

# Changsha SunSky Electronic Design & Development Co.,Ltd.

Wireless Voting Base Station

Model: EA2000T

18 October, 2011



Report No.: 11070047

(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

	
<b>Peter Cai</b> Test Engineer	<b>Spring Zhou</b> Technical Manager

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# RF Test Report

T0: FCC 15.247:2010

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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
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, 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	Accreditation Body	Scope
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Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive

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## 1 Executive Summary & EUT information

The purpose of this test programme was to demonstrate compliance of the Changsha SunSky Electronic Design & Development Co.,Ltd. Wireless Voting Base Station, and model EA2000T against the current Stipulated Standards. The Wireless Voting Base Station has demonstrated compliance with the FCC 15.247:2010.

### EUT Information

**EUT** : Wireless Voting Base Station  
**Description**  
**Model No** : EA2000T  
**Serial No** : N/A  
**Input Power** : INPUT: 100-240VAC 50-60Hz  
OUTPUT: 15VDC 1.5A  
**Classification**  
**Per Stipulated** : DTS  
**Test Standard**

## 2 TECHNICAL DETAILS

Purpose	Compliance testing of Wireless Voting Base Station with stipulated standard
Applicant / Client	Changsha SunSky Electronic Design&Development Co.,Ltd. Room1024, BuildingA, Biaozi Business Center, No.198 Xiang Fu Road, Tianxin District, Changsha, China
Manufacturer	Changsha SunSky Electronic Design&Development Co.,Ltd. Room1024, BuildingA, Biaozi Business Center, No.198 Xiang Fu Road, Tianxin District, Changsha, China
Laboratory performing the tests	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
Test report reference number	11070047
Date EUT received	8 August, 2011
Standard applied	FCC 15.247:2010
Dates of test (from – to)	8 October to 17 October, 2011
No of Units:	#1
Equipment Category:	DTS
Trade Name:	SunVote
Model :	EA2000T
RF Operating Frequency (ies)	2404MHz – 2466MHz
Number of Channels :	32
Modulation :	MSK
FCC ID :	WSVSUNVOTEBASE2X

### 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	Pass / Fail
CFR 47 Part 15.247: 2010		
15.203	Antenna Requirement	Pass
15.205	Restricted Band of Operation	Pass
15.207(a)	Conducted Emissions Voltage	N/A
15.247(a)(1)	Channel Separation	N/A
15.247(a)(1)	Occupied Bandwidth	Pass
15.247(a)(2)	6dB Bandwidth	Pass
15.247(a)(1)	Number of Hopping Channels	N/A
15.247(a)(1)	Time of Occupancy	N/A
15.247(b)	Output Power	Pass
15.247(c)	Antenna Gain > 6 dBi	Pass
15.247(d)	Conducted Spurious Emissions	Pass
15.209; 15.247(d)	Radiated Spurious Emissions	Pass
15.247(e)	Power Spectral Density	Pass
15.247(f)	Hybrid System Requirement	N/A
15.247(g)	Hopping Capability	N/A
15.247(h)	Hopping Coordination Requirement	N/A
15.247(i)	RF Exposure requirement	Pass

ANSI C63.4: 2009

PS: All measurement uncertainties are not taken into consideration for all presented test result.



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

### **5.1 Antenna Requirement**

**Requirement(s):** 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The EUT antenna is PCB antenna. Antenna maximum gain is 5.3dBi.

## 5.2 Conducted Emissions Voltage

Requirement:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

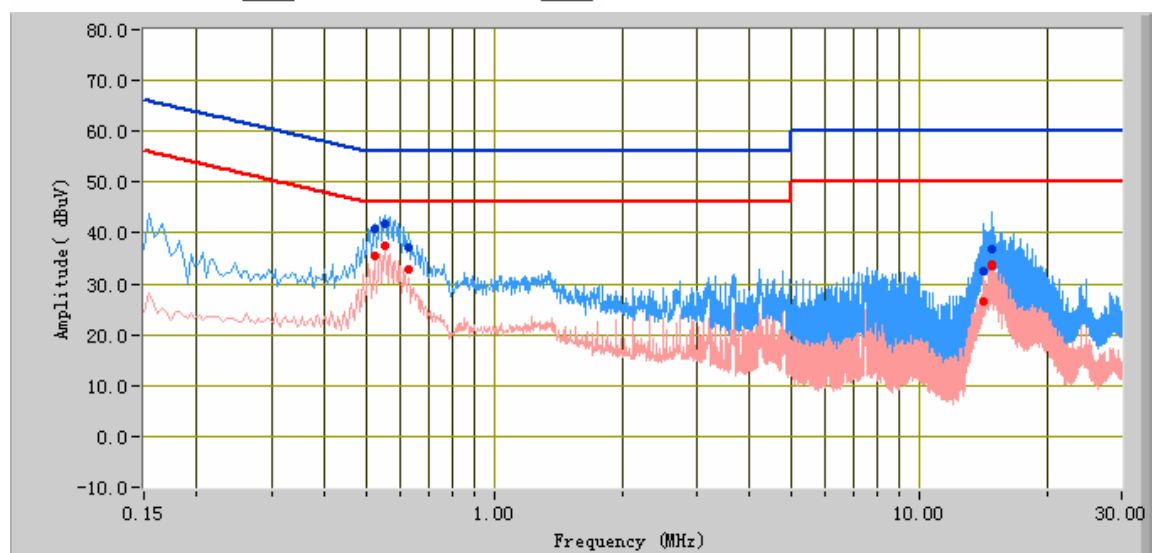
\*Decreases with the logarithm of the frequency.

### Procedures:

- All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- 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  $\pm 3.5\text{dB}$ .
- |                          |                      |          |
|--------------------------|----------------------|----------|
| Environmental Conditions | Temperature          | 25°C     |
|                          | Relative Humidity    | 50%      |
|                          | Atmospheric Pressure | 1019mbar |
- Test date : 17 October, 2011  
Tested By : Peter Cai

**Peak Detector**  **Quasi Peak Limit**   
**Average Detector**  **Average Limit** 

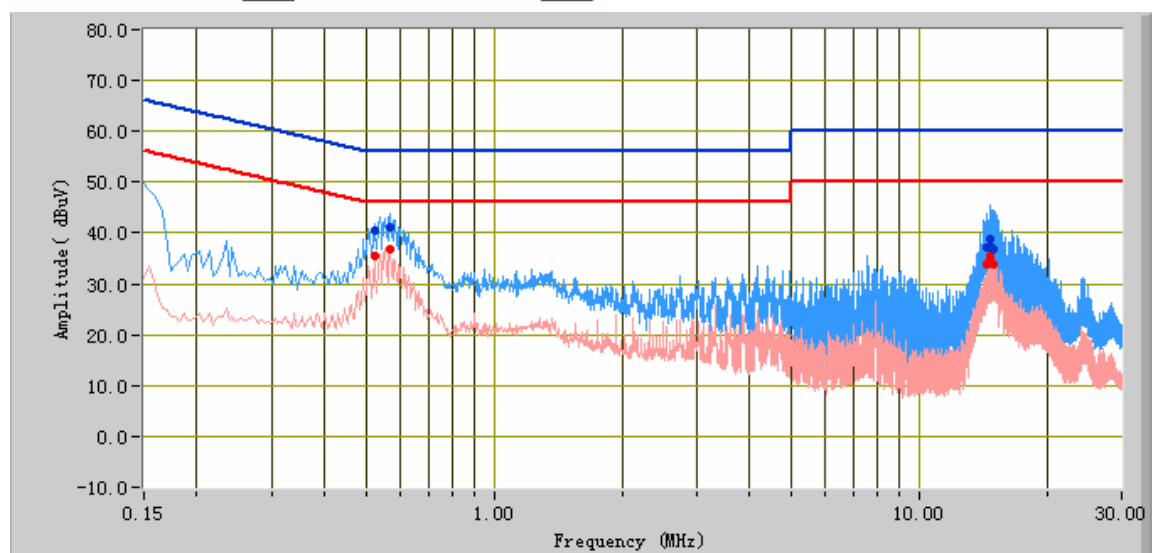


## Test Data

### Line

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.55	41.89	56.00	-14.11	37.51	46.00	-8.49	10.16
0.52	40.70	56.00	-15.30	35.63	46.00	-10.37	10.16
14.83	36.82	60.00	-23.18	33.62	50.00	-16.38	10.47
0.63	37.22	56.00	-18.78	32.78	46.00	-13.22	10.14
14.85	36.85	60.00	-23.15	33.79	50.00	-16.21	10.47
14.22	32.55	60.00	-27.45	26.64	50.00	-23.36	10.45

**Peak Detector**  **Quasi Peak Limit**   
**Average Detector**  **Average Limit** 



### Test Data

#### Neutral

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.57	41.21	56.00	-14.79	36.86	46.00	-9.14	10.15
0.52	40.48	56.00	-15.52	35.50	46.00	-10.50	10.16
14.75	38.68	60.00	-21.32	35.56	50.00	-14.44	10.46
15.03	36.98	60.00	-23.02	33.93	50.00	-16.07	10.47
14.49	37.22	60.00	-22.78	33.83	50.00	-16.17	10.46
14.73	37.49	60.00	-22.51	34.58	50.00	-15.42	10.46

5.3 6dB Occupied Bandwidth

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions                      Temperature                      25°C  
   Relative Humidity                      50%  
   Atmospheric Pressure                      1019mbar
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 30MHz – 40GHz is ±1.5dB.
4. Test date : 17 October, 2011  
Tested By : Peter Cai

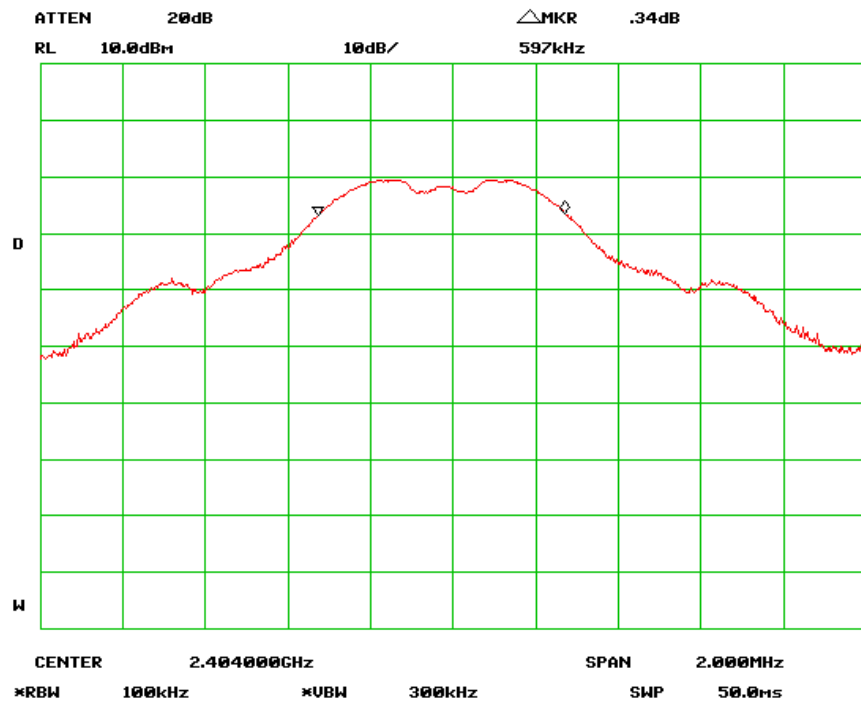
Requirement(s): 47 CFR § 15.247(a)(1)

Procedures: The 6dB Bandwidths were measured conducted using a spectrum analyzer at low, mid, and hi channels. 6dB Bandwidth Limit: >500kHz.

