

# Beijing InHand Networks Technology Co., Ltd.

## Industrial Cellular Router




**Main Model: IR615WH01-AP**  
**Serial Model: Please See Page 5**

**March 20, 2013**  
**Report No.: 13020108-1-FCC-R3**  
**(This report supersedes NONE)**



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

		
<b>Deon Dai</b> Compliance Engineer	<b>Alex Liu</b> Technical Manager	

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**Test result presented in this test report is applicable to the representative sample only.**

# RF Test Report

**SIEMIC, INC.**  
Assessing global markets

To: FCC Part 22(H) & FCC Part 24(E): 2012

## Laboratory Introduction

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Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
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Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety

### Accreditations for Product Certifications

Country/Region	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC, (RCB 208)	RF , Telecom
Hong Kong	OFTA (US002)	RF , Telecom

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# CONTENTS

**1. EXECUTIVE SUMMARY & EUT INFORMATION.....5**  
**2. TECHNICAL DETAILS .....6**  
**3. MODIFICATION .....7**  
**4. TEST SUMMARY .....8**  
**5. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS .....9**  
**ANNEX A. TEST INSTRUMENT & METHOD .....12**  
**ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS .....15**  
**ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT .....23**  
**ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST .....26**  
**ANNEX E. DECLARATION OF SIMILARITY .....27**

# 1. EXECUTIVE SUMMARY & EUT INFORMATION

**The purpose of this test programmed was to demonstrate compliance of the Beijing InHand Networks Technology Co., Ltd. Industrial Cellular Router and model: IR615WH01-AP against the current Stipulated Standards. The Industrial Cellular Router has demonstrated compliance with the FCC Part 22(H) & FCC Part 24(E): 2012.**

## EUT Information

**EUT**

**Description** : **Industrial Cellular Router**

**Main Model** : **IR615WH01-AP**

**Serial Model** : **IR605WH01-AP, IR605WH01-STA, IR615WH01-STA, IR695WH01-AP, IR695WH01-STA, IG605WH01-AP, IG605WH01-STA, IG615WH01-AP, IG615WH01-STA, IG695WH01-AP, IG695WH01-STA**

**Antenna Gain** : **GSM850: 0.8 dBi**  
**PCS1900: 0.8 dBi**  
**Adapter**  
**Model: AW018WR-1200 100CV**

**Input Power** : **Input: 100-240V 50/60Hz 0.5A**  
**Output: 12V 1A**  
**EUT Power supply: 9-26V DC Power Terminal**

**Classification**  
**Per Stipulated** : **FCC Part 22(H) & FCC Part 24(E): 2012**  
**Test Standard**

## 2. TECHNICAL DETAILS

<b>Purpose</b>	Compliance testing of Industrial Cellular Router with stipulated standard
<b>Applicant / Client</b>	Beijing InHand Networks Technology Co., Ltd. West Wing, 11th Floor, Building G, Wang Jing Science Park, Chaoyang District, Beijing, 100102 China
<b>Manufacturer</b>	Beijing InHand Networks Technology Co., Ltd. West Wing, 11th Floor, Building G, Wang Jing Science Park, Chaoyang District, Beijing, 100102 China
<b>Laboratory performing the tests</b>	SIEMIC Nanjing (China) Laboratories NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email:info@siemic.com
<b>Test report reference number</b>	13020108-1-FCC-R3
<b>Date EUT received</b>	March 06, 2013
<b>Standard applied</b>	FCC Part 22(H) & FCC Part 24(E): 2012
<b>Dates of test</b>	March 18, 2013
<b>No of Units</b>	#1
<b>Equipment Category</b>	Spread Spectrum System/Device
<b>Trade Name</b>	N/A
<b>RF Operating Frequency (ies)</b>	WCDMA Band II TX: 1852.4~1907.6 MHz; RX: 1932.4~1987.6 MHz WCDMA Band V TX : 826.4 ~ 846.6 MHz; RX : 871.4 ~ 891.6 MHz WLAN:2.4GHz band: 802.11b/g/n(HT 20) : 2412-2462 MHz 802.11n( HT 40): 2422~2452MHz
<b>Number of Channels</b>	277CH (WCDMA Band II) and 102CH (WCDMA Band V)
<b>Modulation</b>	QPSK
<b>FCC ID</b>	ZAZIR6X5WAP

