Relay2, Inc.

Wireless Router

Main Model: R2-CAP-ND-900N
Serial Model: N/A

November 13, 2013

Report No.: 13070456-FCC-E

(This report supersedes NONE)

Modifications made to the product : None		
This Test Report is Issued Under the Authority of:		
Herith shi	Alex Liu	
Herith Shi **Compliance Engineer**	**Alex Liu** **Technical Manager**	

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

EMC Test Report

To:FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009

SIEMIC, INC.
Accessing global markets

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management through out a project. Our extensive experience with China, Asia Pacific, North America, European, and international compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

SIEMIC (Shenzhen-China) Laboratories Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

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CONTENTS

1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programmers was to demonstrate compliance of the Relay2, Inc., Wireless Router and Model: R2-CAP-ND-900N against the current Stipulated Standards. The Wireless Router has demonstrated compliance with the FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009.

EUT Information

EUT Description	:	**Wireless Router**
Main Model	:	**R2-CAP-ND-900N**
Serial Model		**N/A**
Antenna Gain	:	**WIFI 2.4GHz: 3 dBi** **WIFI 5GHz: 5 dBi**
Input Power	:	**Adapter:** **Model:FSP025-1AD207A** **Input: AC 100-240V 50/60Hz 0.7A** **Output: DC 48V 0.52A**
Classification Per Stipulated Test Standard	:	**Class B Emission Product Per** **FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009**

2 TECHNICAL DETAILS

Purpose	**Compliance testing of Wireless Router with stipulated standards**
Applicant / Client	**Relay2, Inc. 1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA**
Manufacturer	**N/A**
Laboratory performing the tests	**SIEMIC (Shenzhen-China) Laboratories Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China Tel: +86-0755-2601 4629 / 2601 4953 Fax: +86-0755-2601 4953-810 Email: China@siemic.com.cn**
Test report reference number	**13070456-FCC-E**
Date EUT received	**October 10, 2013**
Standard applied	**FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009**
Dates of test (from – to)	**October 10 to November 12, 2013**
No of Units	**#1**
Equipment Category	**JBP**
Trade Name	**Verykool**
RF Operating Frequency (ies)	**WIFI(802.11a/b/g/n20): 2412-2462 MHz; 5180-5240 MHz; 5745-5825MHz WIFI (802.11n40): 2422-2452 MHz; 5190-5230 MHz; 5755-5795 MHz**
Number of Channels	**WIFI 2.4G(802.11a/b/g/n-20): 11CH WIFI 5.18-5.24G(802.11a/ n-20): 8CH WIFI 5.745-5.825G(802.11a/ n-20): 5CH WIFI 2.4G(n-40): 7CH WIFI 5.19-5.23G(n-40):2CH WIFI 5.755-5.795G(n-40): 2CH**
Modulation	**WIFI(802.11a/b/g/n): DSSS/OFDM**
FCC ID	**2AAA9-R2CAPND900N**

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:

Class B Emission Product

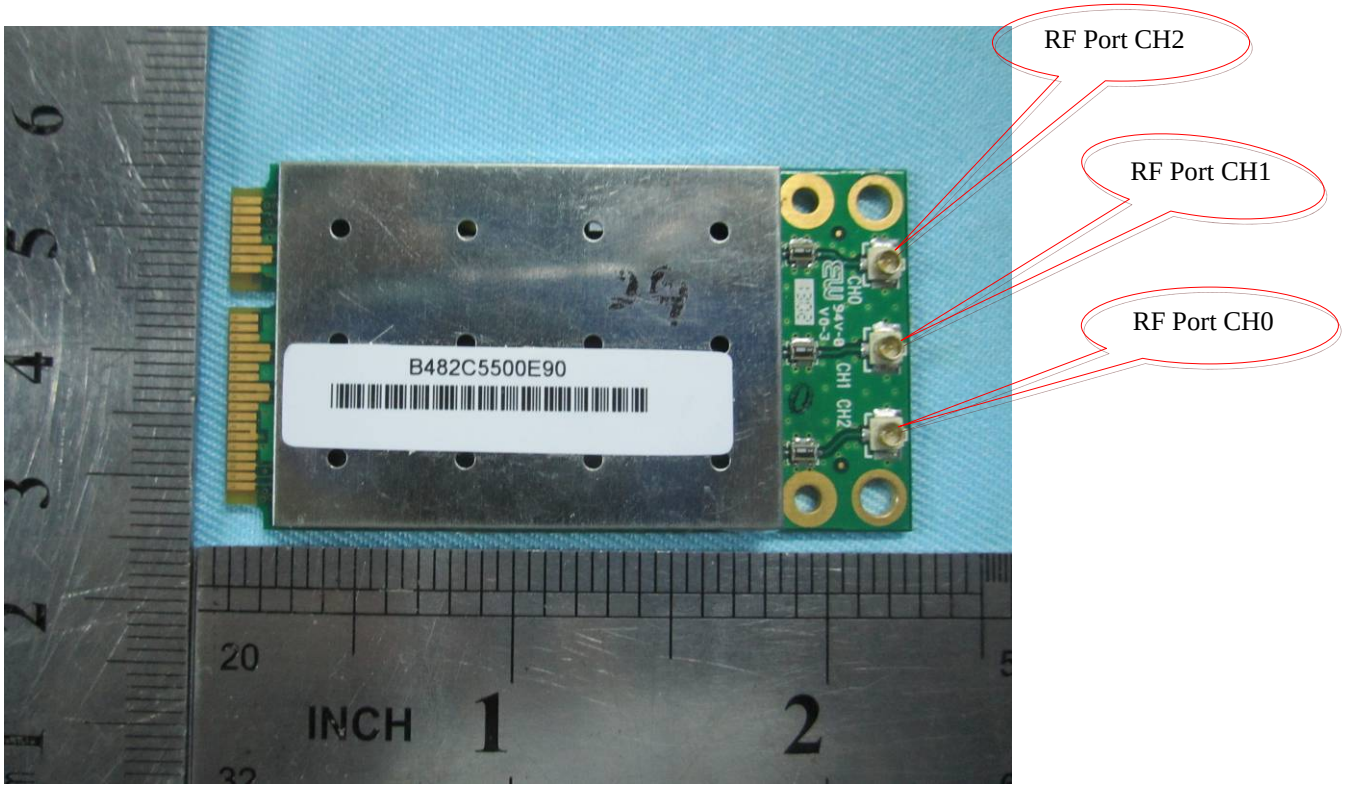
Test Results Summary

Emissions			
Test Standard	**Description**	**Product Class**	**Pass / Fail**
FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009	Conducted Emissions	See Above	Pass
FCC Part 15 Subpart B Class B: 2013, ANSI C63.4: 2009	Radiated Emissions	See Above	Pass

All measurement uncertainty is not taken into consideration for all presented test result.

A. Table for RF Out Put

The RF board has three RF out port: CH0; CH1; CH2



B. Table for frequency list

For 2.4G band

802.11b\g\n-20		802.11n-40	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447		
9	2452		
10	2457		
11	2462		

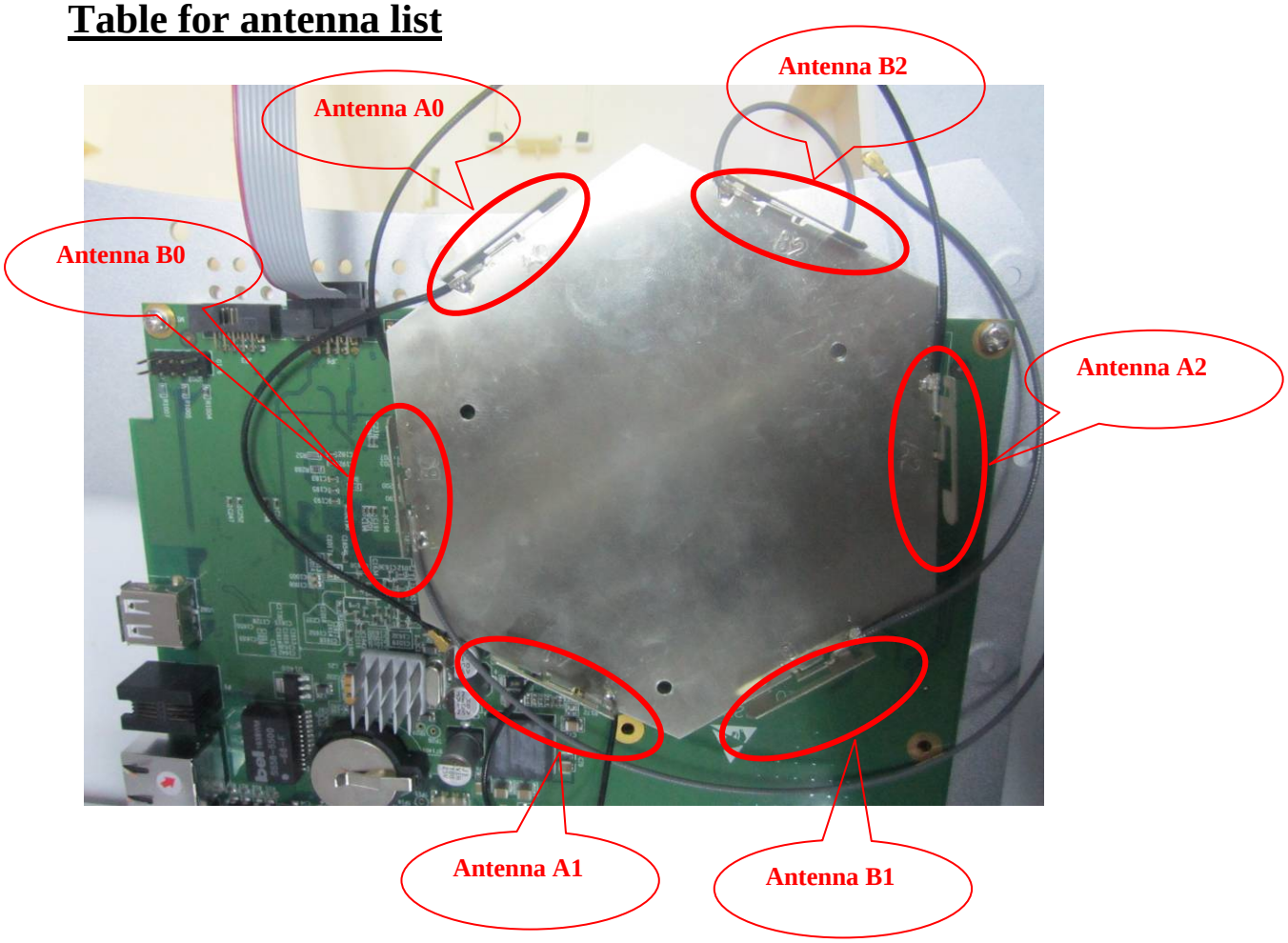
For 5.18-5.24G band

802.11a\n-20		802.11n-40	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190
40	5200	46	5230
44	5220		
48	5240		

For 5.755-5.795G band

802.11a\n-20		802.11n-40	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755
153	5765	159	5795
157	5785		
161	5805		
165	5825		

Table for antenna list



For 2.4GHz MIMO mode: the three IFA (Antenna A0; A1; A2, is for 2.4GHz) antennas is fixed on a metal plate. The antenna is a Sectorized antenna; the gain is 3 dBi is including all of the antennas.

