1 Limits

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.

a) 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

b) 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

2.1.2 Test Procedure

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

2.2 EIRP

2.2.1 EIRP for operational 2.4GHz Band

For WiFi function, operating at 2412-2472MHz for 802.11b/g/n(HT20), 13 channels with 5MHz channel spacing; 2422-2462MHz for 802.11n(HT40), 9 channels with 5MHz channel spacing.

a) Modulation Type:

BPSK, QPSK, 16QAM, 64QAM for OFDM. CCK, DQPSK, DBPSK for DSSS.

b) Antenna

Type: Chain 0: PCB antenna.

Gain: Chain 0: 4 dBi gain (2400 ~ 2483.5 MHz)

c) Maximum Conducted Average Power

Maximum Conducted Average Power(dBm)							
Mode	Channel/ Frequency (MHz)	Data Rate (Mbps)	Measured Power		Power with Duty Factor		
			Chain 0	Chain 1	Chain 0	Chain 1	Total (Chain 0+1)
802.11b	1(2412)	1	16.86	-	16.86	-	-
	6(2437)		16.24	-	16.24	-	-
	11(2462)		15.89	-	15.89	-	-
	12(2467)		14.72	-	14.72	-	-
	13(2472)		14.81	-	14.81	-	-
802.11g	1(2412)	54	12.06	-	13.89	-	-
	6(2437)		11.71	-	13.54	-	-
	11(2462)		11.32	-	13.15	-	-
	12(2467)		8.45	-	10.28	-	-
	13(2472)		8.31	-	10.14	-	-
802.11n (HT20)	1(2412)	MCS7	9.44	-	11.55	-	-
	6(2437)		9.41	-	11.52	-	-
	11(2462)		8.92	-	11.03	-	-
	12(2467)		8.73	-	10.84	-	-
	13(2472)		8.65	-	10.76	-	-
802.11n (HT40)	3(2422)	MCS7	9.64	-	12.85	-	-
	6(2437)		9.47	-	12.68	-	-
	9(2452)		9.25	-	12.46	-	-
	10(2457)		9.02	-	12.23	-	-
	11(2462)		8.97	-	12.18	-	-
The Maximum conducted average power data refer to the report 1609260375RFC-1.							

So, the maximum conducted output Average power for the EUT is 16.86 dBm in the frequency 2.412GHz 802.11b mode which is within the production variation.

The nominal conducted output Average power specified:

Mode	Channel/ Frequency (MHz)	Nominal conducted output Average power(dBm)	Tolerance (dBm)
802.11b	1(2412)	16.00	±1.00
	6(2437)	16.00	±1.00
	11(2462)	16.00	±1.00
	12(2467)	15.00	±1.00
	13(2472)	15.00	±1.00
802.11g	1(2412)	13.00	±1.00
	6(2437)	13.00	±1.00
	11(2462)	13.00	±1.00
	12(2467)	10.00	±1.00
	13(2472)	10.00	±1.00
802.11n (HT20)	1(2412)	12.00	±1.00
	6(2437)	12.00	±1.00
	11(2462)	12.00	±1.00
	12(2467)	11.00	±1.00
	13(2472)	11.00	±1.00
802.11n (HT40)	3(2422)	12.00	±1.00
	6(2437)	12.00	±1.00
	9(2452)	12.00	±1.00
	10(2457)	11.00	±1.00
	11(2462)	11.00	±1.00

d) ERP/EIRP

The maximum EIRP = Nominal conducted output Average power + Tolerance + Antenna Gain
=16.00 + 1.00+ 4.00 =21.00 dBm=125.8925mW

2.3 MPE Evaluation

2.3.1 MPE Calculation Method

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

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)

2.3.2 MPE Calculation Result

a) Result for operational 2.4GHz Band

The worst case is power density at prediction frequency at 20cm: **0.0250 (mW/cm²)**

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0250 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

Result: Pass

*** End of Report ***

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