### 3. MODIFICATION

NONE

## 4. TEST SUMMARY

**The product was tested in accordance with the following specifications.  
All testing has been performed according to below product classification:**

**Spread Spectrum System/Device**

**Test Results Summary**

Test Standard	Description	Product Class	Pass / Fail
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	See Above	Pass

**Note: Only tested spurious emission in this report, for other module RF test data (Module FCC ID: QISEM770W), please refer to report: SYBHZ(R)E024102009EB-2;SYBHZ(R)E024102009EB-3**



# **5. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS**

## **5.1 §2.1053, §22.917 & §24.238 - Spurious Radiated Emissions**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is ±6.0dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions
 

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1018mbar
5. Test date : March 18, 2013  
Tested By : Deon Dai

**Standard Requirement:**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. The spectrum is scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

**Procedures:**

Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. The EUT was tested at low, mid and high with the highest output power. An emission was scan up to 10<sup>th</sup> harmonic of the operating frequency.

Sample Calculation:

EUT Field Strength = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)

**Test Result: Pass**

**For IR615WH01-AP**

**WCDMA Band II (Part 24E)**

**Low channel**

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
32.18	-49.52	98	101	V	-17.1	0.5	0	-67.12	-13	-54.12
748.65	-51.22	199	210	H	6.4	1.5	0	-46.32	-13	-33.32
2726	-45.24	144	110	V	9.4	8.34	0	-44.18	-13	-31.18
2726	-48.13	360	189	H	9.4	8.34	0	-47.07	-13	-34.07

**Middle channel**

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
48.11	-53.25	236	100	V	-4.4	0.67	0	-58.32	-13	-45.32
761.56	-56.25	149	200	H	6.4	1.84	0	-51.69	-13	-38.69
2435	-46.84	198	101	V	9.4	7.33	0	-44.77	-13	-31.77
3435	-50.08	209	210	H	9.4	7.33	0	-48.01	-13	-35.01

**High channel**

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
50.19	-51.25	213	108	V	-4.4	0.67	0	-56.32	-13	-43.32
769.44	-54.14	211	199	H	6.4	1.84	0	-49.58	-13	-36.58
2721	-46.15	108	100	V	9.4	8.34	0	-45.09	-13	-32.09
2721	-49.99	198	200	H	9.4	8.34	0	-48.93	-13	-35.93

## WCDMA Band V (Part 22H)

### Low channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
33.14	-54.14	143	120	V	-17.1	0.67	0	-71.91	-13	-58.91
749.35	-59.14	265	200	H	6.4	1.5	0	-54.24	-13	-41.24
2731	-50.25	143	101	V	9.4	8.5	0	-49.35	-13	-36.35
2731	-53.95	287	200	H	9.4	8.5	0	-53.05	-13	-40.05

### Middle channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
31.18	-54.25	144	120	V	-17.1	0.5	0	-71.85	-13	-58.85
750.91	-56.14	13	210	H	6.4	1.5	0	-51.24	-13	-38.24
2733	-50.14	299	100	V	9.4	7.33	0	-48.07	-13	-35.07
2733	-53.25	355	188	H	9.4	7.33	0	-51.18	-13	-38.18

### High channel

Frequency (MHz)	Substituted level (dBm)	Direction (degree)	Height (cm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Amplifier (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
48.35	-55.11	211	100	V	-4.4	0.67	0	-60.18	-13	-47.18
749.14	-54.84	199	200	H	6.4	1.5	0	-49.94	-13	-36.94
2705	-48.25	188	105	V	9.4	8.34	0	-47.19	-13	-34.19
2705	-50.14	269	200	H	9.4	8.34	0	-49.08	-13	-36.08