For 5GHz MIMO mode: the three IFA (Antenna B0; B1; B2, is for 5GHz) antennas is fixed on a metal plate. The antenna is a Sectorized antenna; the gain is 5 dBi is including all of the antennas.

MIMO antenna requirement according with KDB 662911 section F

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 Conducted Emissions Test Result

Note:

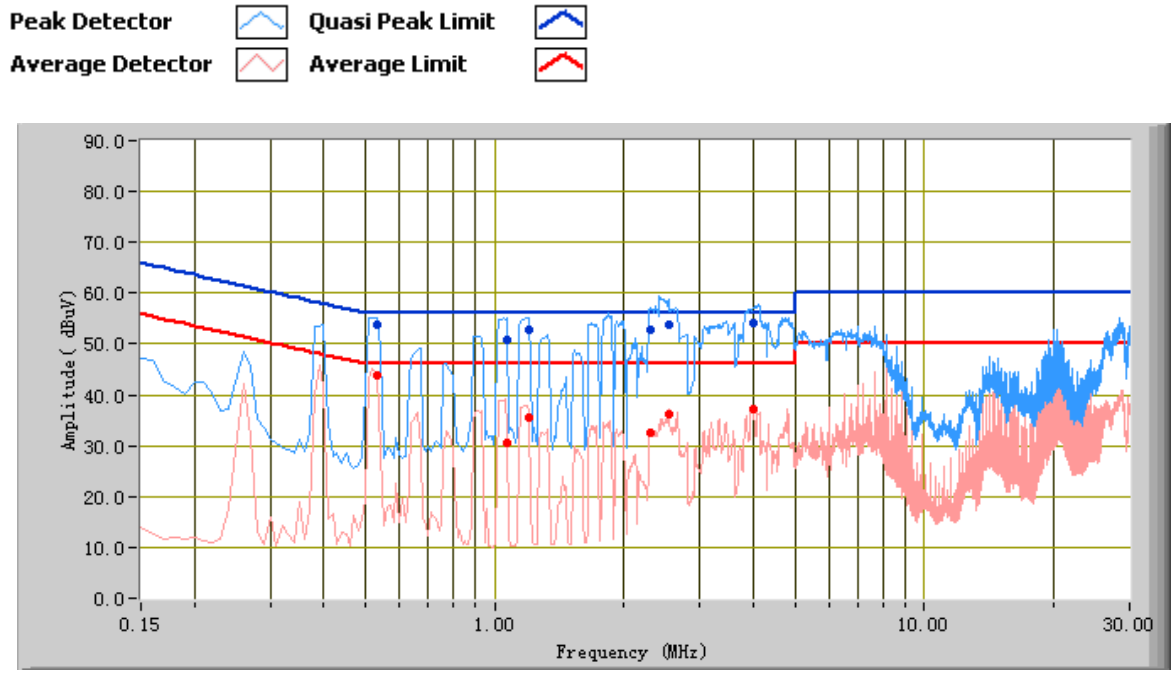
1. All possible modes of operation were investigated. Only the several worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted 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 9kHz – 30MHz (Average & Quasi-peak) is ±3.86dB.
4. Environmental Conditions

Temperature	25ºC
Relative Humidity	50%
Atmospheric Pressure	1009mbar

5. Test date : ,November 06, 2013
   Tested By : Herith Shi

Test Result: Pass

Test Mode:	Ping the Router

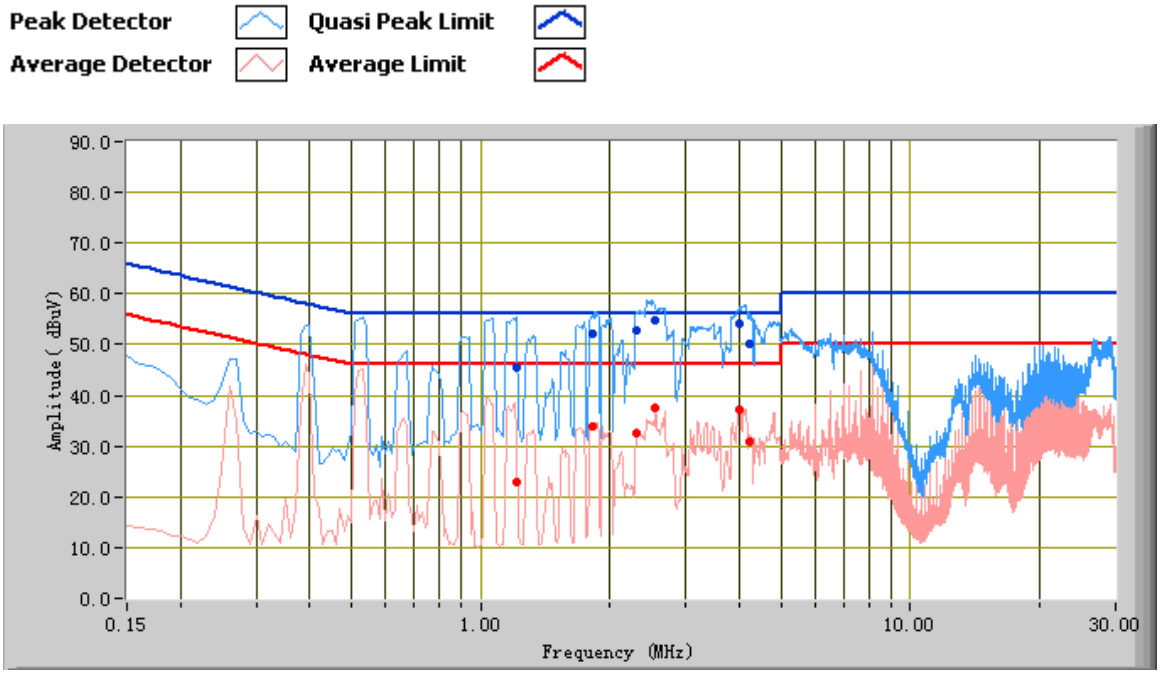


Test Data

Phase Line Plot at 120V AC, 60Hz

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
2.54	53.69	56.00	-2.31	36.12	46.00	-9.88	10.13
3.98	54.27	56.00	-1.73	37.31	46.00	-8.69	10.17
2.30	52.74	56.00	-3.26	32.51	46.00	-13.49	10.12
0.53	53.72	56.00	-2.28	43.89	46.00	-2.11	10.10
1.20	52.95	56.00	-3.05	35.37	46.00	-10.63	10.10
1.07	50.90	56.00	-5.10	30.54	46.00	-15.46	10.10

Test Mode:	Ping the Router



Test Data

Phase Natural Plot at 120V AC, 60Hz

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
2.54	54.82	56.00	-1.18	37.43	46.00	-8.57	10.13
3.98	54.10	56.00	-1.90	37.16	46.00	-8.84	10.17
2.30	52.72	56.00	-3.28	32.68	46.00	-13.32	10.12
1.82	52.30	56.00	-3.70	33.96	46.00	-12.04	10.11
4.22	50.02	56.00	-5.98	30.83	46.00	-15.17	10.17
1.21	45.44	56.00	-10.56	23.00	46.00	-23.00	10.10

5.2 Radiated Emissions Test Result

Note:

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 30MHz – 1GHz (QP only @ 3m & 10m) is +6dB/-6dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