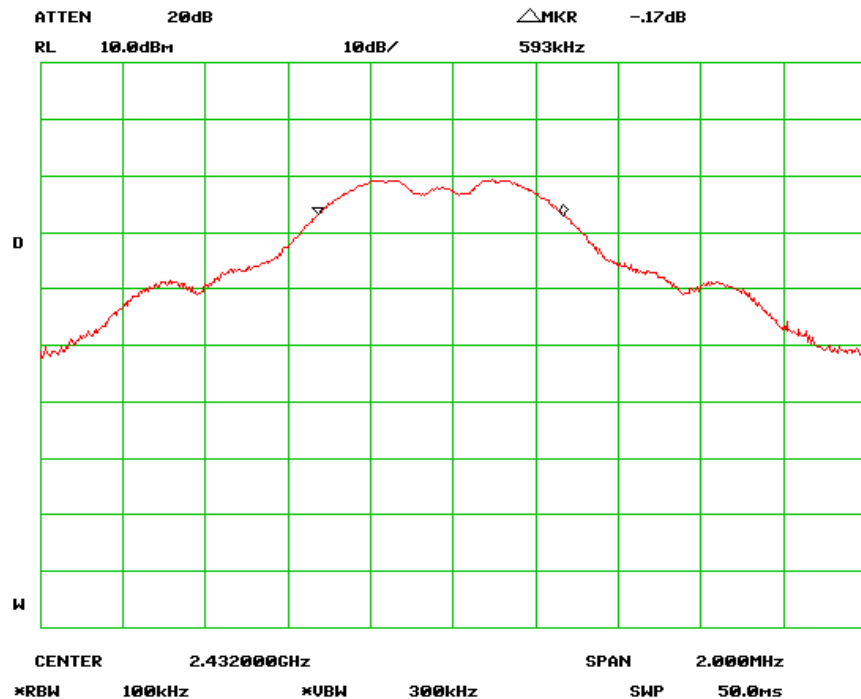
Test result: Pass

Channel	Channel Frequency (MHz)	6dB Occupied Bandwidth Limit (MHz)	6dB Channel Bandwidth (MHz)
Low	2404	0.5	0.597
Mid	2432	0.5	0.593
High	2466	0.5	0.593

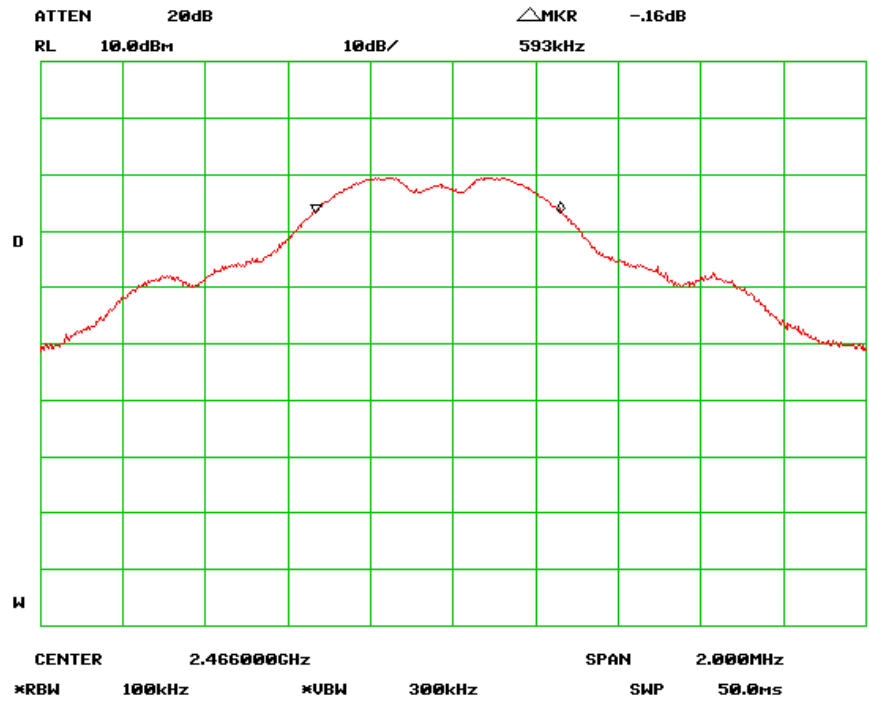
Refer to the attached plots.



6dB Bandwidth – Low Channel



6dB Bandwidth – Mid Channel



6dB Bandwidth – High Channel

5.4 Power Spectral Density

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions      Temperature      25°C  
   Relative Humidity      50%  
   Atmospheric Pressure      1019mbar
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 30MHz – 40GHz is ±1.5dB.
4. Test date : 17 October, 2011  
Tested By : Peter Cai

Requirement(s): 47 CFR § 15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3KHz band during any time interval of continuous transmission.

Procedures: The power spectral density measurement was taken conducted using a spectrum analyzer.

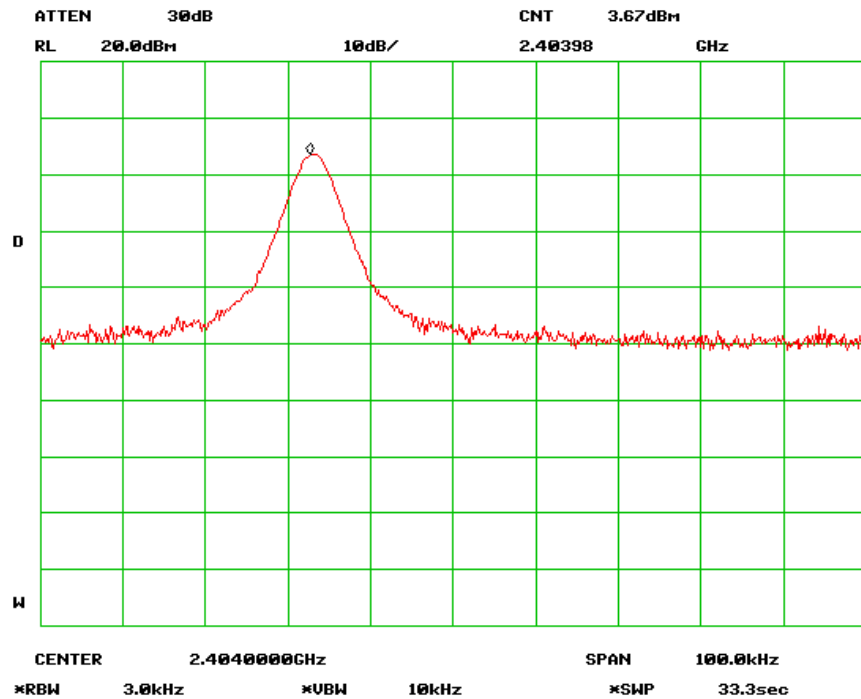
RBW=3KHz, VBW>RBW, Sweep time to SPAN/RBW(s).

Test result: Pass

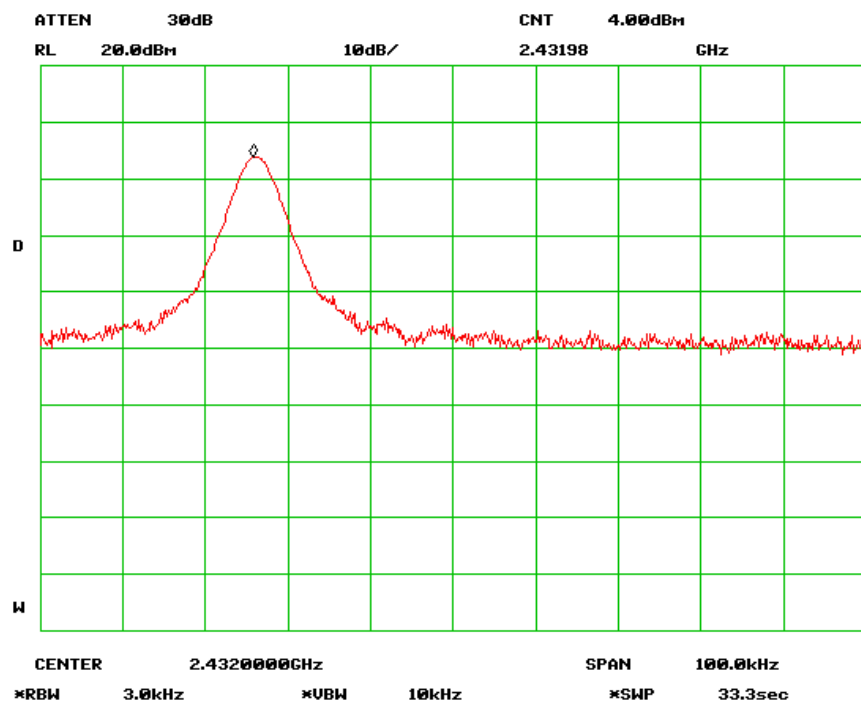
Channel	Channel Frequency (MHz)	Peak Spectral Density Limit (dBm/3KHz)	Peak Spectral Density (dBm/3KHz)
Low	2404	8	3.67
Mid	2432	8	4.00
High	2466	8	4.00



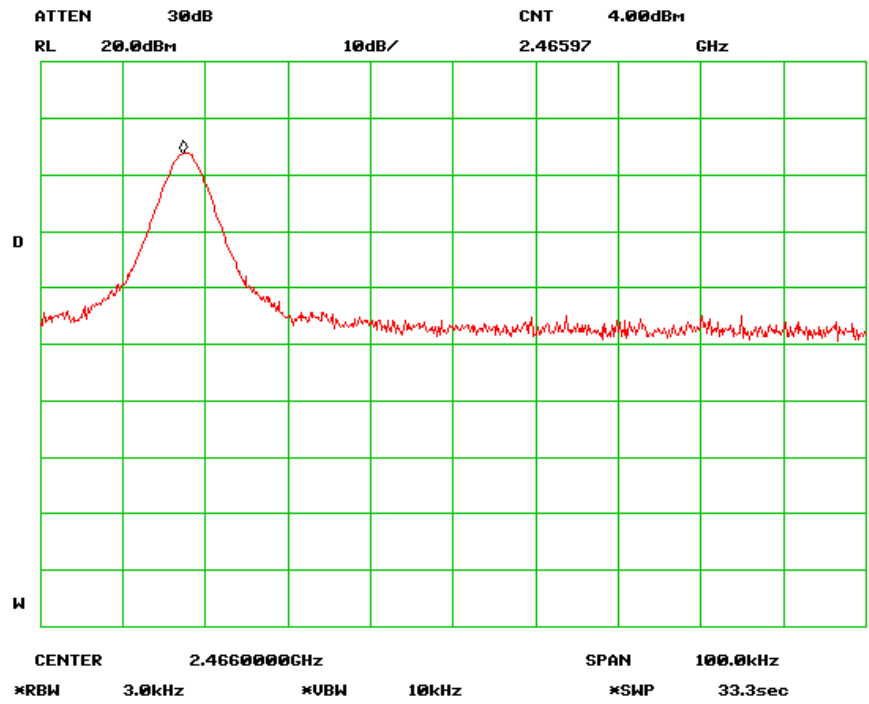
Refer to the attached plots.