**Annex A. TEST INSTRUMENT & METHOD**

**Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES**

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
<b>Radiated Emissions</b>				
Hp Spectrum Analyzer	8563E	3821A09023	01/10/2013	01/09/2014
R&S EMI Receiver	ESPI3	101216	10/27/2012	10/26/2013
Antenna (30MHz~6GHz)	JB6	A121411	12/28/2012	12/27/2013
ETS-Lindgren Antenna(1 ~18GHz)	3115	N/A	10/29/2012	10/28/2013
A- INFOMW Antenna (1 ~18GHz)	JXTXLB- 10180	J2031081120 092	06/25/2012	06/24/2013
Horn Antenna (18~40GHz)	AH-840	101013	04/22/2012	04/22/2013
Microwave Pre-Amp (18~40GHz)	PA-840	181250	05/30/2012	05/29/2013
Hp Agilent Pre-Amplifier	8447F	1937A01160	11/03/2012	11/02/2013
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	AMF-7D- 00101800- 30-10P	1451709	11/03/2012	11/02/2013
Universal Radio Communication Tester	CMU200	104031	10/27/2012	10/26/2013
Chamber	3m	N/A	04/13/2012	04/12/2013

**Annex A. ii. RADIATED EMISSIONS TEST DESCRIPTION**

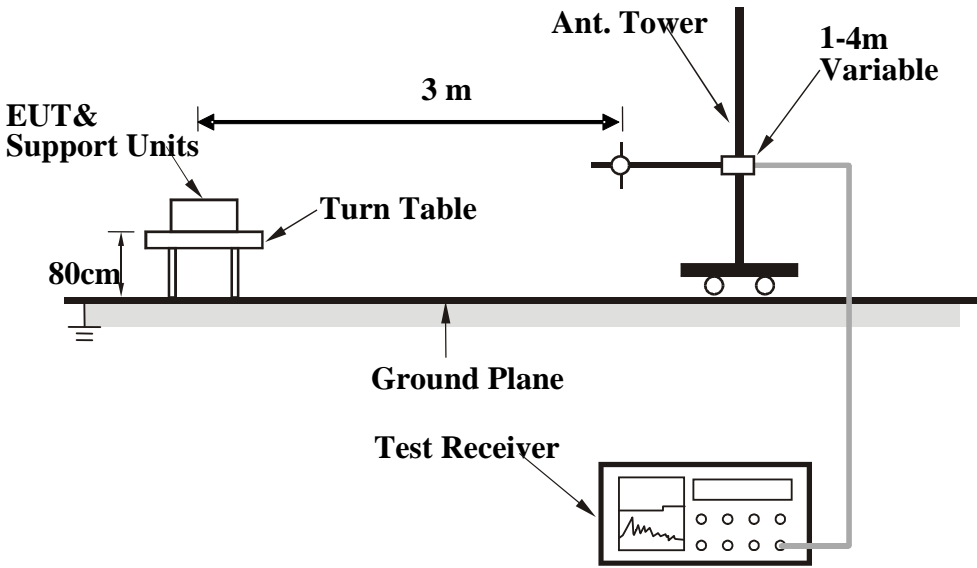
**EUT Characterisation**

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 10<sup>th</sup> harmonic for operating frequencies  $\geq 108$ MHz), was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer/receiver with the appropriate broadband antenna placed 3m or 10m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or EMC 3m chamber.

**Test Set-up**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



**Test Method**

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

**Final Radiated Emission Measurement**

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site or EMC 10m chamber. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