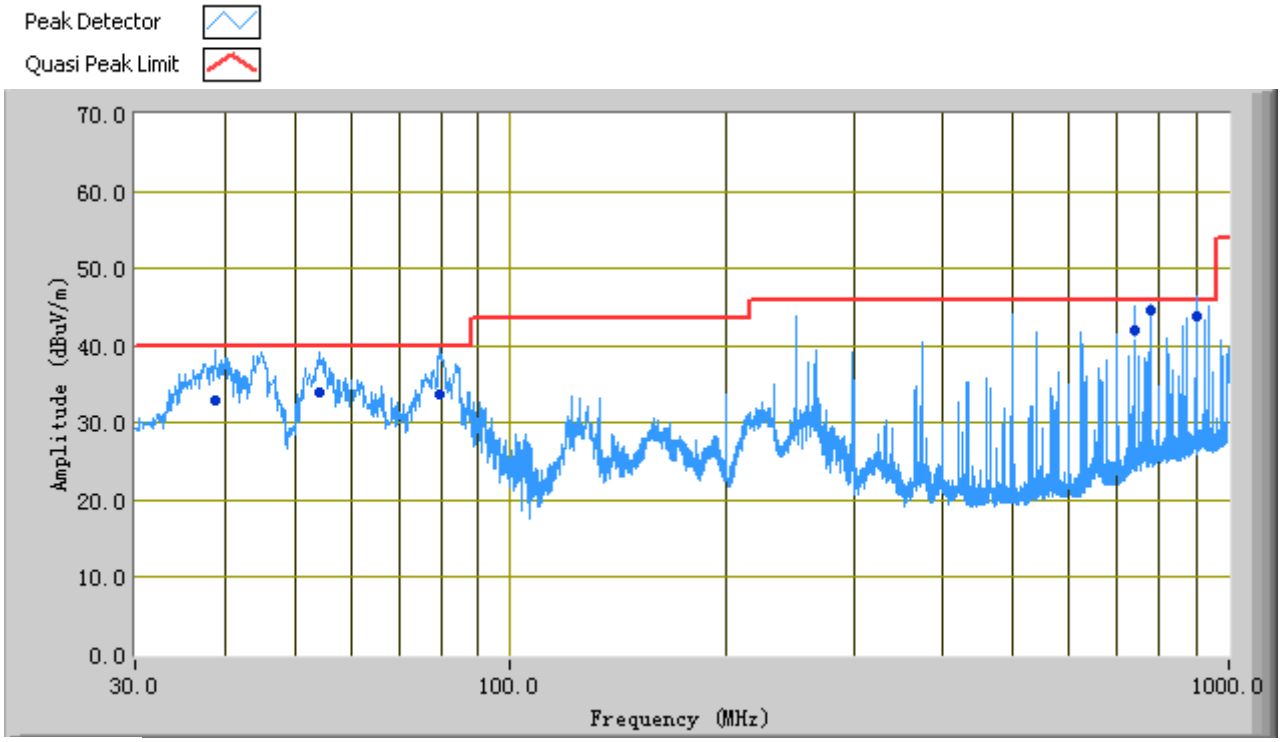
Temperature	25ºC
Relative Humidity	50%
Atmospheric Pressure	1009mbar

5. Test date : November 08, 2013
   Tested By : Herith Shi

Test Result: Pass

Test Mode:	Ping the Router

Below 1GHz



Test Data

Frequency (MHz)	Quasi Peak (dBuV/m)	Azimuth	Polarity(H/V)	Height (cm)	Factors (dB)	Limit (dBuV)	Margin (dB)
780.01	44.79	182.00	H	107.00	2.89	46.00	-1.21
740.05	42.06	190.00	H	117.00	1.69	46.00	-3.94
900.04	43.79	150.00	H	178.00	4.77	46.00	-2.21
79.76	33.71	227.00	V	119.00	-13.75	40.00	-6.29
38.78	32.90	116.00	V	126.00	-6.66	40.00	-7.10
53.96	33.92	252.00	V	174.00	-13.99	40.00	-6.08

Note: The data above 1 GHz which below 20 dB to the limit was not recorded.

Annex A. TEST INSTRUMENTATION & GENERAL PROCEDURES

Annex A.i. TEST INSTRUMENTATION

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
AC Line Conducted Emissions				
EMI test receiver	ESL6	100262	11/19/2012	11/19/2013
Line Impedance Stabilization Network	LI-125A	191106	11/14/2012	11/13/2013
Line Impedance Stabilization Network	LI-125A	191107	11/14/2012	11/13/2013
Transient Limiter	LIT-153	531118	03/03/2013	03/02/2014
Radiated Emissions				
EMI test receiver	ESL6	100262	11/19/2012	11/19/2013
Positioning Controller	UC3000	MF780208282	11/19/2012	11/19/2013
OPT 010 AMPLIFIER(0.1-1300MHz)	8447E	2727A02430	11/19/2012	11/19/2013
Microwave Preamplifier(0.5～18GHz)	PAM-118	443008	11/08/2013	11/07/2014
Bilog Antenna (30MHz~6GHz)	JB6	A110712	01/27/2013	01/26/2014
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	071283	11/20/2012	11/19/2013

Annex A.ii. AC LINE CONDUCTED EMISSIONS TEST DESCRIPTION

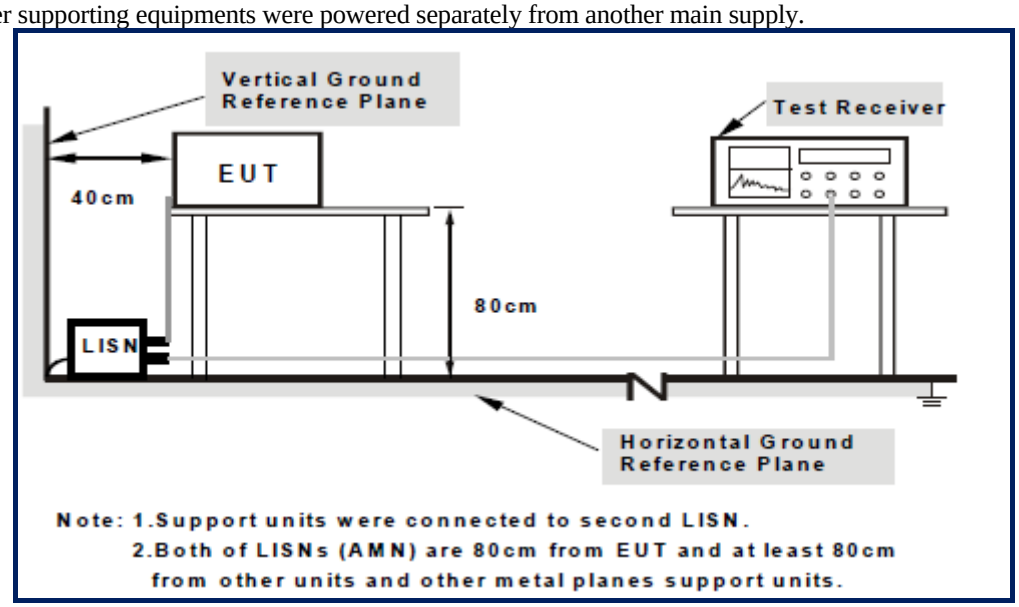
Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.

2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.

3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.

4. All other supporting equipments were powered separately from another main supply.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration1

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.

2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.

3. High peaks, relative to the limit line, were then selected.

4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.

5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Description of Conducted 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 common scan range from 150 kHz to 30 MHz; the program will first start a peak and average scan on selectable measurement time and step size. After the program complete the pre-scan, this program will perform the Quasi Peak and Average measurement, based on the pre-scan peak data reduction result.

Sample Calculation Example

At 20 MHz limit = 250 μV = 47.96 dBμV

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dBμV
(Calibrated for system losses)

Therefore, Q-P margin = 47.96 – 40.00 = 7.96 i.e. **7.96 dB below limit**

Annex A. iii. RADIATED EMISSIONS TEST DESCRIPTION

EUT Characterization

EUT characterisation, over the frequency range from 30MHz to 10th Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

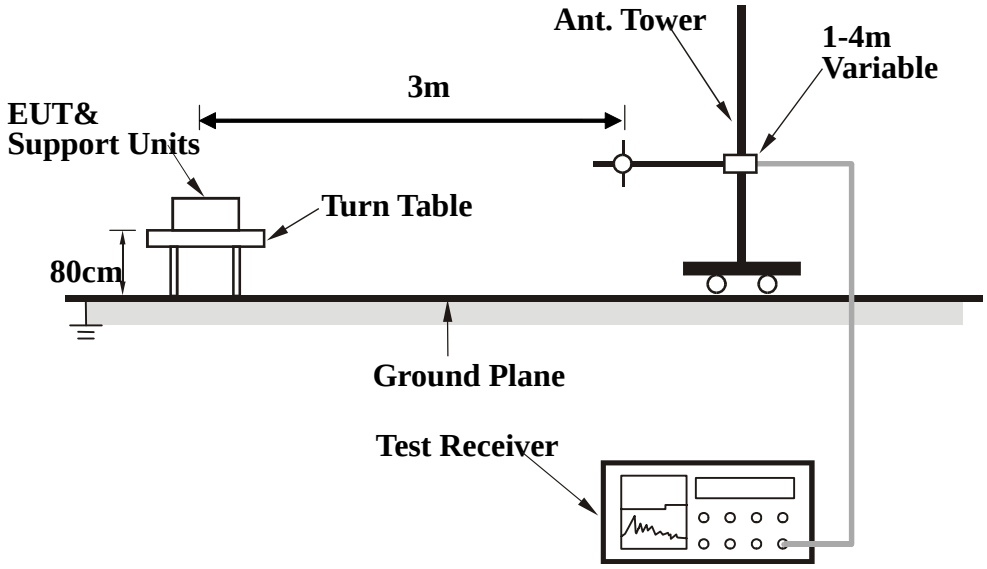
The EUT was placed in the chamber, at a height of about 0.8 m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable 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 3m EMC 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 1.5mX1.0mX0.8m high, non-conductive 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.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration2

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 1GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on an open test site. As the same purpose, for emission frequencies measured above 1GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz 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 was 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	100kHz	100kHz
Above 1000	Peak	1MHz	1MHz
	Average	1MHz	10Hz

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:

Peak = Reading + Corrected Factor

where
Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)
And the average value is

Average = Peak Value + Duty Factor or
Set RBW = 1MHz, VBW = 10Hz.