PSD - Low Channel



PSD - Mid Channel



PSD - High Channel

5.5 Peak Output Power

1. Conducted Measurement
- EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.
2. 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 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions
- Temperature25°C

Relative Humidity50%

Atmospheric Pressure1019mbar
4. Test date : 17 October, 2011
- Tested By : Peter Cai

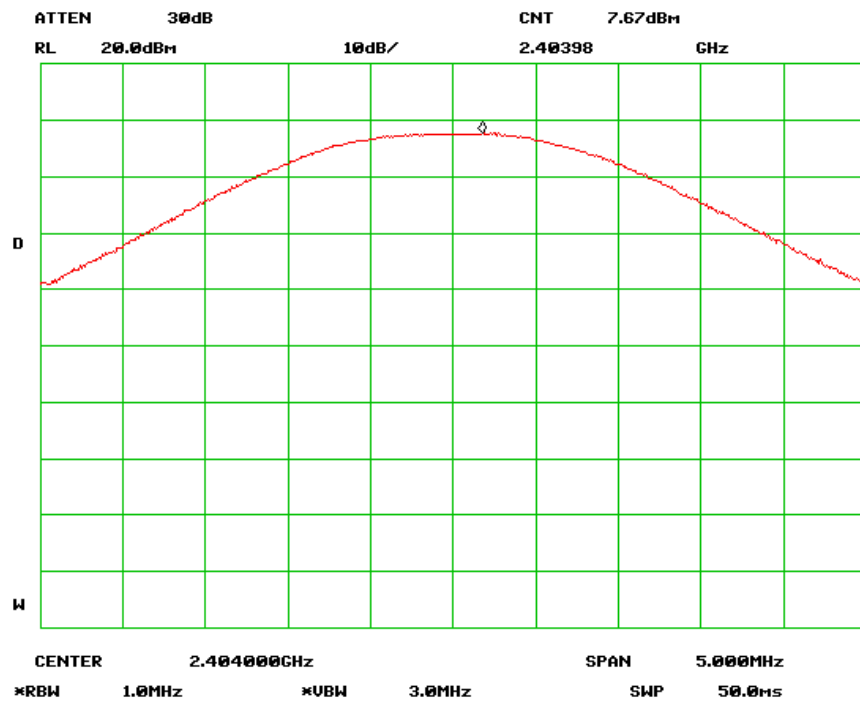
Standard Requirement: 47 CFR § 15.247(b)

**Procedures:** The peak output power was measured conducted using a spectrum analyzer at low, mid, and hi channels. Peak detector was set to measure the power output. The power is converted from watt to dBm, therefore, 1 watt = 30 dBm. The highest antenna gain that will be used is 5.3dBi.

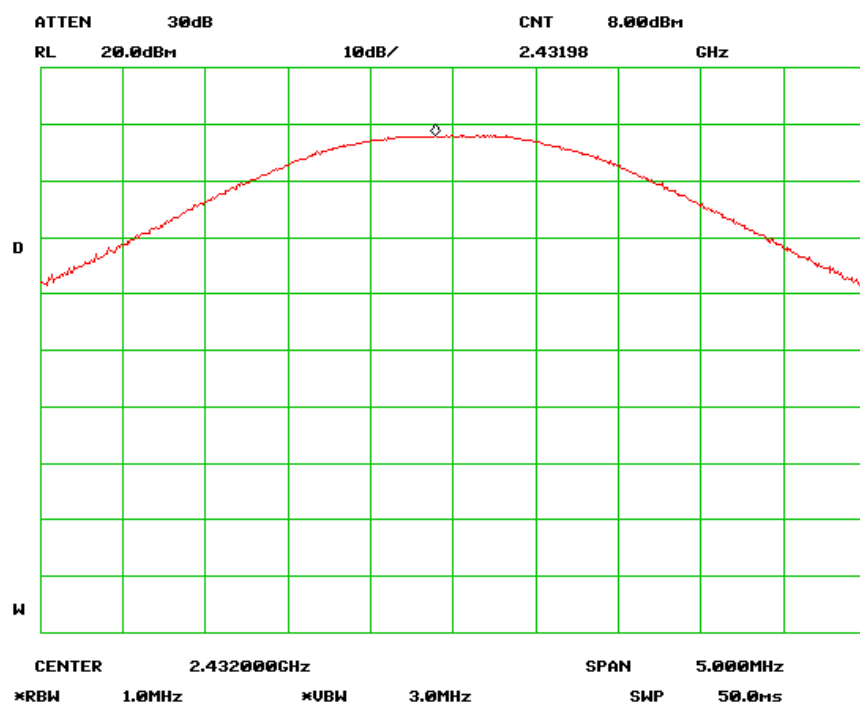
Test Result: Pass

Channel	Channel Frequency (MHz)	Peak Output Power Limit (dBm)	Measured Output Power (dBm)
Low	2404	30	7.67
Mid	2432	30	8.00
High	2466	30	8.17

Refer to the attached plots.



Output Power Low Channel



Output Power Mid Channel



## 5.6 Antenna Port Emission

- Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
- 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 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
- Environmental Conditions

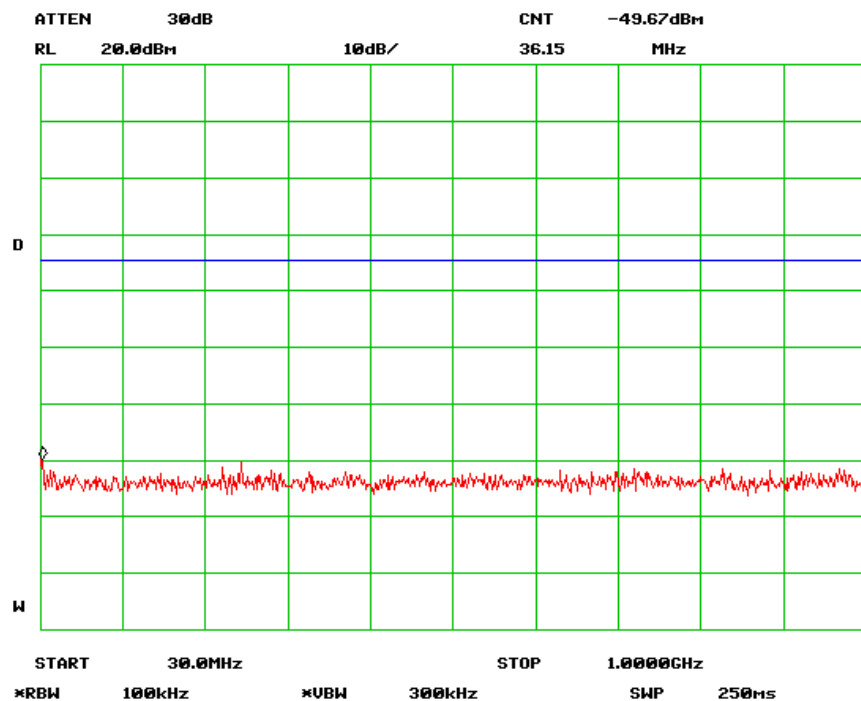
Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
- Test date : 17 October, 2011  
Tested By : Peter Cai

**Standard Requirement:** Radiated emission limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

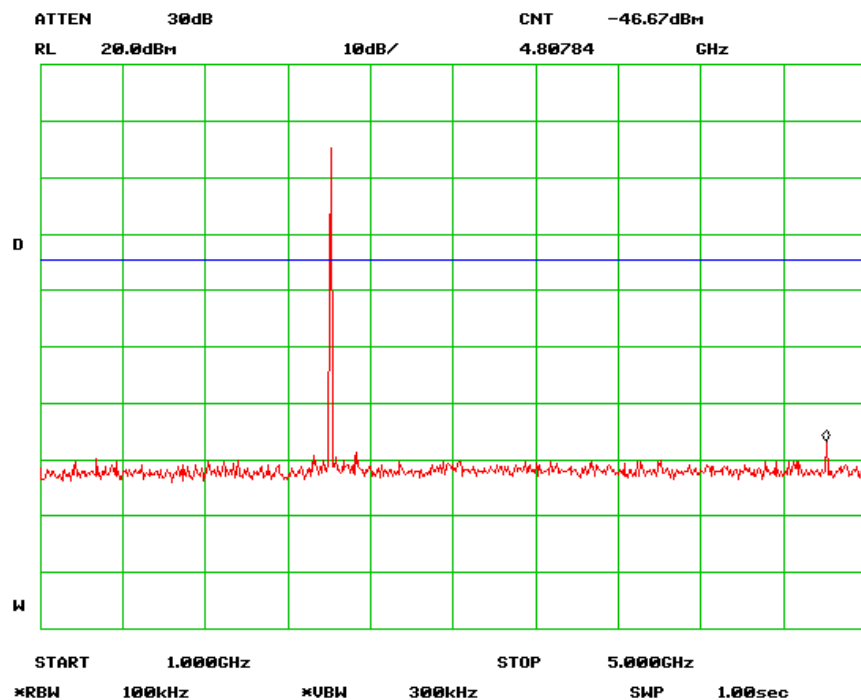
**Procedures:** The conducted spurious emissions were measured conducted using a spectrum analyzer at low, mid, and hi channels. The limit was determined by attenuating 20 dB of the RF peak power output.

**Test Result:** Pass

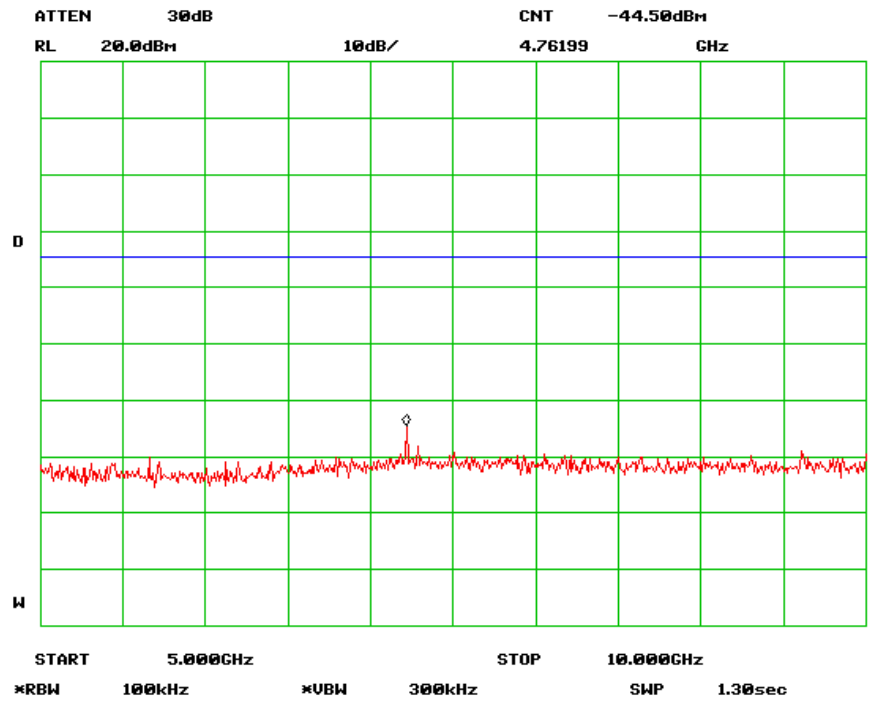
Refer to the attached plots.