**Description of Radiated Emission Program**

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

**Sample Calculation Example**

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor or}$$

$$\text{Set RBW} = 1\text{MHz, VBW} = 10\text{Hz.}$$

Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

**Annex B. EUT AND TEST SETUP PHOTOGRAPHS**

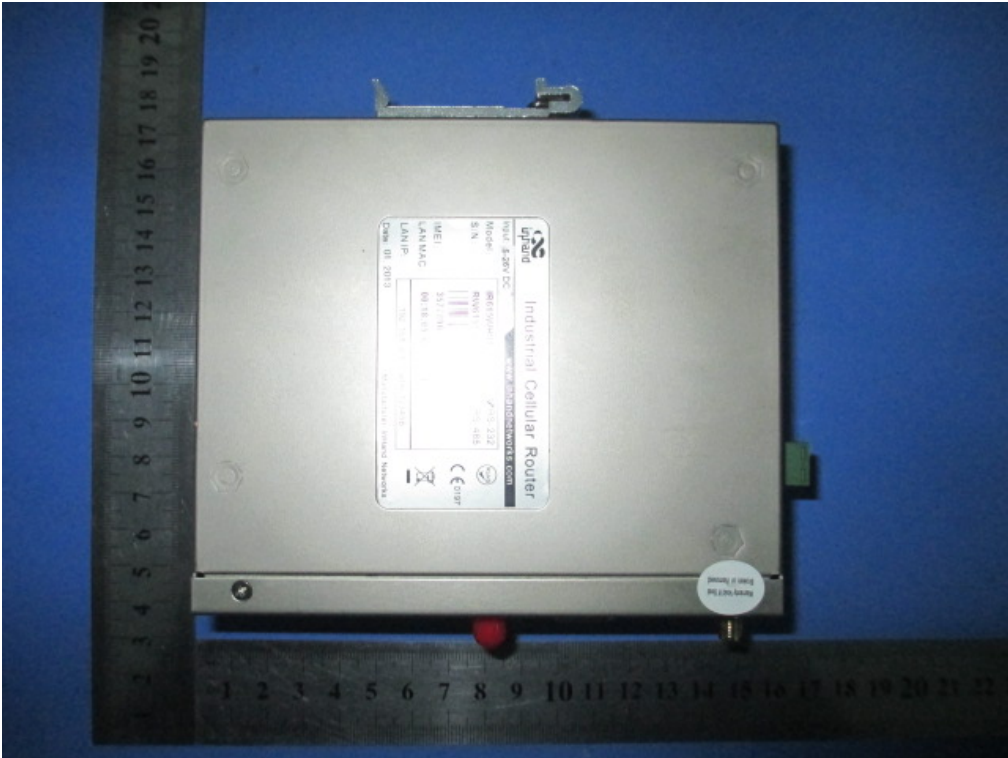
**Annex B.i. Photograph 1: EUT External Photo**