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 1GHz. 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 - Top View

EUT - Front View

EUT - Rear View

EUT - Top View

EUT - Bottom View

EUT - Left View

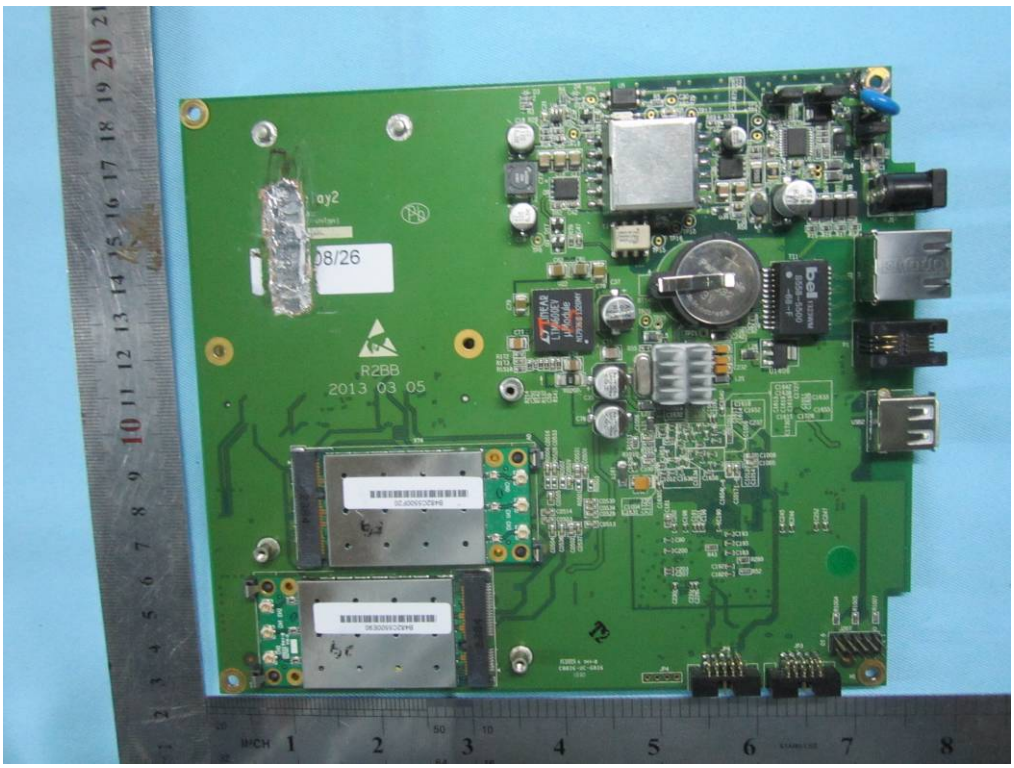
EUT - Right View

Annex B.ii. Photograph 2: EUT Internal Photo

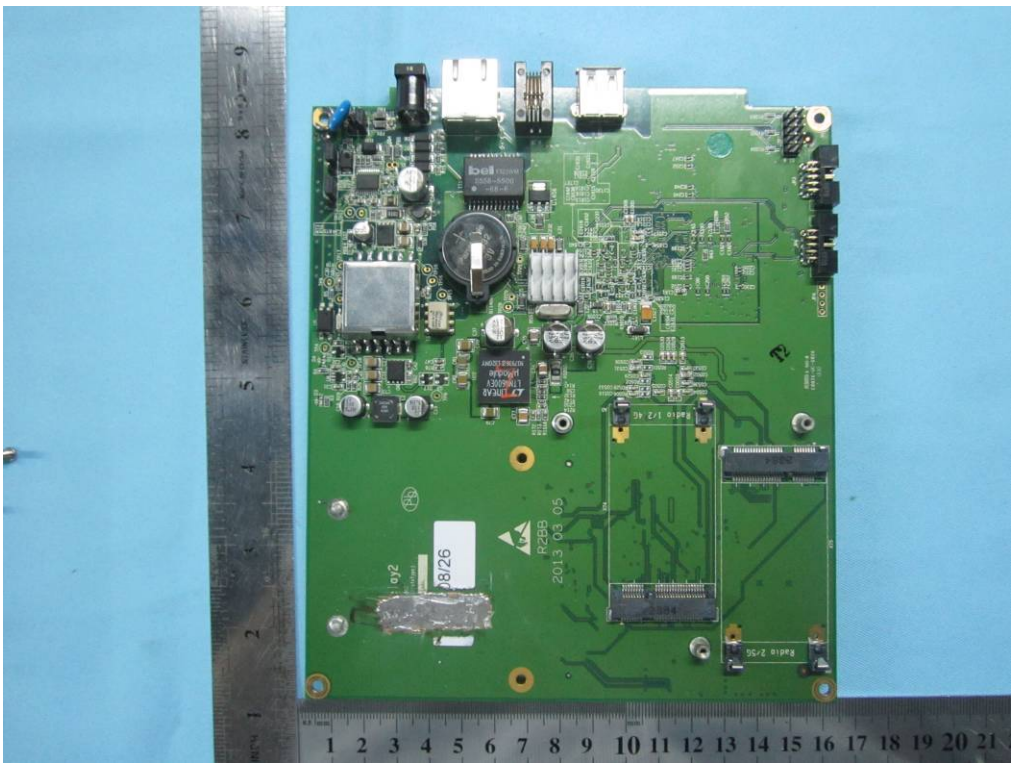
Cover Off - Top View