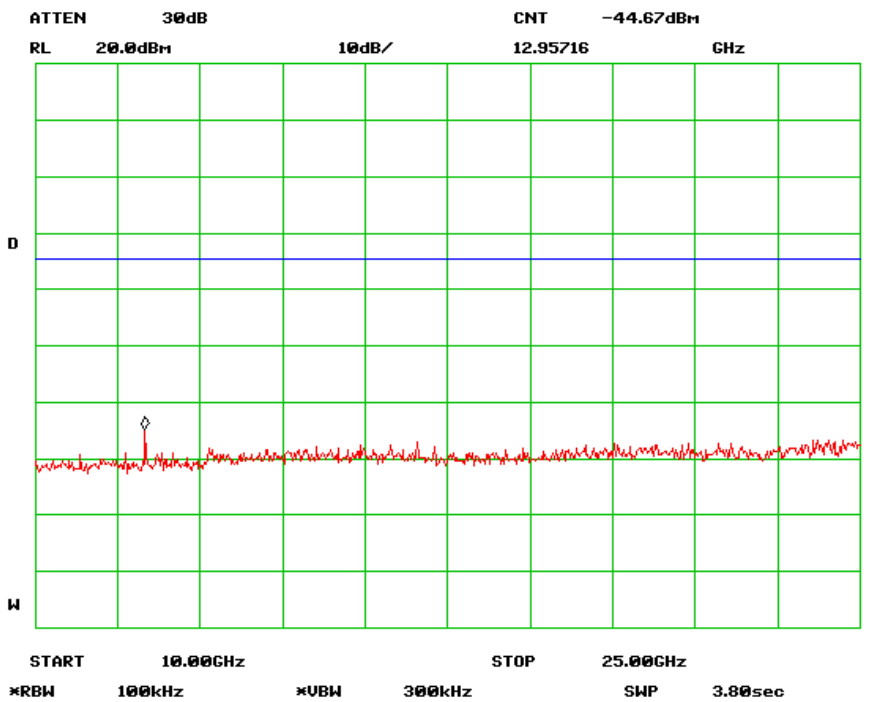
Antenna Port Emission Low Channel -1



Antenna Port Emission Low Channel -2

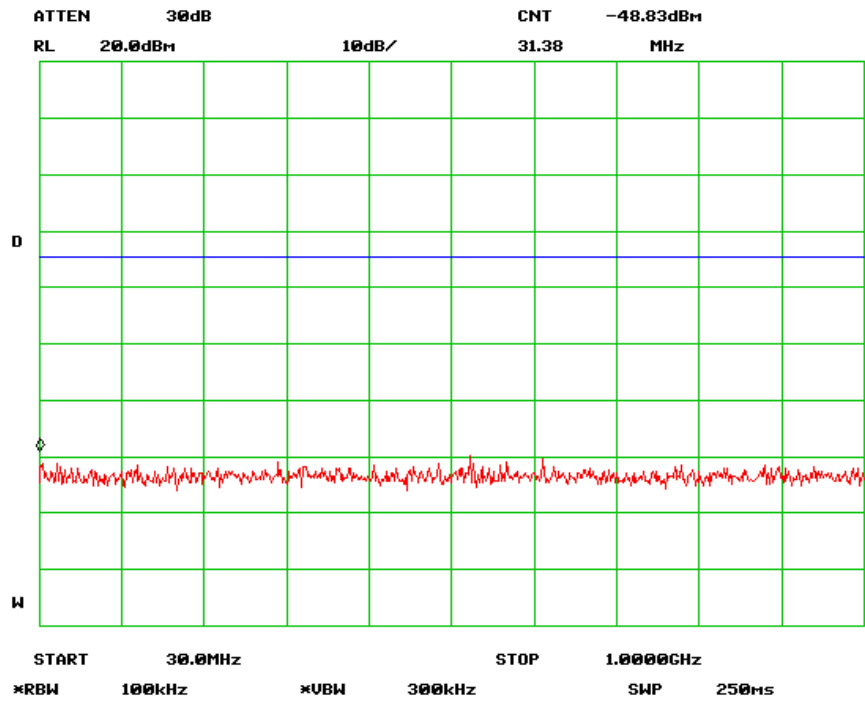


Antenna Port Emission Low Channel -3

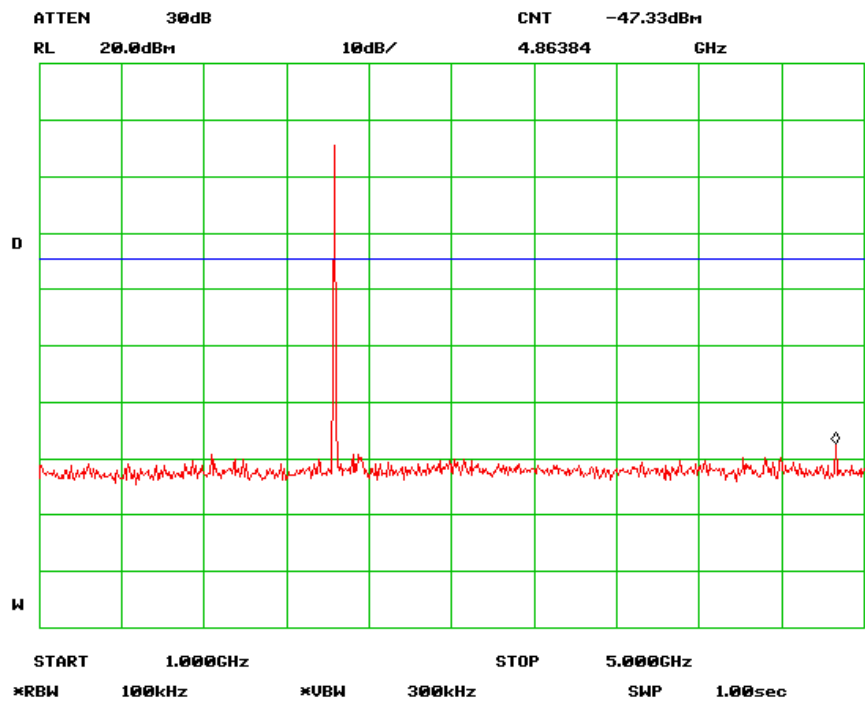


Antenna Port Emission Low Channel -4

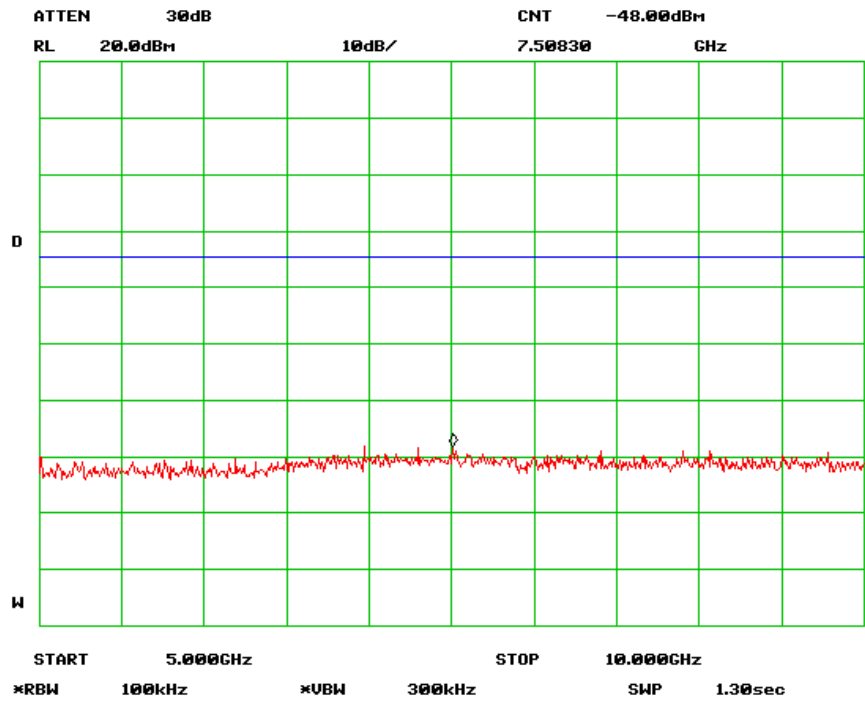




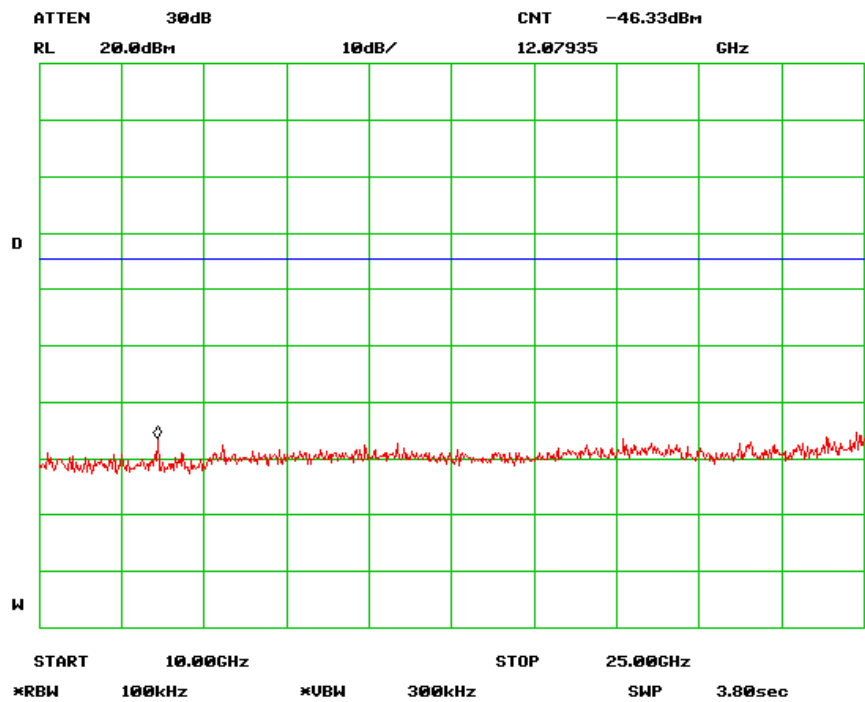
Antenna Port Emission Mid-1 Channel



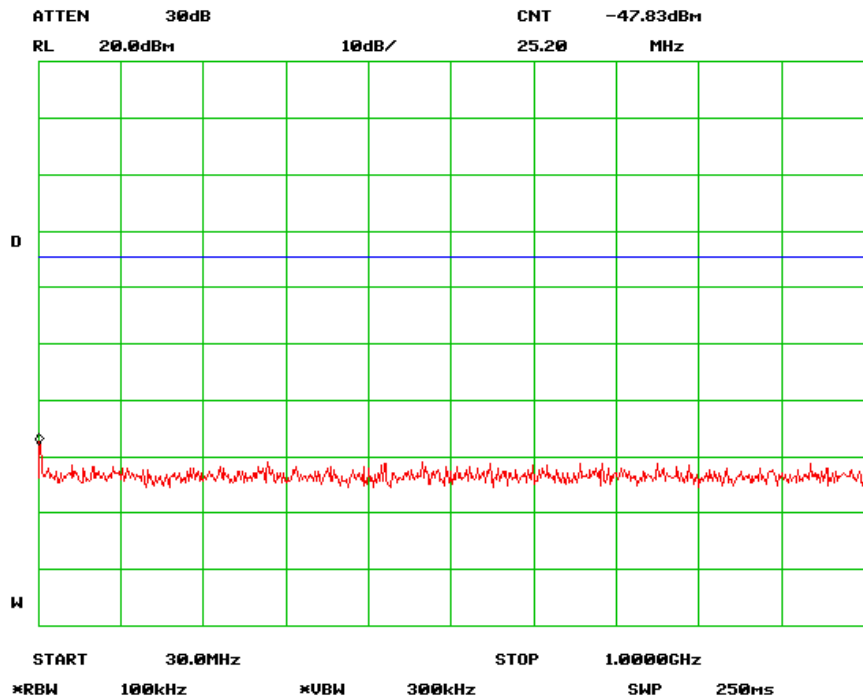
Antenna Port Emission Mid-2 Channel



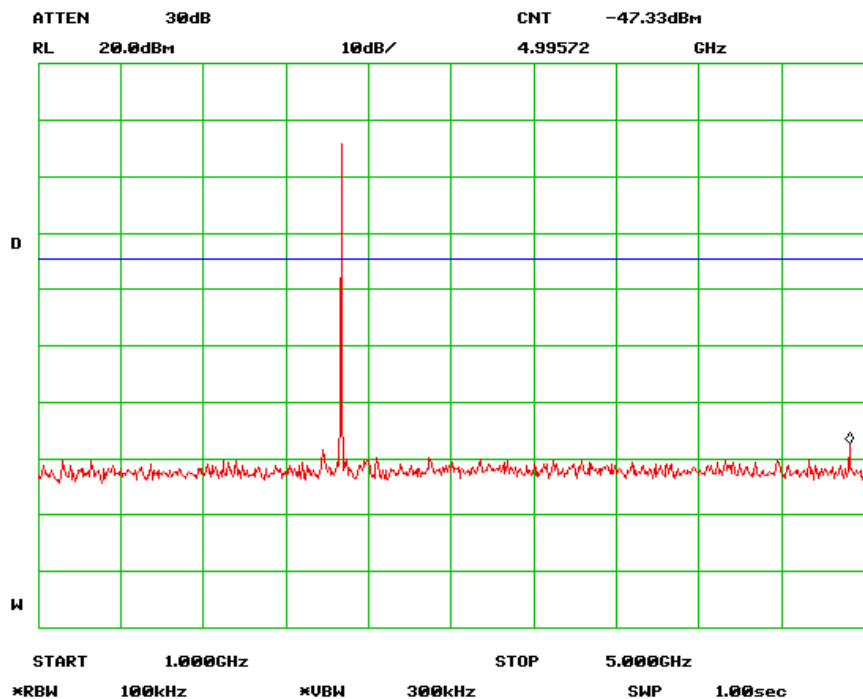
Antenna Port Emission Mid-3 Channel



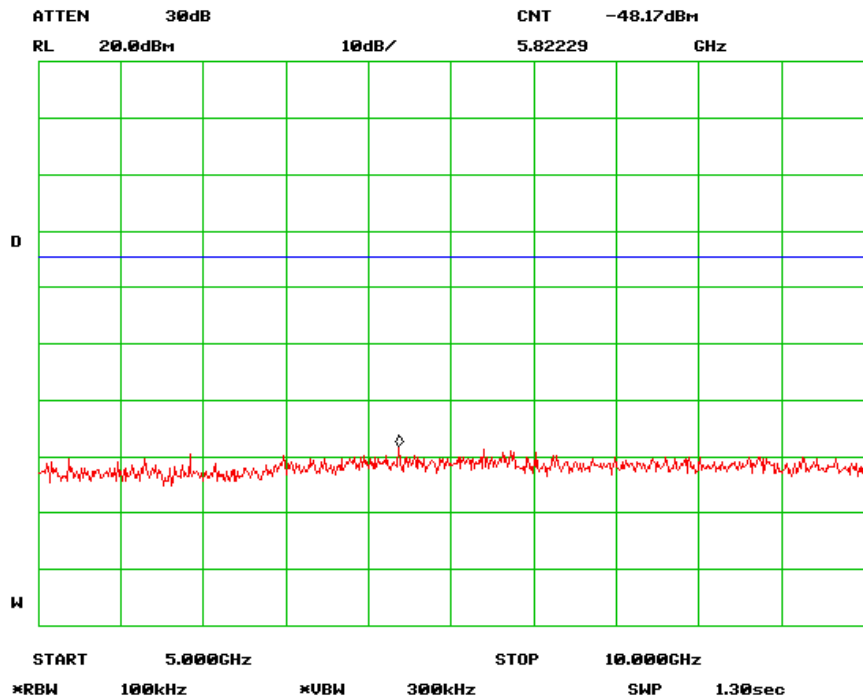
Antenna Port Emission Mid-4 Channel



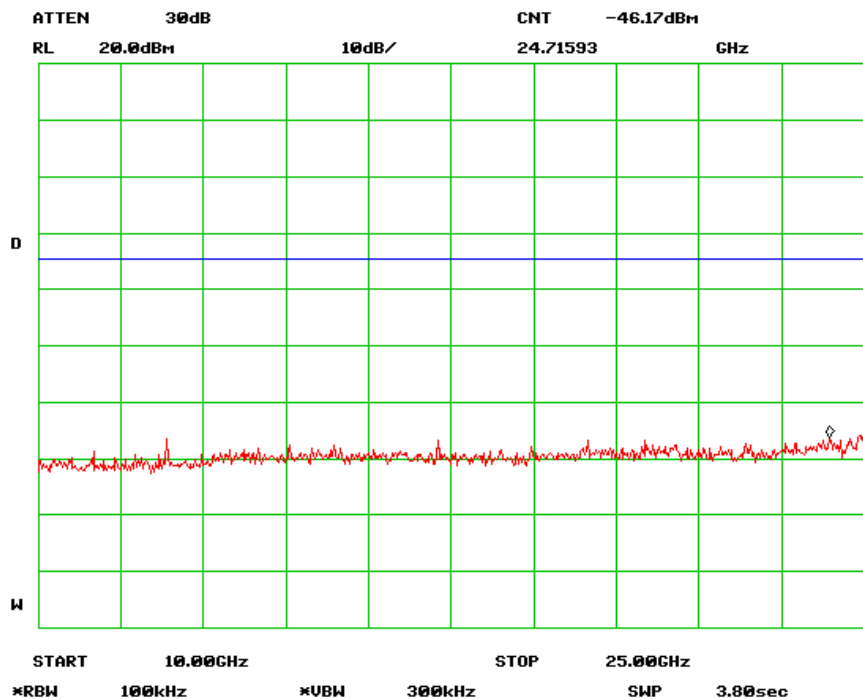
Antenna Port Emission High-1 Channel



Antenna Port Emission High-2 Channel



Antenna Port Emission High-3 Channel



Antenna Port Emission High-4 Channel

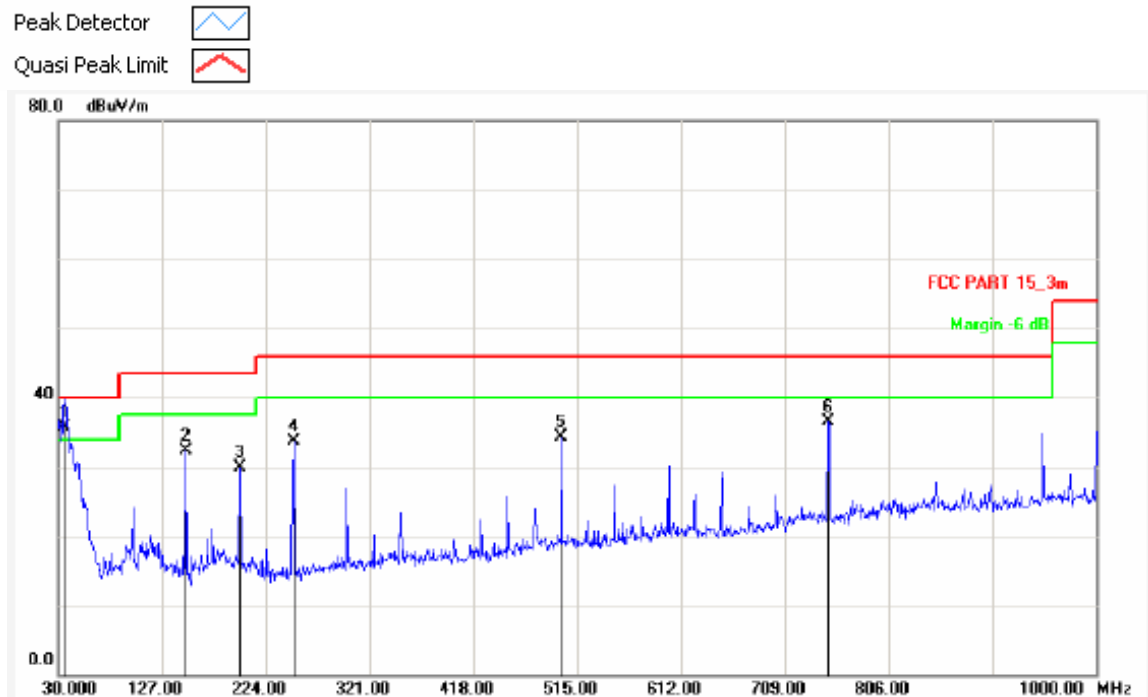
