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RF Exposure Evaluation Report

Report No. : CQSZ20180500203EW-04

Applicant: Hangzhou Great Star Industrial Co., Ltd.

Address of Applicant: No.35, Jiuahuan Road, Jiubao Town, Jianggan District, Hangzhou 310019, China


Manufacturer: Hangzhou Great Star Industrial Co., Ltd.

Address of Manufacturer: No.35, Jiuahuan Road, Jiubao Town, Jianggan District, Hangzhou 310019, China

Equipment Under Test (EUT):

Product: Iris Wi-Fi Smart Hub

Model No.: IH300

Brand Name: 

FCC ID: 2AMI2IH300

IC: 22853-IH300

Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
RSS 102 Issue 5 March 2015

Date of Test: 2018-05-20 to 2018-06-05

Date of Issue: 2018-06-05

Test Result : **PASS***

Tested By:

(Aaron Ma)

Reviewed By:

(Owen Zhou)

Approved By:

(Jack Ai)



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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

2 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQSZ20180500203EW-04	Rev.01	Initial report	2018-06-05

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4 General Information

4.1 Client Information

Applicant:	Hangzhou Great Star Industrial Co., Ltd.
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Manufacturer:	Hangzhou Great Star Industrial Co., Ltd.
Address of Manufacturer:	No.35, Jiuhuan Road, Jiubao Town, Jianggan District, Hangzhou 310019, China

4.2 General Description of EUT

Product Name:	Iris Wi-Fi Smart Hub
Model No.:	IH300
Trade Mark:	
Hardware Version:	IH300-003V-IMX-D-iMagic
Software Version:	Linux iMagic 4.1.15-HW
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz Zigbee: 2405~2480MHz Z-wave: 908.4MHz ~ 916MHz BLE: 2402~2480MHz
Modulation Type:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM, QPSK,BPSK) Zigbee: O-QPSK Z-wave : FSK (908.4MHz and 908.42MHz), GFSK (916MHz) BLE: GFSK
Number of Channel:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels Zigbee: 16 Channels Z-wave : 3 Channels BLE: 40 Channels
Sample Type:	Mobile production
Test Software of EUT:	Secure CRT (manufacturer declare)
Antenna Type:	Integral antenna for WIFI, Z-wave PCB antenna for Zigbee, BLE
Antenna Gain:	WIFI: 1.6dBi Zigbee: 0.3dBi Z-wave: 2.0dBi BLE: 3.5 dBi
Power Supply:	Adapter: Model:RD1201500-C55-81MG Input:100-240V~50/60Hz 0.6A Output:DC12V 1.5A Battery: ICR18650 2600mAh, 3.7V

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement for FCC

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/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². 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 standalone operations

1) For BLE

Antenna Gain: 3.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.24 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

GFSK mode	
Test channel	Peak Output Power (dBm)
Lowest(2402MHz)	-3.13
Middle(2440MHz)	-3.11
Highest(2480MHz)	-3.04

GFSK mode

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Highest	2480	-3.04	0.5	3.5	0.0001	1.0	PASS

2) For WIFI

Antenna Gain: 1.6dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.45 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11b mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	8.53
Middle(2437MHz)	8.45
Highest(2462MHz)	8.48
802.11g mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	12.29
Middle(2437MHz)	12.18
Highest(2462MHz)	12.22
802.11n(HT20)mode	
Test channel	Average Output Power (dBm)
Lowest(2412MHz)	12.12
Middle(2437MHz)	12.03
Highest(2462MHz)	12.09

802.11g(worst case)

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Lowest	2412	12.29	16.94	1.6	0.0049	1.0	PASS

3) For Zigbee

Antenna Gain: 0.3dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.07 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

O-QPSK mode	
Test channel	Average Output Power (dBm)
Lowest(2405MHz)	16.73
Middle(2440MHz)	16.78
Highest(2480MHz)	16.69

O-QPSK mode

Channel	Frequency (MHz)	Max Conducted average Output Power (dBm)	Output Power to Antenna (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Middle	2440	16.78	58.61	0.3	0.0125	1.0	PASS

4) For Z-wave

Antenna Gain: 2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.585 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

Z-wave mode	
Test channel	Peak Output Power (dBm)
Lowest(908.4MHz)	-3.02
Middle(908.42MHz)	-4.85
Highest(916MHz)	-2.34

Z-wave mode

Channel	Frequency (MHz)	Max e.i.r.p (dBm)	Max e.i.r.p (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Middle	916	-2.34	0.58	2	0.0002	0.606	PASS

5.1.4 EUT RF Exposure Evaluation simultaneous transmission operations

According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits :

Simultaneous transmission mode	The sum of the ratios	Result
Wifi + Zigbee + Z-wave	$0.0049/1 + 0.0125/1 + 0.0002/0.606$	$=0.018 < 1$
Wifi + BLE + Z-wave	$0.0049/1 + 0.0001/1 + 0.0002/0.606$	$=0.005 < 1$
Zigbee + Z-wave	$0.0125/1 + 0.0002/0.606$	$=0.013 < 1$
BLE + Z-wave	$0.0001/1 + 0.0002/0.606$	$=0.0004 < 1$

5.2 RF Exposure Compliance Requirement for IC

5.2.1 EUT RF Exposure Evaluation standalone operations

Exemption from Routine Evaluation Limits – RF Exposure Evaluation

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:

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;

RF exposure evaluation exempted power for BLE: 2.73W

RF exposure evaluation exempted power for WIFI: 2.68W

RF exposure evaluation exempted power for Zigbee: 2.73W

RF exposure evaluation exempted power for Z-wave: 1.37W

The Max. e.i.r.p. for BLE: 0.46 dBm = 0.001 W

The Max. e.i.r.p. for WIFI: 13.89 dBm = 0.0245 W

The Max. e.i.r.p. for Zigbee: 17.08 dBm = 0.051 W

The Max. e.i.r.p. for Z-wave: -0.34 dBm = 0.0009 W

All e.i.r.p. are less than the RF exposure evaluation exempted power. So RF exposure evaluation is not required.

5.2.2 EUT RF Exposure Evaluation simultaneous transmission operations

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits :

Simultaneous transmission mode	The sum of the ratios	Result
Wifi + Zigbee + Z-wave	$0.0245/2.68 + 0.051/2.73 + 0.0009/1.37$	$=0.03 < 1$
Wifi + BLE + Z-wave	$0.001/2.73 + 0.0245/2.68 + 0.0009/1.37$	$=0.01 < 1$
Zigbee + Z-wave	$0.051/2.73 + 0.0009/1.37$	$=0.02 < 1$
BLE + Z-wave	$0.0001/2.73 + 0.0009/1.37$	$=0.001 < 1$