Adapter-front view

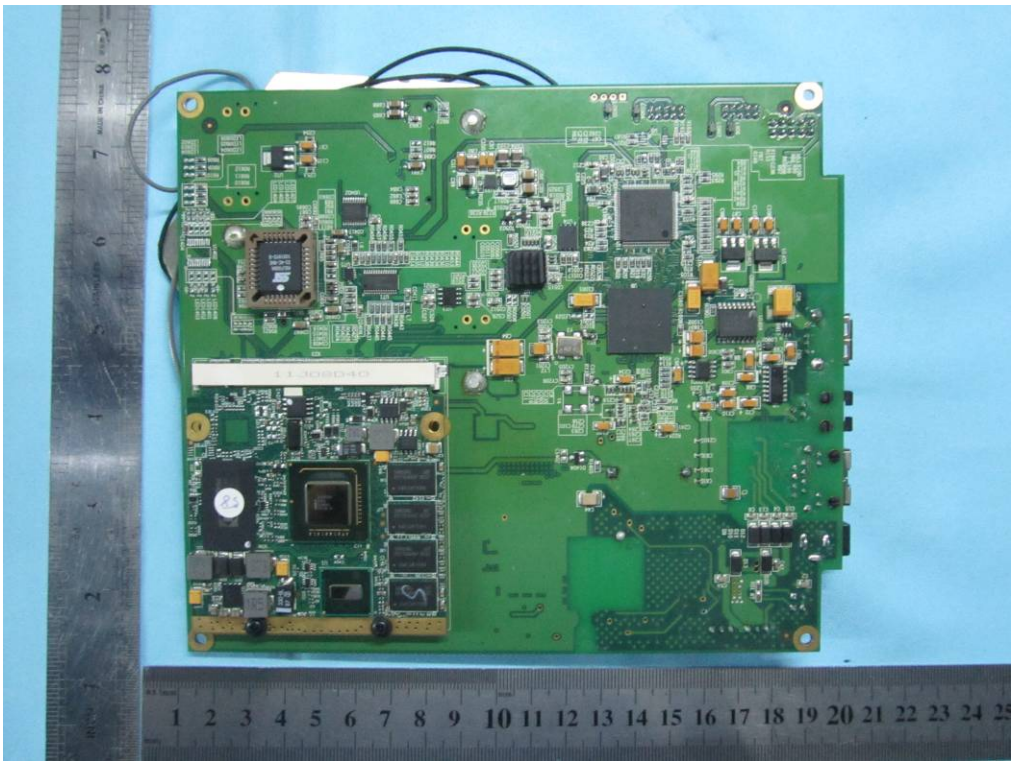
Mainborad - Top View



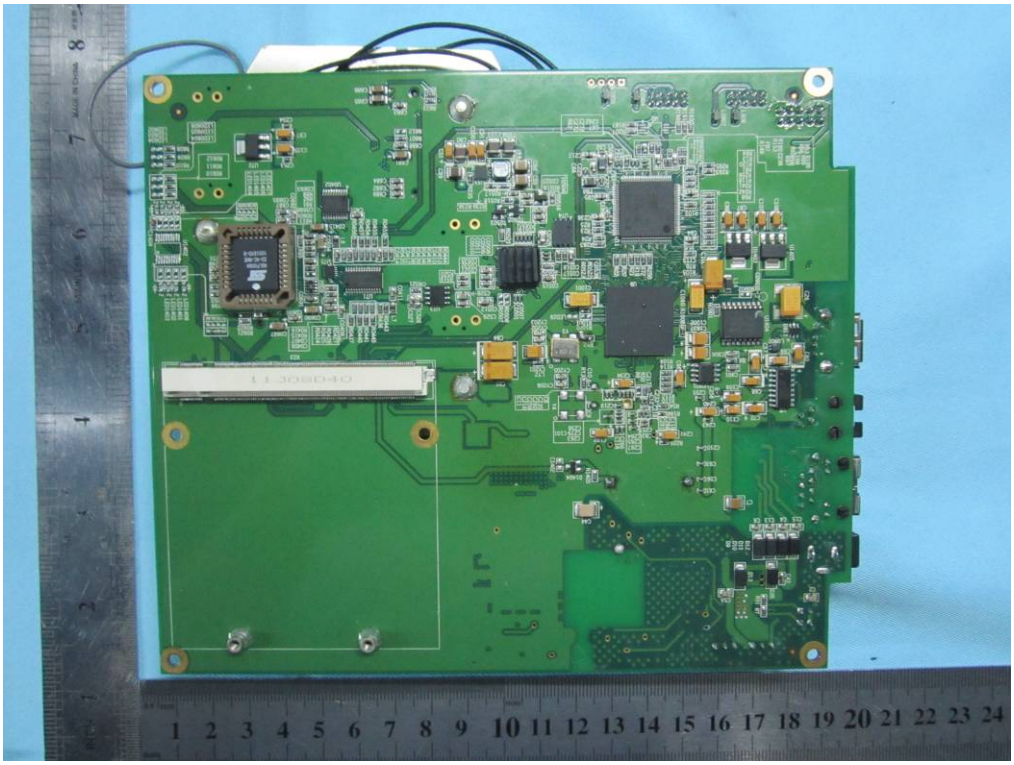
Mainborad Uncover - Top View-1



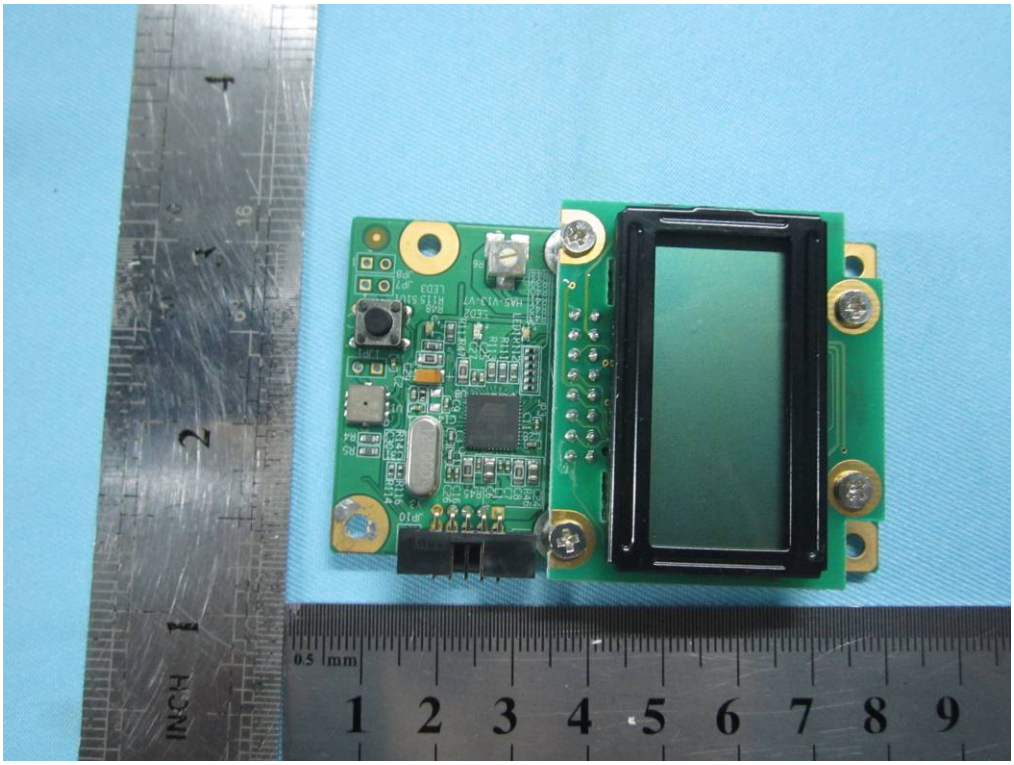
Mainborad Uncover - Top View-2



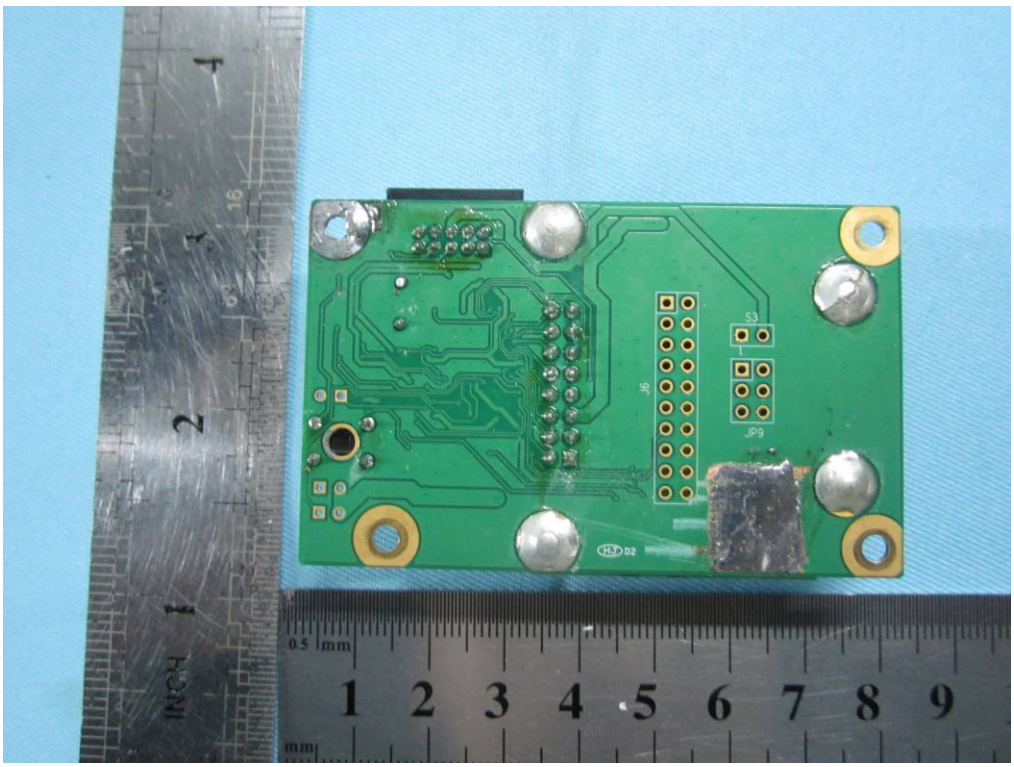
Mainborad - Bottom View



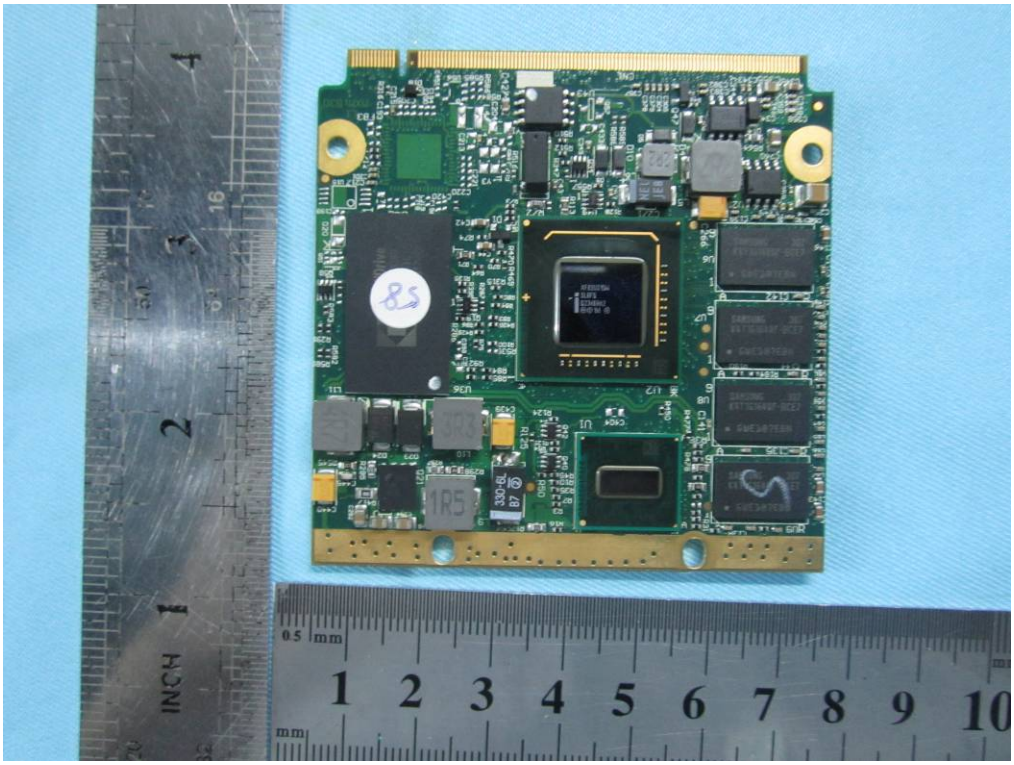
Mainborad Uncover - Bottom View