## 5.7 Radiated Spurious Emission < 1GHz

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 & 1GHz above ( 3m & 10m) is +/-6dB.
4. Environmental Conditions      Temperature      25°C  
Relative Humidity      50%  
Atmospheric Pressure      1019mbar
5. Test date : 17 October, 2011  
Tested By : Peter Cai

**Standard Requirement:** The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

**Test Result: Pass**

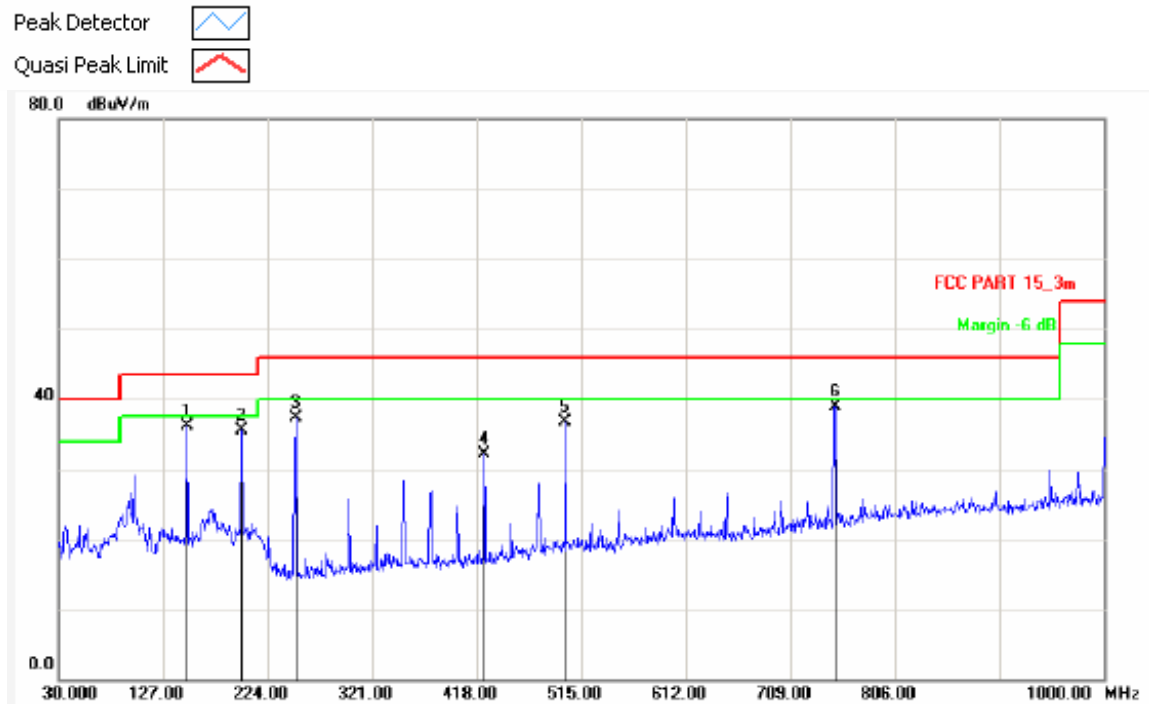
## Radiated Emission Plot



## Test Data

Frequency (MHz)	Quasi Peak (dBuV/m)	Azimuth	Polarity(H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
35.82	35.64	113.00	V	145.00	-27.80	40.00	-4.36
149.31	32.26	326.00	V	165.00	-27.13	43.50	-11.24
199.75	29.83	252.00	V	135.00	-22.88	43.50	-13.67
250.19	33.78	312.00	V	103.00	-31.84	46.00	-12.22
500.45	34.24	85.00	V	362.00	-23.54	46.00	-11.76
749.74	36.44	105.00	V	178.00	-20.80	46.00	-9.56

