FCC Maximum Permissible Exposure(MPE) Estimation Report

Product Name: WiFi Station

Model: HW01

Report No.: SYBH(Z-SAR)026092014-3

FCC ID: QISHW-02G

	APPROVED (Lab Manager)	PREPARED (Test Engineer)
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DATE	2014-11-03	2014-11-03

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※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2014-11-03	Cheng Jiawen

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1 EUT Description

Device Information:			
DUT Name:	WiFi Station		
Type Identification:	HW01		
Device Type :	Mobile Device		
FCC ID:	QISHW-02G		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment/general population		
Hardware Version :	CL1E5383SM Ver A		
Software Version :	21.298.01.21.736		
Antenna Type :	Internal Antenna		
Gain:	< 1.5dBi		
Device Operating Configurations:			
Supporting Mode(s)	Wi-Fi 2.4G		
Test Modulation	802.11b (DSSS), 802.11g/n(OFDM)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	Wi-Fi 2.4G	2402-2472	2402-2472

1.1 General Description

HW01 is an enhanced WiFi 2.4G device, only enhanced WiFi, not including 4G/3G. it must be coordinated with HW-02G.

When HW-02G insert into HW01,the HW-02G WIFI antenna does not work;

When HW01 is working LAN/WAN-WiFi mode, the HW-02G 4G/3G antenna does not work;

2 Test specification(s)

ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 4 of March 2010))
KDB 447498 D01	General RF Exposure Guidance v05r02

3 Testing laboratory

Test Site	The Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Zone K3,Huawei Industrial Base, Bantian Industry Area, Longgang District, Shenzhen, Guangdong, China
Telephone	+86 755 28780808
Fax	+86 755 89652518
State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310 A2LA TESTING CERT #2174.01

4 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

5 Application details

Start Date of test	2014-11-03
End Date of test	2014-11-03

6 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

7 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC's MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

Per FCC KDB447498 D01, either peak or spatially averaged results may be applied to determine compliance; and with respect to plane-wave equivalent power density limits when $\geqslant$ 300 MHz, and electric and magnetic field strength limits when < 300 MHz.

Table: Limits For Maximum Permissible Exposure (MPE)

(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 Time (minute)|E|^2,|H|^2 or S
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				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm^2)	Averaging Time (minute)|E|^2,|H|^2 or S
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
1500-100,000	/	/	1.0	30
f=frequency in MHz			*Plane-wave equivalent power density	

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E^2, H^2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

Per FCC KDB 447498D01, in order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

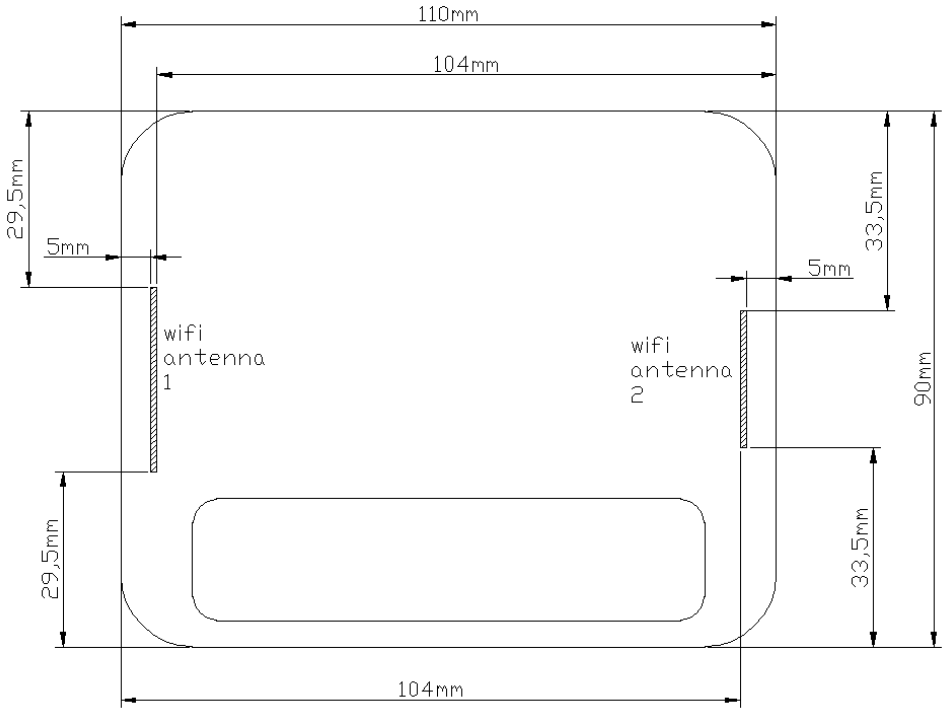
$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} \leq 1$$

For the mixed mobile and portable host platform exposure conditions, the following formula should be applied to determine simultaneous transmission test exclusion:

The [∑ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [∑ of MPE ratios] is ≤ 1.0.

8 RF Exposure Evaluation

HW01 has two WiFi transmitters. The location of the antennas inside HW01 is shown as below picture:



According to the usage scenario, HW01 must be coordinated with HW-02G. HW01 can not work independently without HW-02G. When HW-02G are inserted into HW01, the HW-02G Wi-Fi antennas will not work any longer; the HW01 Wi-Fi antennas will work instead.

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v05r02.

All Simultaneous Transmission Possibilities are as below:

Simultaneous Tx Combination	Configuration
1	UMTS (HW-02G) + WiFi 2.4G(HW01)

The RF exposure evaluation results for the device are as below:

Model	Band	Antenna	Tune-up* limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm^2)	MPE Limit (mW/cm^2)
HW01	Wi-Fi 2.4G	Ant1	19.00	1.50	20.50	112.20	20	0.022	1.0
HW01	Wi-Fi 2.4G	Ant2	19.00	1.50	20.50	112.20	20	0.022	1.0

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

Model	Band	SAR_{max} (W/kg) or S_{max} (mW/cm^2)	SAR(W/kg) or MPE (mW/cm^2) Limit	Calculation result	Conclusion
HW-02G*	UMTS Band V	0.945	1.6	0.613	**PASS**
HW01	Wi-Fi 2.4G SISO	0.022	1.0		
HW-02G*	UMTS Band V	0.945	1.6	0.635	**PASS**
HW01	Wi-Fi 2.4G Ant1	0.022	1.0		
HW01	Wi-Fi 2.4G Ant2	0.022	1.0		

Note:* Please refer to SAR test report of HW-02G (Report No: SYBH(Z-SAR)026092014-2)for detailed SAR test results.

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance.
Therefore the product also meets the requirements under multiple sources condition.

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