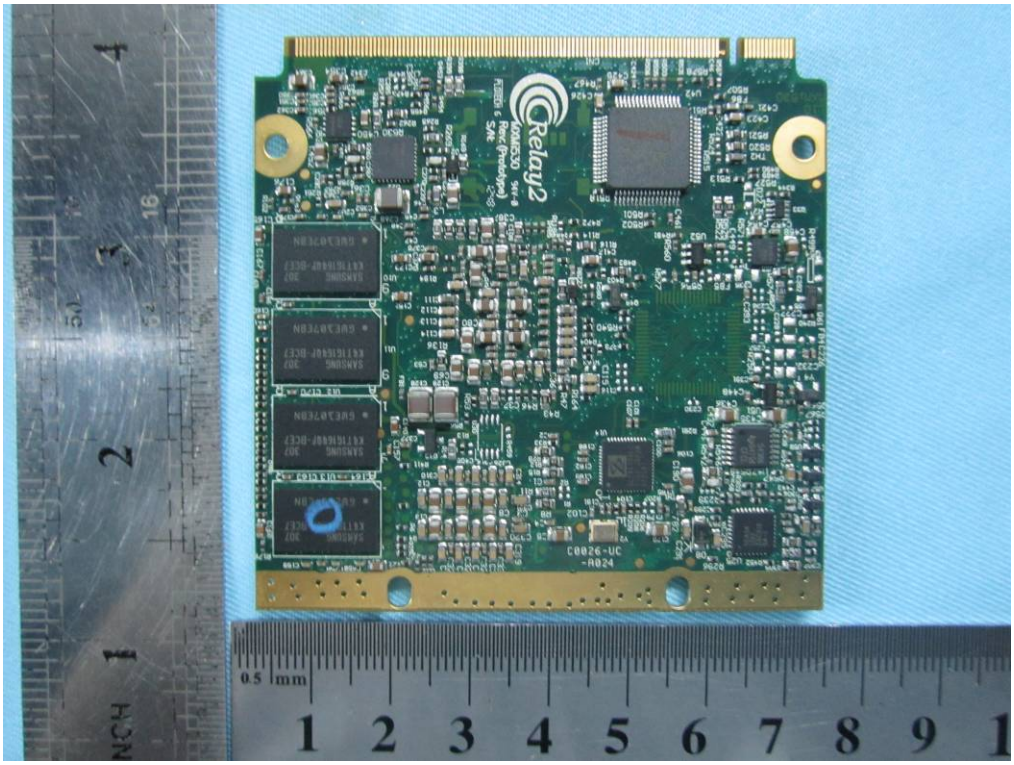
LED board - Top View



LED board - Bottom View

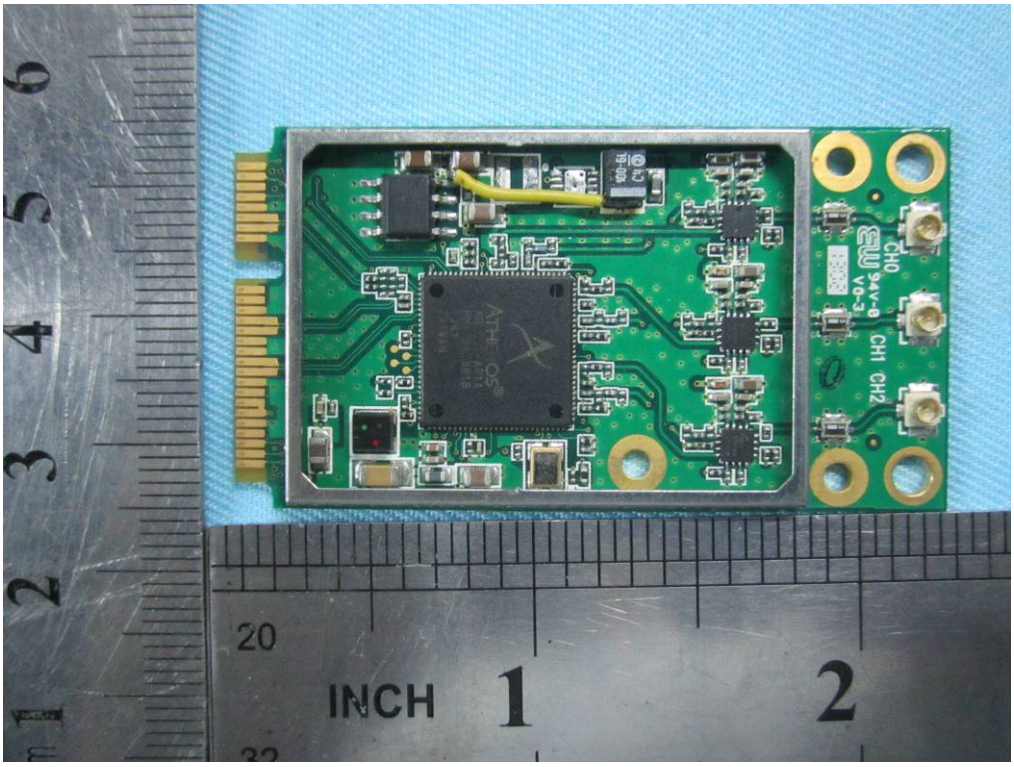


Control board - Top View

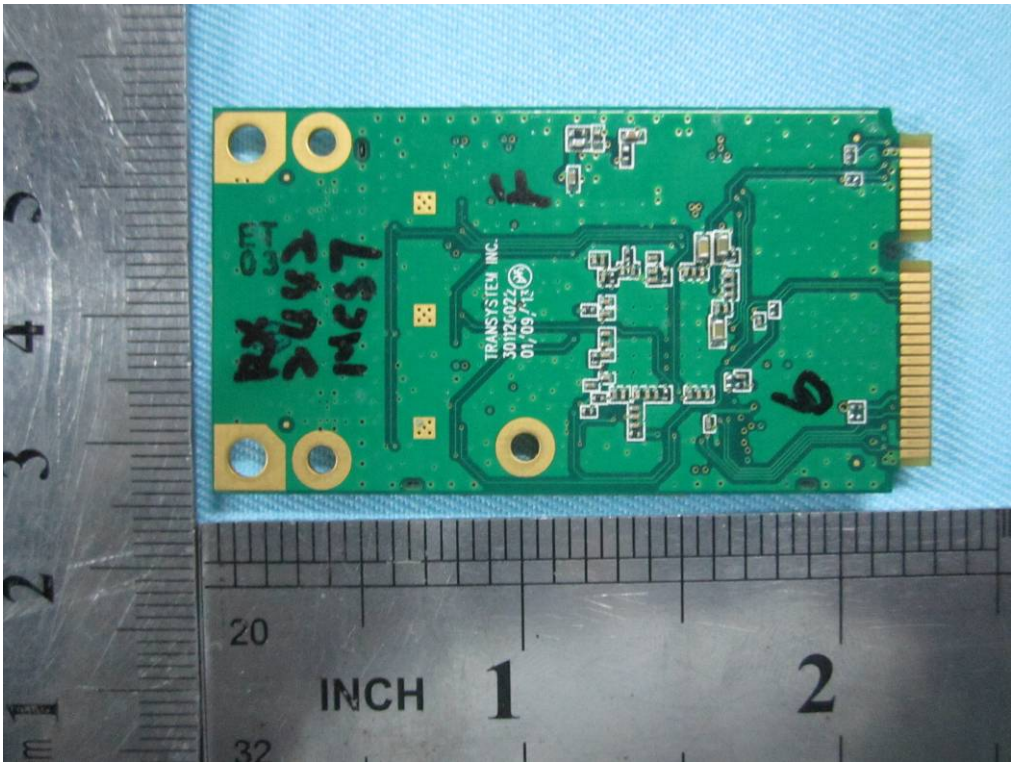


Control board – Botton View

2.4GHz RF board - Top View

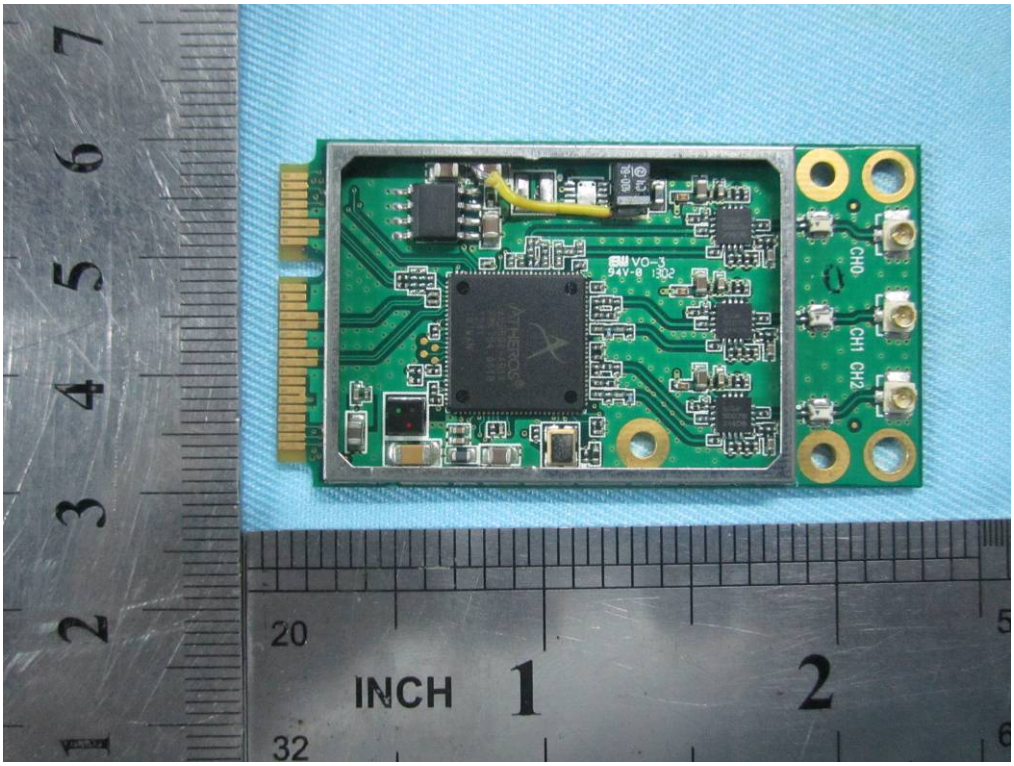


2.4GHz RF board Uncover - Top View

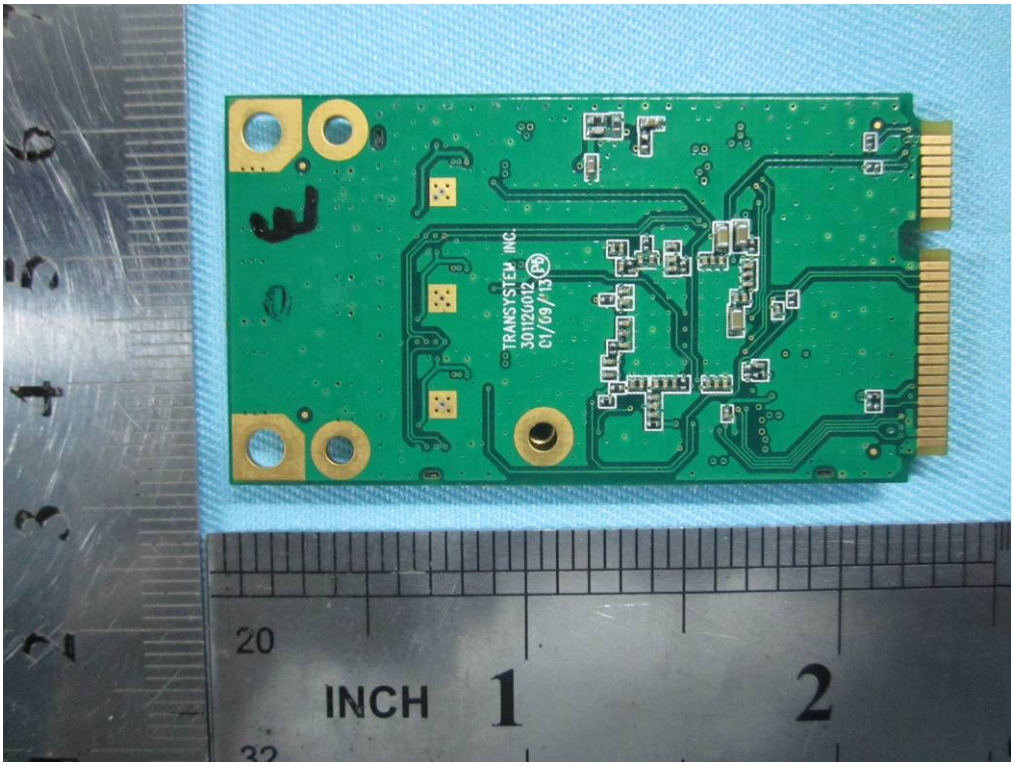