## Radiated Emission Plot



## Test Data

Frequency (MHz)	Quasi Peak (dBuV/m)	Azimuth	Polarity(H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
149.31	36.07	60.00	H	170.00	-27.17	43.50	-7.43
199.75	35.43	2.00	H	128.00	-30.72	43.50	-8.07
250.19	37.34	218.00	H	112.00	-27.07	46.00	-8.66
424.79	32.14	85.00	H	100.00	-31.74	46.00	-13.86
500.45	36.71	157.00	H	355.00	-27.10	46.00	-9.29
750.71	38.88	122.00	H	119.00	-27.67	46.00	-7.12

## **5.8 Radiated Spurious Emissions > 1GHz & Band Edge**

- 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.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- 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 & 1GHz above ( 3m & 10m) is +/-6dB.
- |                          |                      |          |
|--------------------------|----------------------|----------|
| Environmental Conditions | Temperature          | 25°C     |
|                          | Relative Humidity    | 50%      |
|                          | Atmospheric Pressure | 1019mbar |
- Test date : 17 October, 2011  
Tested By : Peter Cai

**Standard Requirement:** The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

**Test Result: Pass**



**@ 2404MHz @ 3 Meter**

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.808	9.00	1.07	v	5.15	55.00	55.4	74.00	-18.6	Peak
4.808	12.00	1.10	h	5.15	55.00	51.8	74.00	-22.2	Peak
4.808	9.00	1.07	v	5.15	55.00	42.6	54.00	-11.4	Ave
4.808	12.00	1.10	h	5.15	55.00	40.6	54.00	-13.4	Ave
7.212	5.30	1.12	v	7.23	55.00	65.6	74.00	-8.4	Peak
7.212	6.11	1.15	h	7.23	55.00	63.7	74.00	-10.3	Peak
7.212	5.30	1.12	v	7.23	55.00	49.5	54.00	-4.5	Ave
7.212	6.11	1.15	h	7.23	55.00	47.9	54.00	-6.1	Ave
9.616	31.0	1.26	v	8.56	55.00	55.1	74.00	-18.9	Peak
9.616	3.0	1.34	h	8.56	55.00	54.3	74.00	-19.7	Peak
9.616	31.0	1.26	v	8.56	55.00	44.3	54.00	-9.7	Ave
9.616	3.0	1.34	h	8.56	55.00	43.2	54.00	-10.8	Ave

Emission was scanned up to 25GHz.

**@ 2432MHz @ 3Meter**

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.864	31.00	1.10	v	5.16	55.00	56.5	74.00	-17.6	Peak
4.864	25.00	1.00	h	5.16	55.00	53.1	74.00	-20.9	Peak
4.864	31.00	1.10	v	5.16	55.00	44.9	54.00	-9.1	Ave
4.864	25.00	1.00	h	5.16	55.00	43.6	54.00	-10.4	Ave
7.296	13.00	1.20	v	7.31	55.00	68.1	74.00	-5.9	Peak
7.296	4.00	1.03	h	7.31	55.00	66.4	74.00	-7.6	Peak
7.296	13.00	1.20	v	7.31	55.00	50.5	54.00	-3.5	Ave
7.296	4.00	1.03	h	7.31	55.00	50.1	54.00	-3.9	Ave
9.728	22.0	1.30	v	8.66	55.00	57.6	74.00	-16.4	Peak
9.728	7.0	1.00	h	8.66	55.00	56.0	74.00	-18.0	Peak
9.728	22.0	1.30	v	8.66	55.00	44.3	54.00	-9.7	Ave
9.728	7.0	1.00	h	8.66	55.00	45.2	54.00	-8.8	Ave

Emission was scanned up to 25GHz.

**@ 2466MHz @ 3Meter**

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.932	15.00	1.07	v	5.17	55.00	54.3	74.00	-19.7	Peak
4.932	25.00	1.10	h	5.17	55.00	53.1	74.00	-20.9	Peak
4.932	15.00	1.07	v	5.17	55.00	44.5	54.00	-9.5	Ave
4.932	25.00	1.10	h	5.17	55.00	42.6	54.00	-11.4	Ave
7.398	0	1.20	v	7.36	55.00	66.4	74.00	-7.6	Peak
7.398	3.00	1.00	h	7.36	55.00	64.4	74.00	-9.6	Peak
7.398	0	1.20	v	7.36	55.00	48.9	54.00	-5.1	Ave
7.398	3.00	1.00	h	7.36	55.00	48.2	54.00	-5.8	Ave
9.864	6.00	1.10	v	8.74	55.00	55.3	74.00	-18.7	Peak
9.864	21.00	1.08	h	8.74	55.00	54.8	74.00	-19.2	Peak
9.864	6.00	1.10	v	8.74	55.00	43.3	54.00	-10.7	Ave
9.864	21.00	1.08	h	8.74	55.00	45.2	54.00	-8.8	Ave

Emission was scanned up to 25GHz.

## Band Edge

Channel	Polarity	Detector	Frequency	Result	Limit	Margin
Low Channel	V	Peak	2400	36.77	74	-37.23
Low Channel	H	Peak	2400	32.12	74	-41.88
Low Channel	V	Avg	2400	26.44	54	-27.56
Low Channel	H	Avg	2400	24.59	54	-29.41

Channel	Polarity	Detector	Frequency	Result	Limit	Margin
High Channel	V	Peak	2483.5	33.23	74	-40.77
High Channel	H	Peak	2483.5	35.67	74	-38.33
High Channel	V	Avg	2483.5	24.33	54	-29.67
High Channel	H	Avg	2483.5	26.75	54	-27.25

## Annex A. TEST INSTRUMENT & METHOD

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

Instrument	Manufacturer	Model	CAL Due Date
Spectrum Analyzer	HP	8563 E	2012.05.25
EMI Receiver	Rohde & Schwarz	ESPI 3	2012.05.25
Antenna (30MHz~2GHz)	Sunol Sciences	JB1	2012.10.04
Horn Antenna (1~18GHz)	A-INFOMW	JXTXLB-10180	2012.06.24
Horn Antenna (1~18GHz)	ETS-Lindgren	3115	2012.06.24
Pre-Amplifier(0.01 ~ 1.3GHz)	HP	8447F	2012.05.25
Pre-Amplifier(0.1 ~ 18GHz)	MITEQ	AMF-7D-00101800-30- 10P	2012.05.25
Horn Antenna (18~40GHz)	Com Power	AH-840	2012.05.25
Microwave Pre-Amp (18~40GHz)	Com Power	PA-840	2012.05.25
LISN	Com-Power	LI 115	2012.05.25
LISN	Com-Power	LI 115	2012.05.25
LIMITER	Com-Power	LIT-153	2012.05.25

## Annex A.ii. 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.

### 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).

### 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. <b>7.96 dB below limit</b>

## Annex A. iii. RADIATED EMISSIONS TEST DESCRIPTION

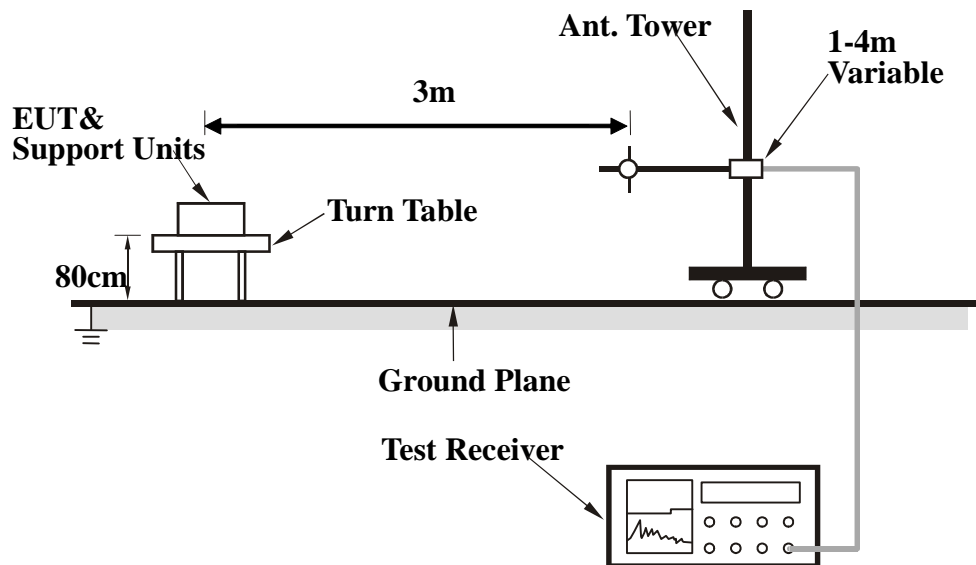
### **EUT Characterisation**

EUT characterisation, over the frequency range from 30MHz to 10<sup>th</sup> 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 0.8m 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).