Whole Package View



Top View of EUT



Bottom View of EUT



Front View of EUT





Rear View of EUT



Left View of EUT



Right View of EUT

**Annex B.ii. Photograph 2: EUT Internal Photo**



Cover Off - Front View

2G/3G Antenna

WIFI Antenna



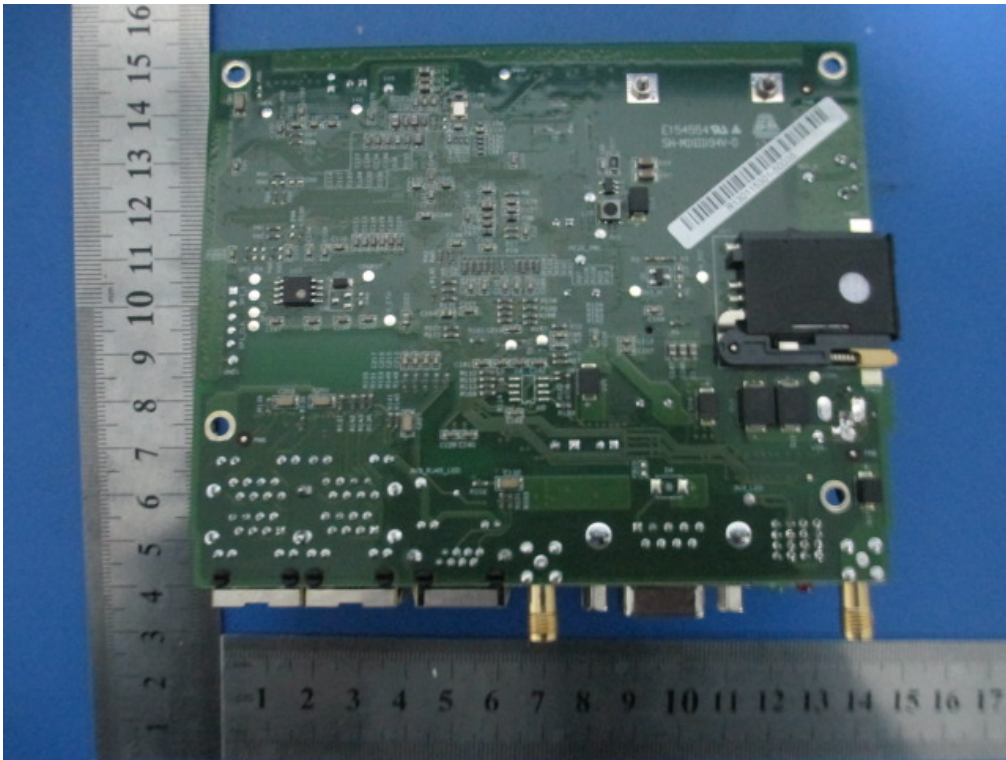
Antenna View



3GModule View for IR615WH01-AP

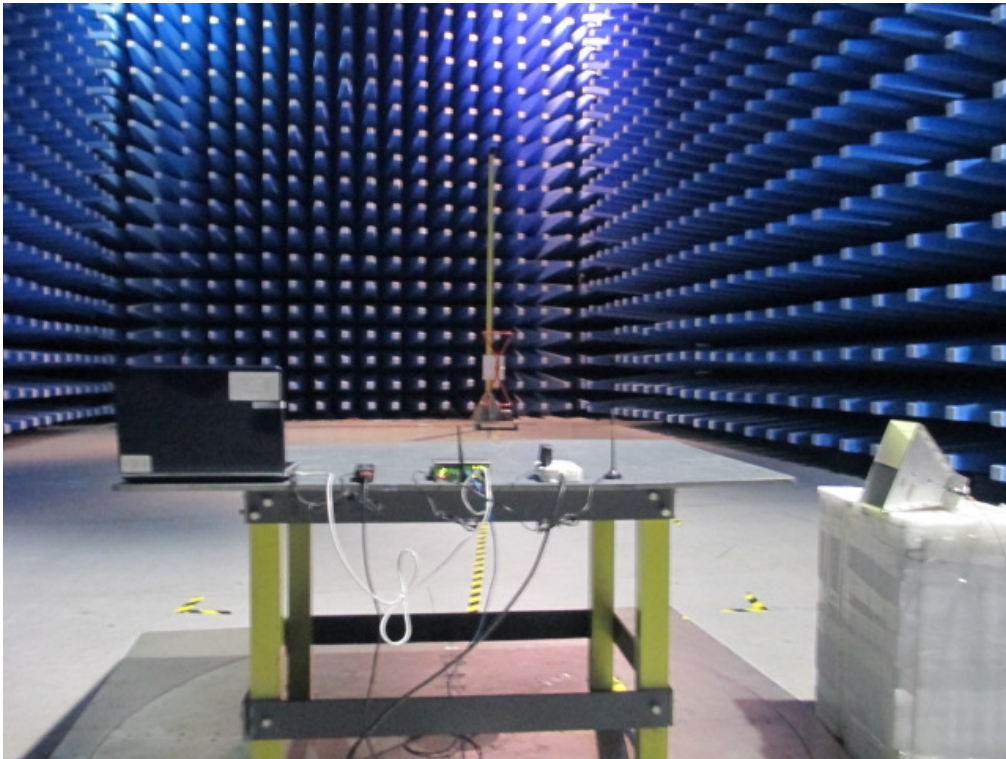


Main Board Front View

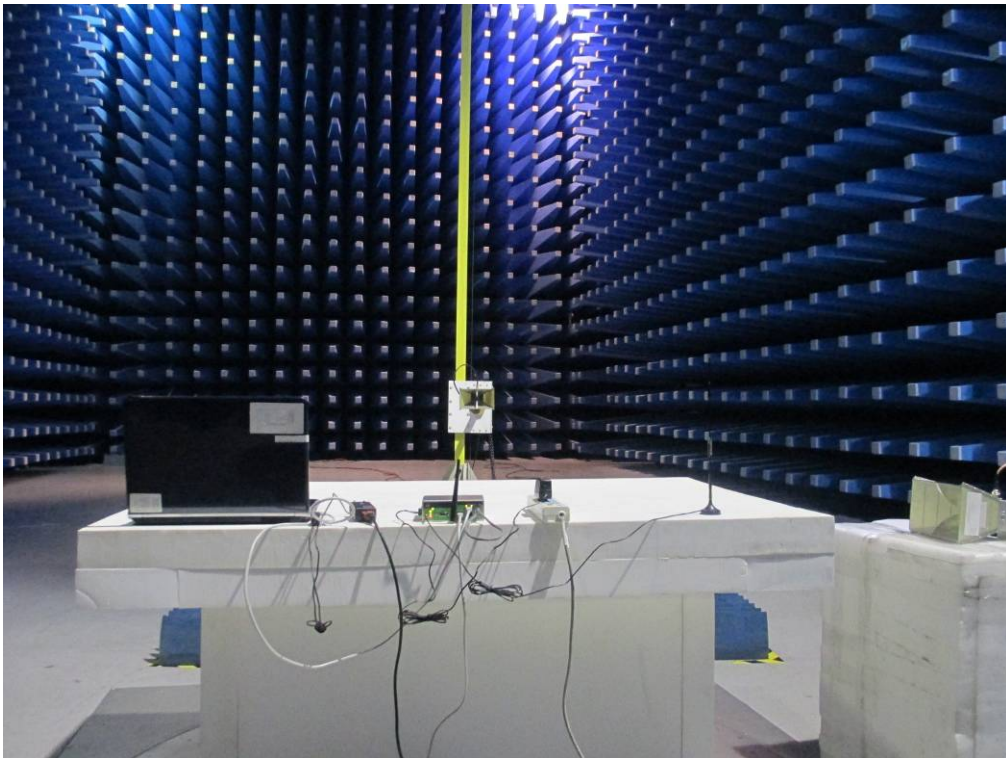


Main Board Rear View

**Annex B.iii. Photograph 3: Test Setup Photo**



Radiated Emissions Test Setup Below 1GHz - Front View



Radiated Emissions Test Setup Above 1GHz - Front View

**Annex C. TEST SETUP AND SUPPORTING EQUIPMENT**

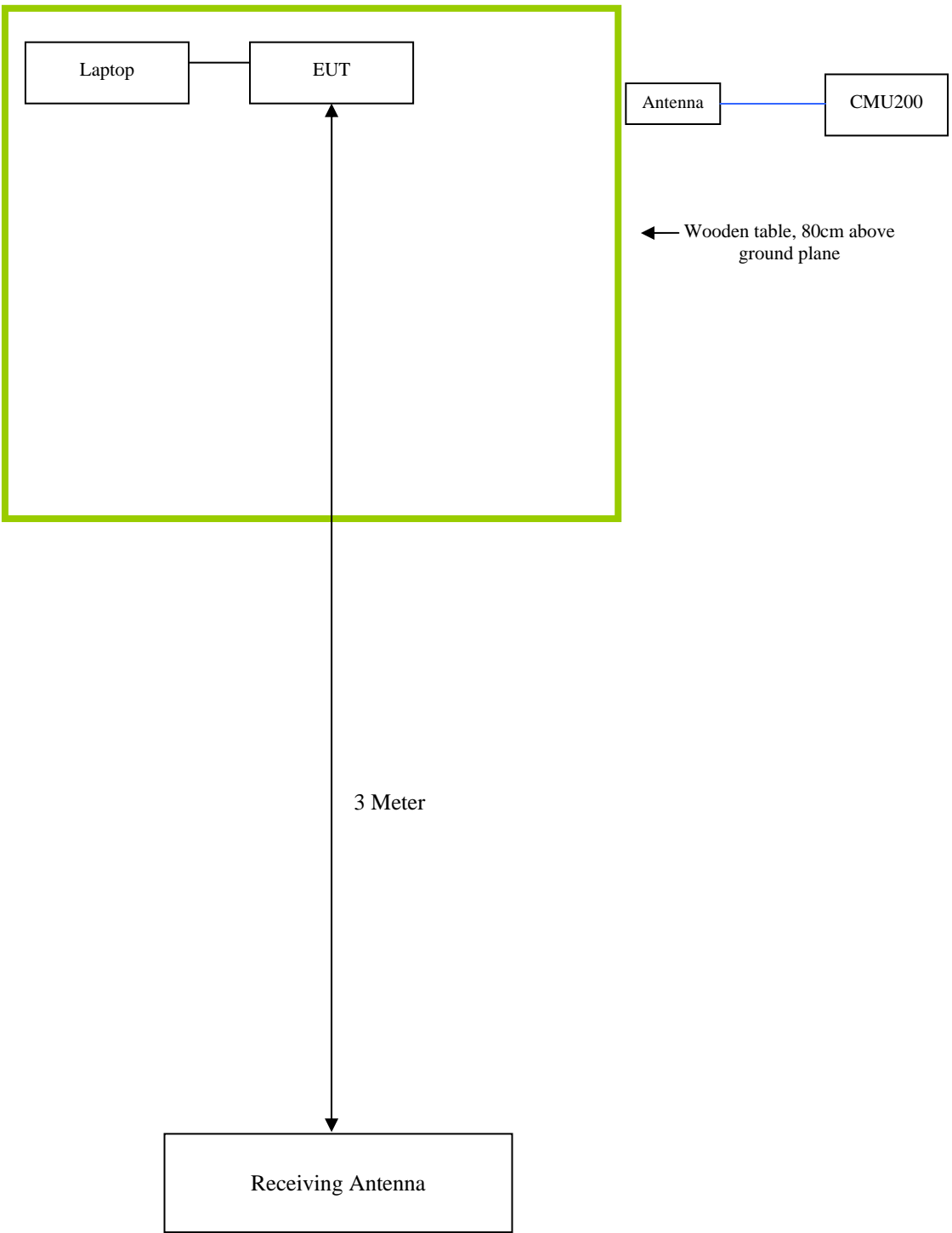