2.4GHz RF board – Botton View

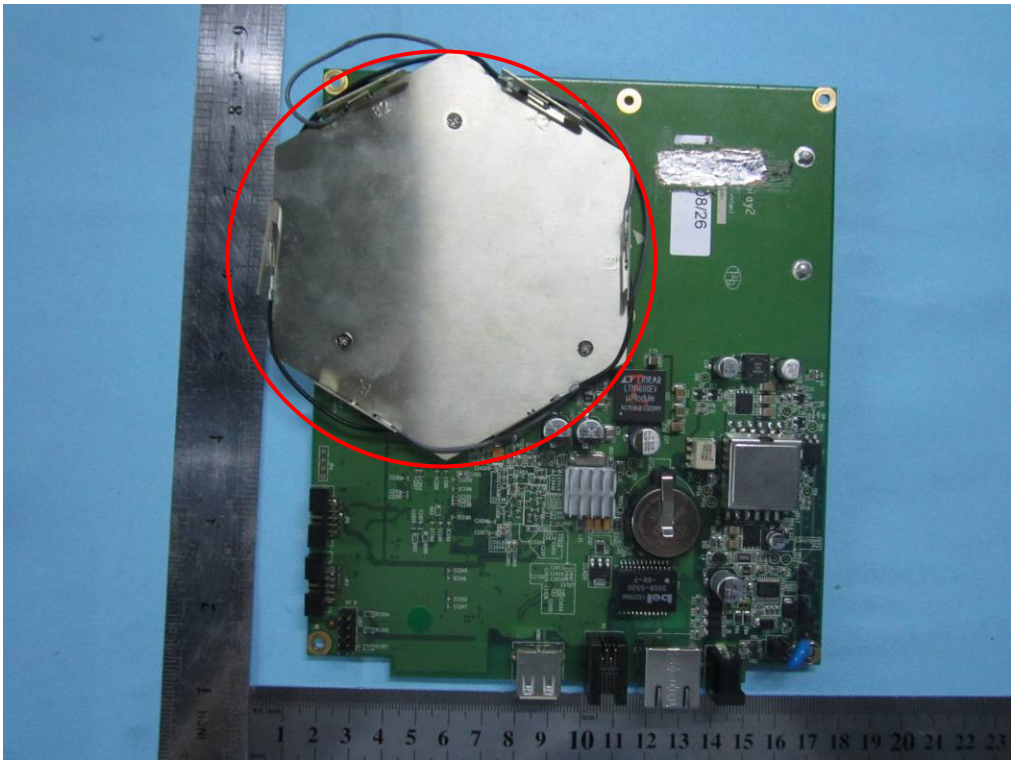
5GHz RF board - Top View



5GHz RF board Uncover - Top View

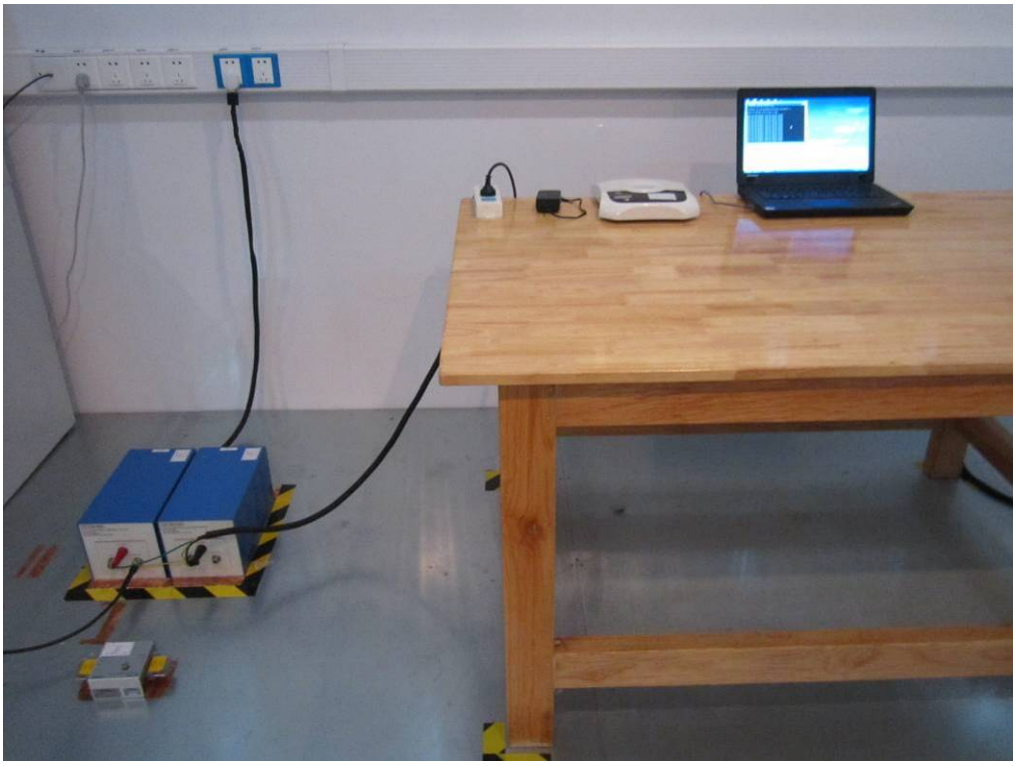


5GHz RF board – Botton View

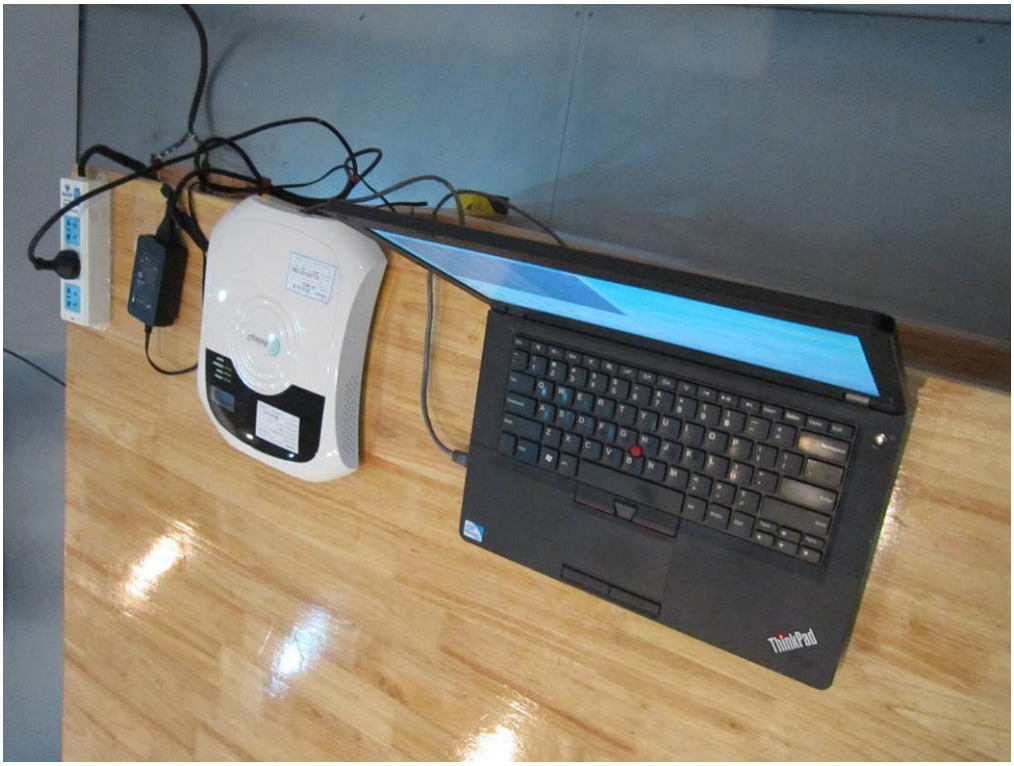


WIFI Antenna View

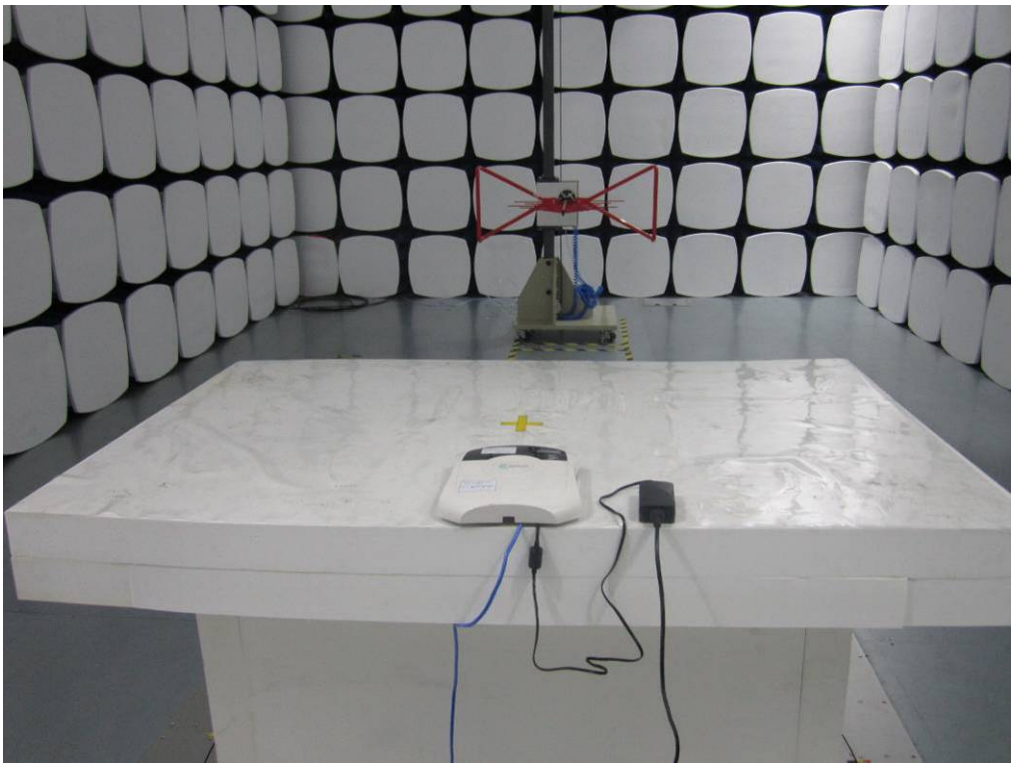
Annex B.iii. Photograph 3: Test Setup Photo