### **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. 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

## **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

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

$$\begin{aligned} \text{Average} &= \text{Peak Value} + \text{Duty Factor or} \\ \text{Set RBW} &= 1\text{MHz, VBW} = 10\text{Hz.} \end{aligned}$$

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**

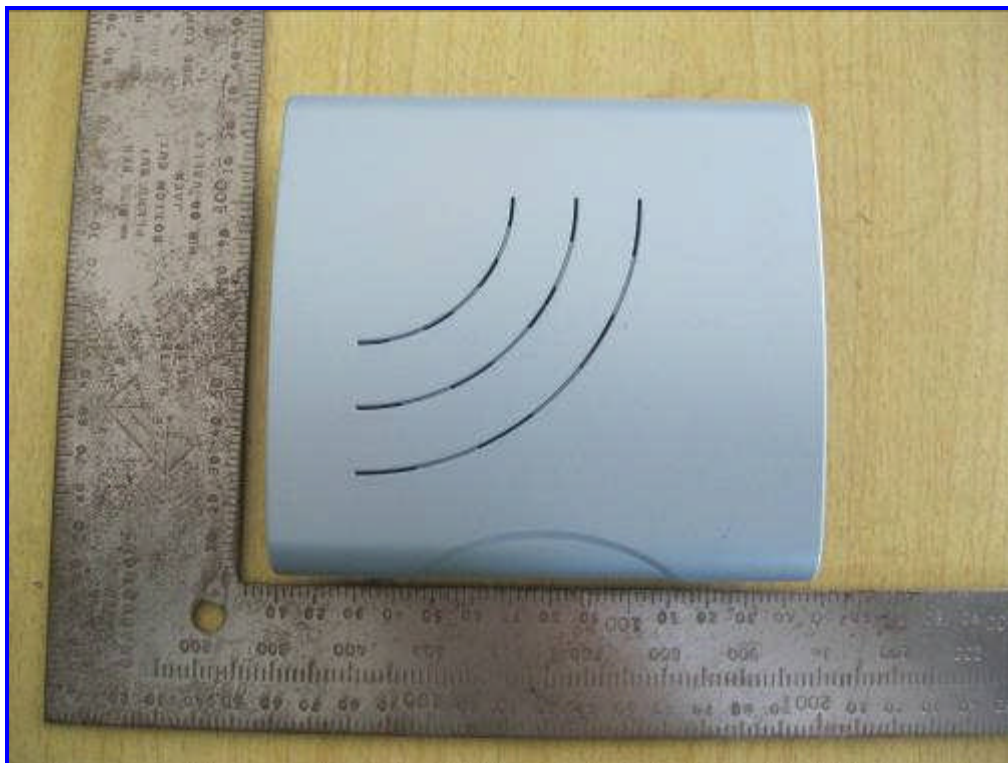


Front View of EUT



Rear View of EUT



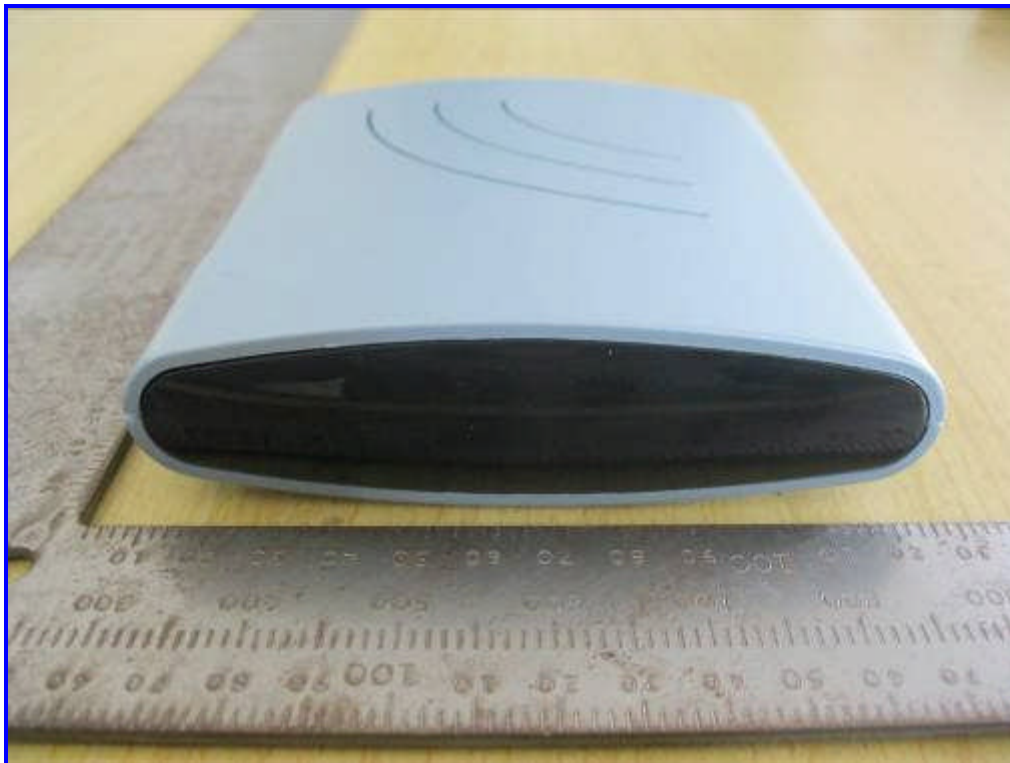


Top View of EUT



Bottom View of EUT





Left View of EUT



Right View of EUT



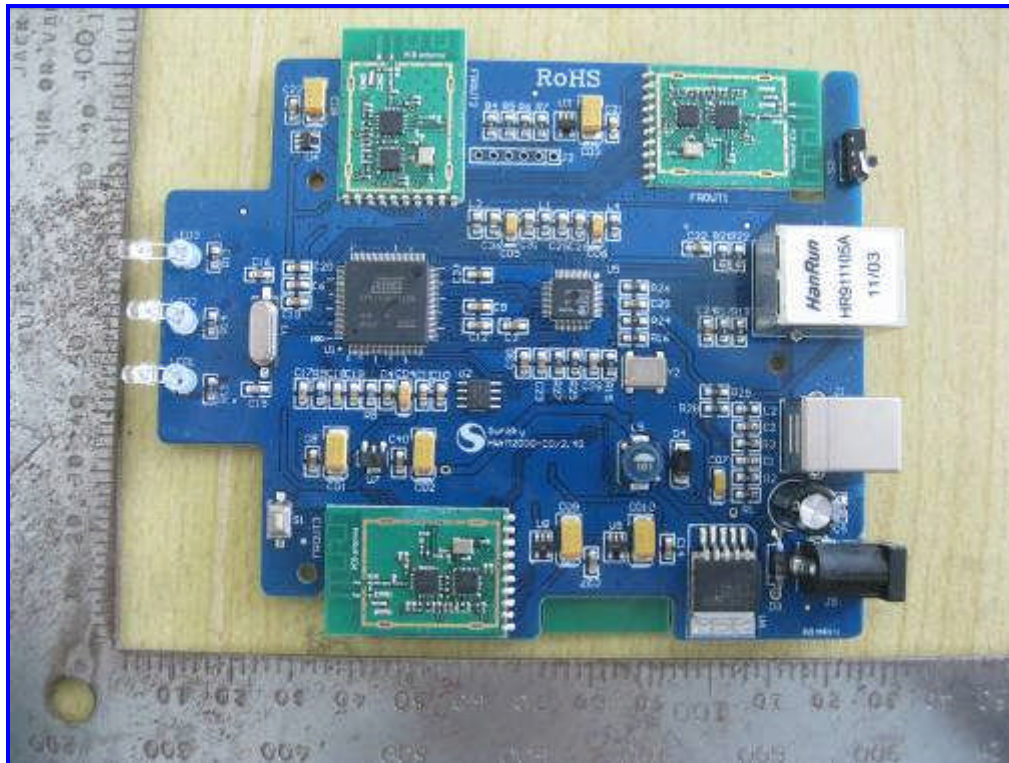
Front View of Power Supply



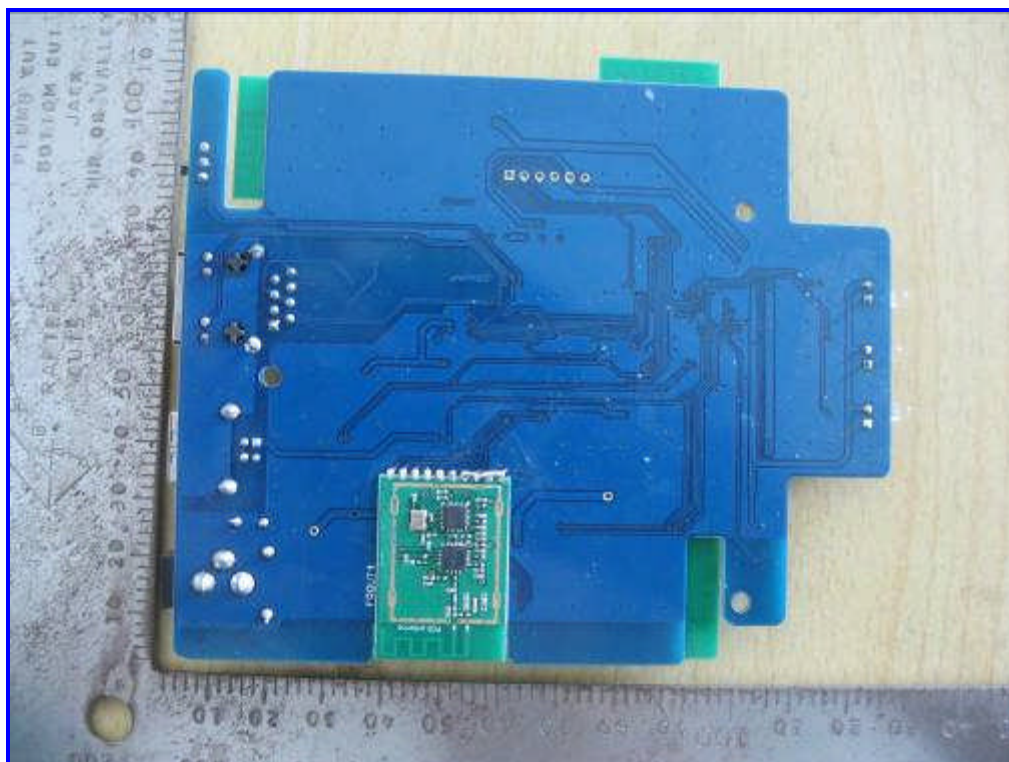
Front View of Power Supply Label



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

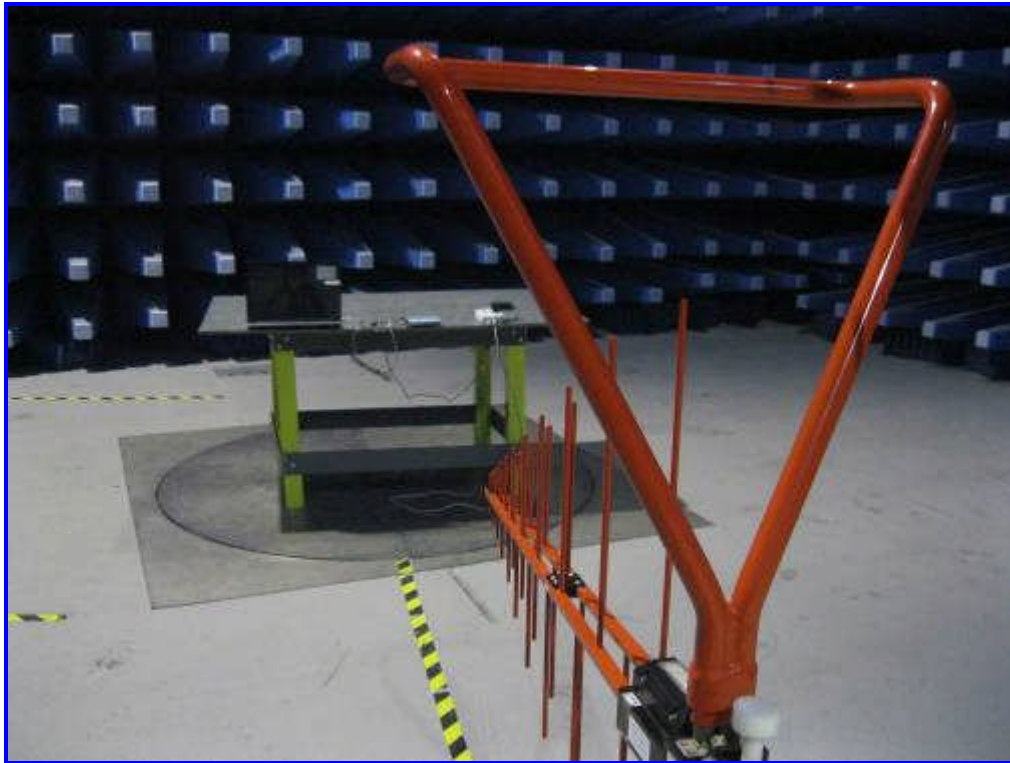


Front View of PCB board



Rear View of PCB board

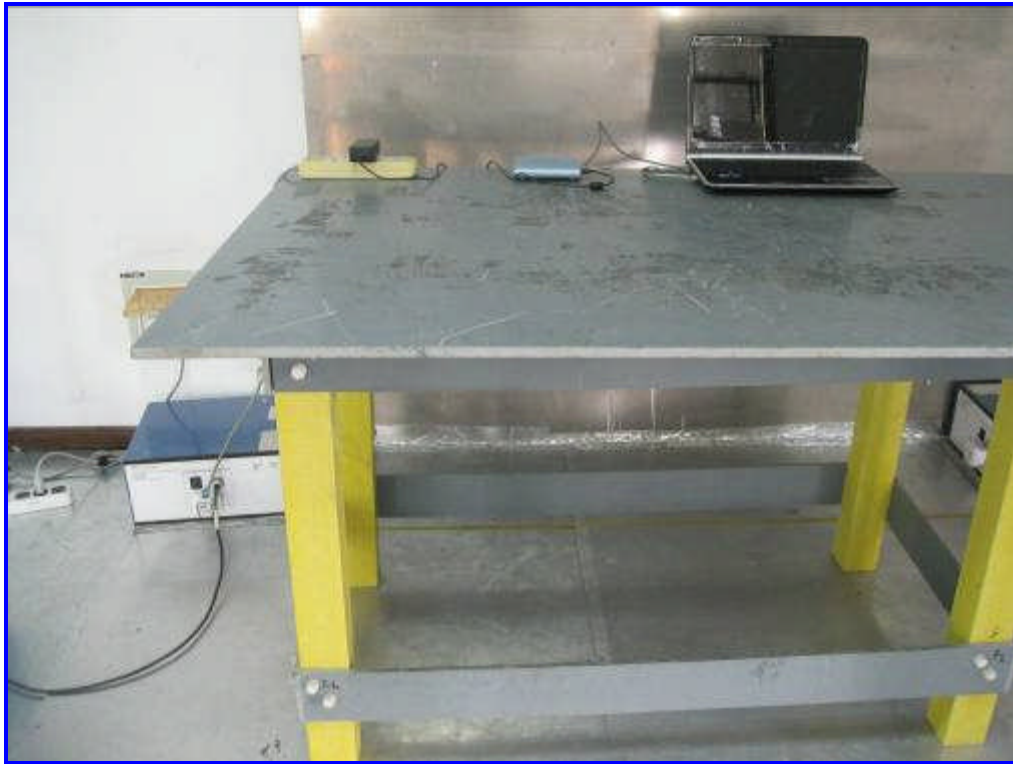
**Annex B.iii. Photograph 3: Test Setup Photo**



Radiated Emission Test Setup Front View below 1GHz



Radiated Emission Test Setup Front View above 1GHz



Conducted Emission Test Setup Front View



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

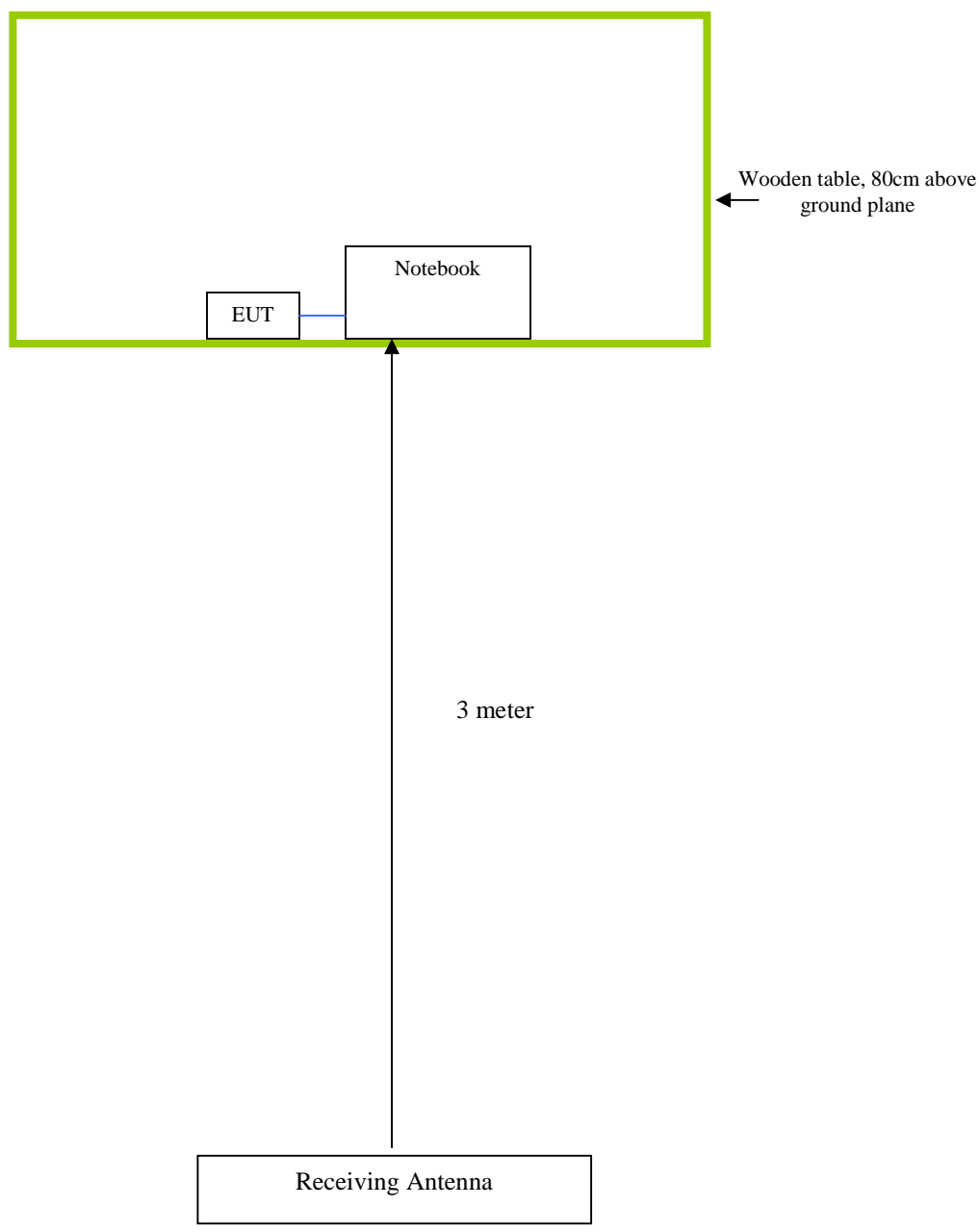
### **EUT TEST CONDITIONS**

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

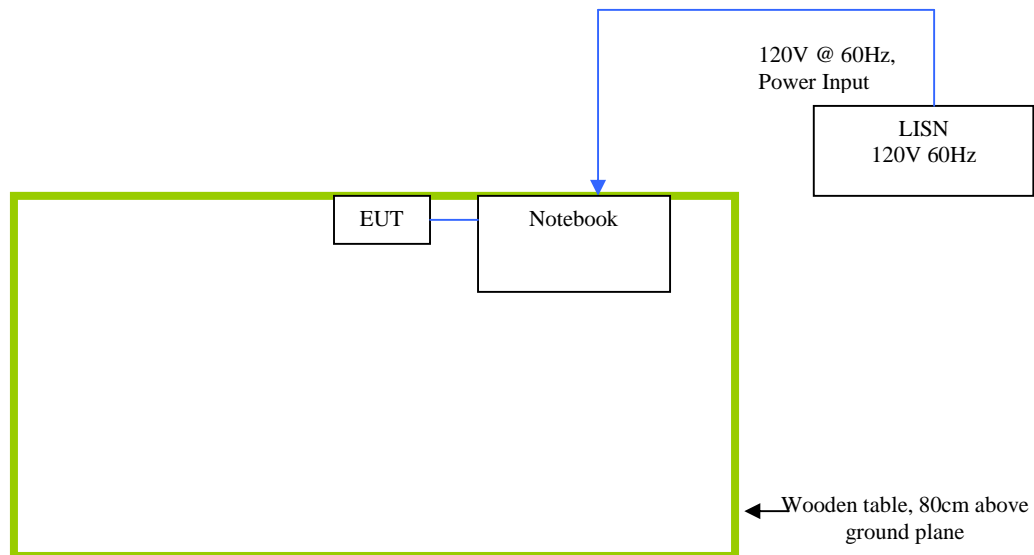
The following is a description of supporting equipment and details of cables used with the EUT.

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

**Block Configuration Diagram for Radiated Emission**



## Block Configuration Diagram for Conducted Emission





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

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

Test	Description Of Operation
Emissions	The EUT was continuously transmitting to stimulate the worst case.

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