**EUT TEST CONDITIONS**

**Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION**

The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Gateway Laptop	MS2288 & LXWHF02013951C3CA92200	N/A
Universal Radio Communication Tester	CMU200	N/A

**Block Configuration Diagram for Radiated Emissions**





**Annex C.ii. EUT OPERATING CONDITIONS**

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
<b>Emissions Testing</b>	The EUT was communicating with base station and set to work at maximum output power.

**Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST**

**Please see attachment**

**Annex E. DECLARATION OF SIMILARITY**

**Declaration letter**

Beijing InHand Networks Technology Co., Ltd

To: SIEMIC Nanjing (China) Laboratories  
No.2-1 Longcang Dadao  
Yuhua Economic Development Zone  
Nanjing, P.R.China

Dear Sir,

For our business issue and marketing requirement, we would like to list different models numbers on the CE/FCC certificates and reports, as following:

Model No.: IR615WH01-AP

- IR605WH01-AP      IR605WH01-STA
- IR695WH01-AP      IR615WH01-STA
- IG605WH01-AP      IR695WH01-STA
- IG615WH01-AP      IG605WH01-STA
- IG695WH01-AP      IG615WH01-STA
- IG695WH01-STA

The twelve models are the same in these: appearance,PCB layout,and basic software function;The differences are as follows:

Ia6b5WH01-c		
【a】	【b】	【c】
R:router	0: basic SW function	AP: Wi-Fi AP
G:gateway	1: support VPN (IPsec/PPTP/L2TP)	STA: Wi-Fi client
	9: support VPN\CA certificate\SSL	

【a】, 【b】, 【c】 is software different only;  
Thank you!

Signature: 王标  
Printed name/title: Wangbiao/ EMC engineer  
Address: WestWing 11th Floor, Buiding G, Wangjing Science Park, Chaoyang District, Beijing