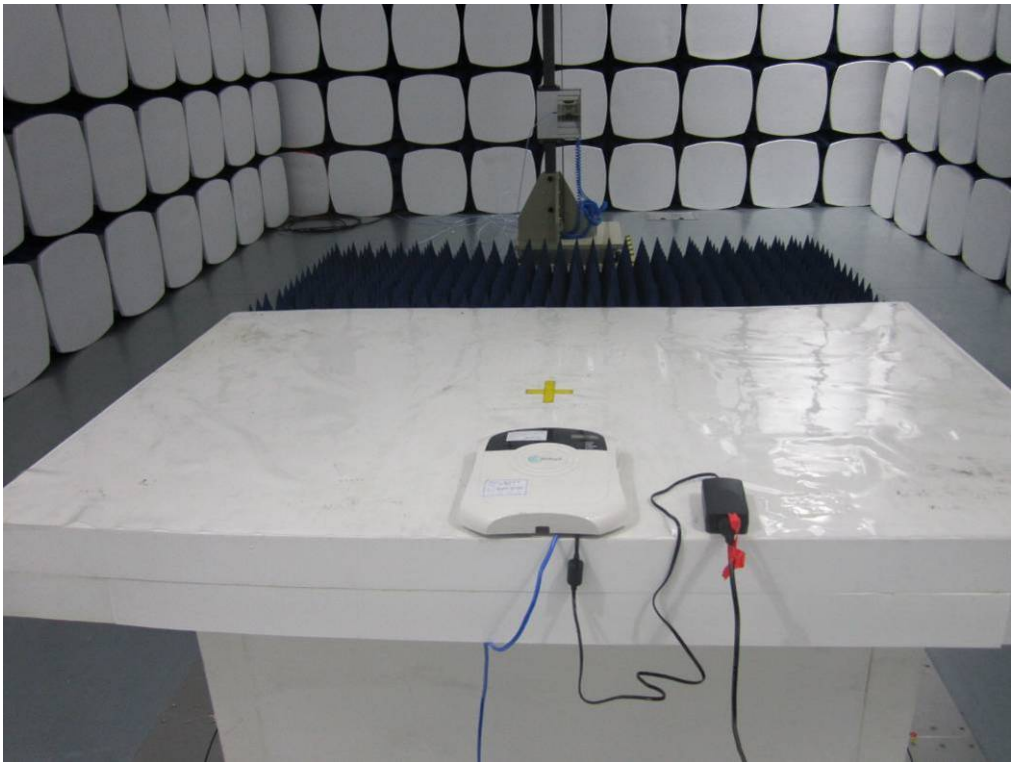
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

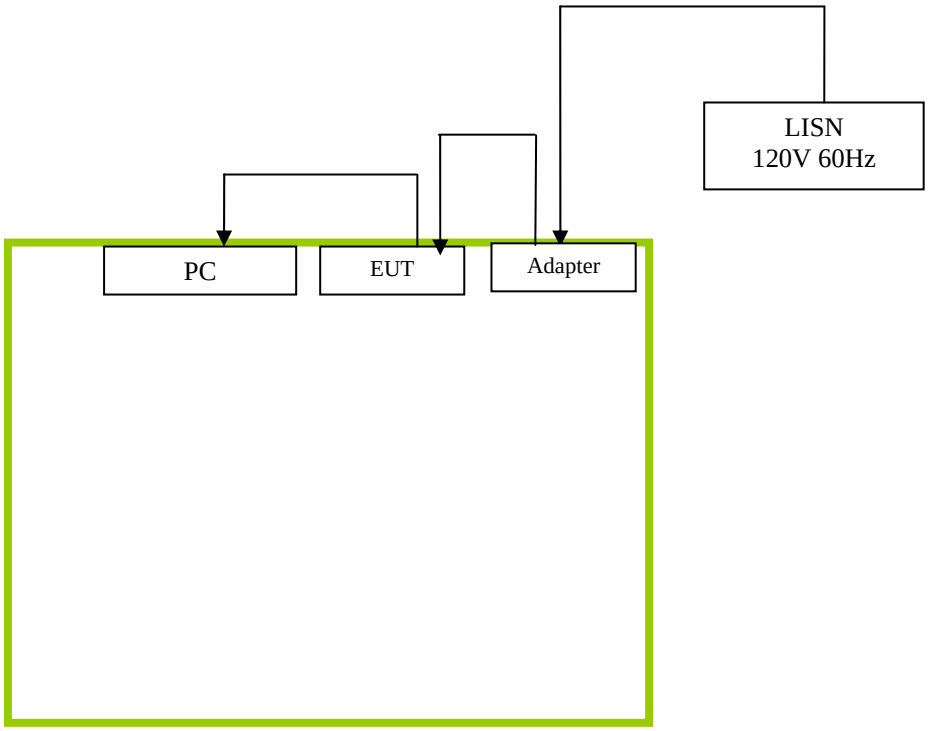
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

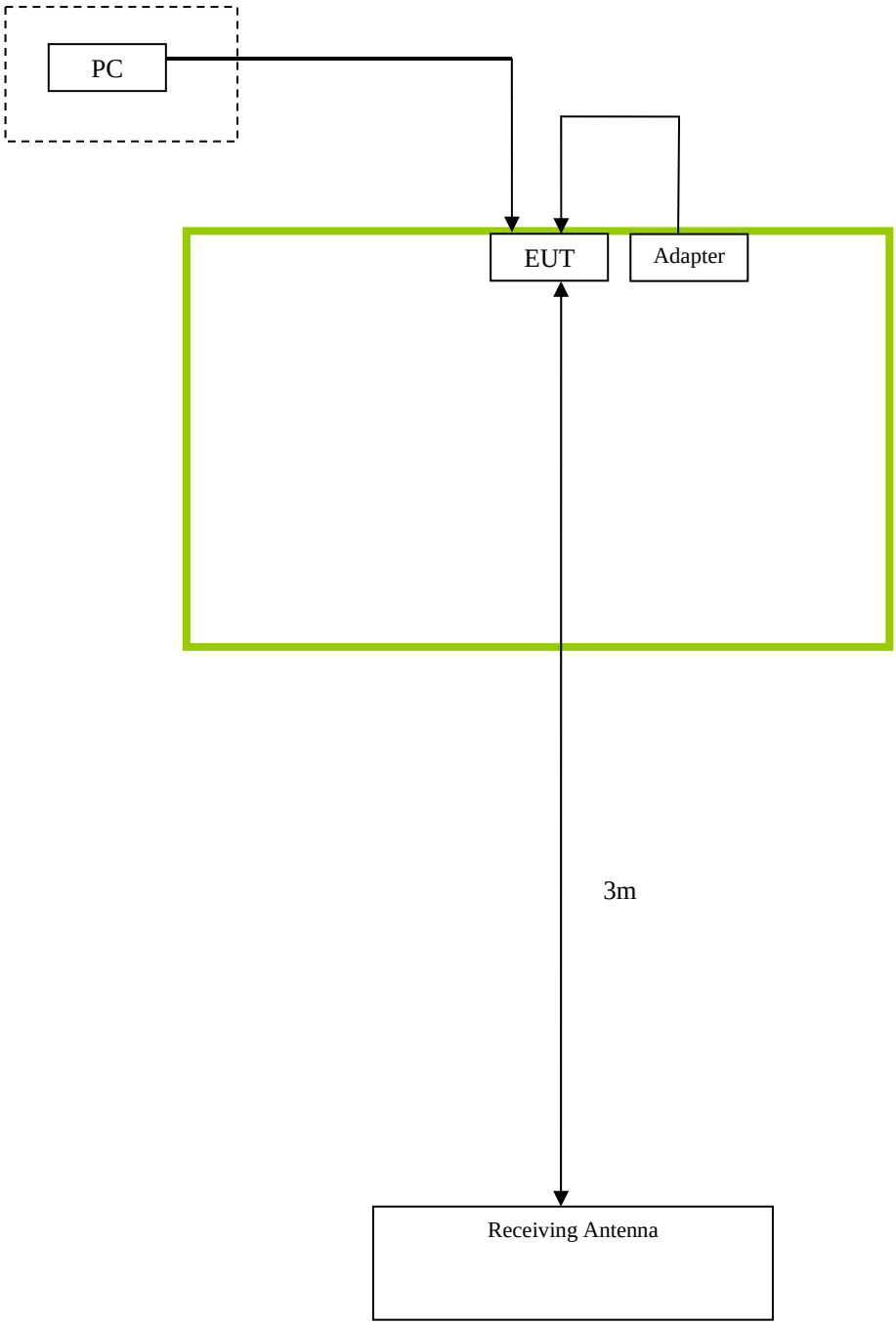
The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Lenovo Laptop	E40& 0579A52	N/A

Block Configuration Diagram for Conducted Emissions
Mode: Ping the Router



Block Configuration Diagram for Radiated Emissions
Mode: Ping the Router



Annex C.ii. EUT OPERATING CONDITIONS

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

Test	Description Of Operation
Emissions	**Ping the Router**

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

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A