**Please see attachment**

## Annex E. SIEMIC ACCREDITATION CERTIFICATES

### SIEMIC ACCREDITATION DETAILS: FCC Registration NO:986914



**SIEMIC ACCREDITATION DETAILS: FCC Listing, Registration NO:986914**

**FEDERAL COMMUNICATIONS COMMISSION**

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

April 19, 2011

Registration Number: 986914

SIEMIC Nanjing (China) Laboratories  
2-1 Longcang Avenue,  
Yuhua Economic and Technology Development Park,  
Nanjing, 210039  
China

Attention: Leslie Bai,

Re: Measurement facility located at 2-1 Longcang Avenue, Nanjing, China  
Anechoic chamber (3 meters) and 3&10 meter OATS  
Date of Renewal: April 19, 2011

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

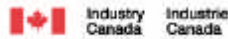
Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish  
Industry Analyst



## SIEMIC ACCREDITATION DETAILS: Industry of Canada Registration No. 4842



January 25, 2011

OUR FILE: 46405-4842  
Submission No: 145222

Siemic Nanjing (China) Laboratories  
2-1 Longgang Avenue  
Yuhua Economic & Technology Dev. Park, Nanjing  
China

Attention: Leslie Bai

Dear Sir/Madame:

The Bureau has received your application for the registration of a 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought ( Site# 4842B-2 ). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

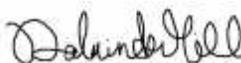
- The company address code associated to the site(s) located at the above address is: **4842B**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed three years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;  
[http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h\\_tr00052e.html](http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tr00052e.html).

If you have any questions, you may contact the Bureau by e-mail at [certification.bureau@ic.gc.ca](mailto:certification.bureau@ic.gc.ca) Please reference our file and submission number above for all correspondence.

Yours sincerely,



Dalwinder Gill  
For: Wireless Laboratory Manager  
Certification and Engineering Bureau  
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