

# EDMI INTERNATIONAL TRADING (SHANGHAI) CO., LTD

## Electricity Meter

Main Model: NC30

Serial Model: N/A

April 25, 2014

Report No.: 14070091-FCC-R1

(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |
| David Huang<br>Compliance Engineer                                                  | Alex Liu<br>Technical Manager                                                       |                                                                                       |

This test report may be reproduced in full only.  
Test result presented in this test report is applicable to the representative sample only.

# RF Test Report

## To: FCC 15.249: 2013

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      |

This page has been left blank intentionally.

## CONTENTS

|          |                                                                            |           |
|----------|----------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>EXECUTIVE SUMMARY &amp; EUT INFORMATION .....</b>                       | <b>5</b>  |
| <b>2</b> | <b>TECHNICAL DETAILS .....</b>                                             | <b>6</b>  |
| <b>3</b> | <b>MODIFICATION.....</b>                                                   | <b>7</b>  |
| <b>4</b> | <b>TEST SUMMARY.....</b>                                                   | <b>8</b>  |
| <b>5</b> | <b>MEASUREMENTS, EXAMINATION AND DERIVED RESULTS .....</b>                 | <b>9</b>  |
|          | <b>ANNEX A. TEST INSTRUMENT &amp; METHOD .....</b>                         | <b>22</b> |
|          | <b>ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS .....</b>                       | <b>26</b> |
|          | <b>ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT.....</b>                   | <b>34</b> |
|          | <b>ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST .....</b> | <b>38</b> |
|          | <b>ANNEX E. DECLARATION OF SIMILARITY .....</b>                            | <b>39</b> |

## **1 EXECUTIVE SUMMARY & EUT INFORMATION**

**The purpose of this test programme was to demonstrate compliance of the EDM I INTERNATIONAL TRADING (SHANGHAI) CO., LTD, Electricity Meter and model: NC30 against the current Stipulated Standards. The Electricity Meter has demonstrated compliance with the FCC 15.249: 2013.**

### **EUT Information**

**EUT  
Description : Electricity Meter**

**Main Model : NC30**

**Serial Model : N/A**

**Input Power : AC 120V 60Hz**

**Classification  
Per Stipulated : FCC 15.249: 2013  
Test Standard**

## **2 TECHNICAL DETAILS**

|                                        |                                                                                                                                                                                                                                                                                          |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                         | <b>Compliance testing of Electricity Meter with stipulated standard</b>                                                                                                                                                                                                                  |
| <b>Applicant / Client</b>              | <b>EDMI INTERNATIONAL TRADING (SHANGHAI) CO., LTD<br/>Room 1504-1508, Tower A, Cao He Jing High-Tech Bldg., 900 Yishan Road, Shanghai 200233, P.R.China</b>                                                                                                                              |
| <b>Manufacturer</b>                    | <b>EDMI INTERNATIONAL TRADING (SHANGHAI) CO., LTD<br/>Room 1504-1508, Tower A, Cao He Jing High-Tech Bldg., 900 Yishan Road, Shanghai 200233, P.R.China</b>                                                                                                                              |
| <b>Laboratory performing the tests</b> | <b>SIEMIC (Shenzhen-China) Laboratories<br/>Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China<br/>Tel: +86-0755-2601 4629 / 2601 4953<br/>Fax: +86-0755-2601 4953-810<br/>Email: China@siemic.com.cn</b> |
| <b>Test report reference number</b>    | <b>14070091-FCC-R1</b>                                                                                                                                                                                                                                                                   |
| <b>Date EUT received</b>               | <b>March 19, 2014</b>                                                                                                                                                                                                                                                                    |
| <b>Standard applied</b>                | <b>FCC 15.249: 2013</b>                                                                                                                                                                                                                                                                  |
| <b>Dates of test (from – to)</b>       | <b>March 26 to April 24, 2014</b>                                                                                                                                                                                                                                                        |
| <b>No of Units</b>                     | <b>#1</b>                                                                                                                                                                                                                                                                                |
| <b>Equipment Category</b>              | <b>DXX</b>                                                                                                                                                                                                                                                                               |
| <b>Trade Name</b>                      | <b> EDM I</b>                                                                                                                                                                                       |
| <b>RF Operating Frequency (ies)</b>    | <b>915-918.6 MHz</b>                                                                                                                                                                                                                                                                     |
| <b>Number of Channels</b>              | <b>10</b>                                                                                                                                                                                                                                                                                |
| <b>Modulation</b>                      | <b>GFSK</b>                                                                                                                                                                                                                                                                              |
| <b>FCC ID</b>                          | <b>2AB2ZNC30</b>                                                                                                                                                                                                                                                                         |

### 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

| Description                                 |                                        | Pass / Fail |
|---------------------------------------------|----------------------------------------|-------------|
| §15.215(c)                                  | 20 dB Bandwidth&99% Occupied Bandwidth | Pass        |
| §15.249(a)                                  | Field Strength Measurement             | Pass        |
| §15.207(a)                                  | Conducted Emissions                    | Pass        |
| §15.205(a), §15.209(a),<br>§15.249, §15.35. | Radiated Emissions(Tx)                 | Pass        |
| /                                           | Band-Edge                              | Pass        |

| Channels | Frequency(MHz) |
|----------|----------------|
| 1        | 915            |
| 2        | 915.4          |
| 3        | 915.8          |
| 4        | 916.2          |
| 5        | 916.6          |
| 6        | 917.0          |
| 7        | 917.4          |
| 8        | 917.8          |
| 9        | 918.2          |
| 10       | 918.6          |

Note: According with FCC Part 15.31(m), we tested low and high channels.

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

### **5.1 20 dB Bandwidth&99% 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          | 23°C     |
| Relative Humidity    | 52%      |
| Atmospheric Pressure | 1008mbar |
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  $\pm 1.5\text{dB}$ .
4. Test date : March 26, 2014  
Tested By : David Huang

#### **Standard Requirement:**

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

#### **Procedures:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel,  $\text{RBW} \geq 1\%$  of the 20 dB bandwidth,  $\text{VBW} \geq \text{RBW}$ , Sweep = auto, Detector function = peak, Trace = max hold.
4. Set the measured low, middle and high frequency and test 20dB bandwidth with spectrum analyzer.

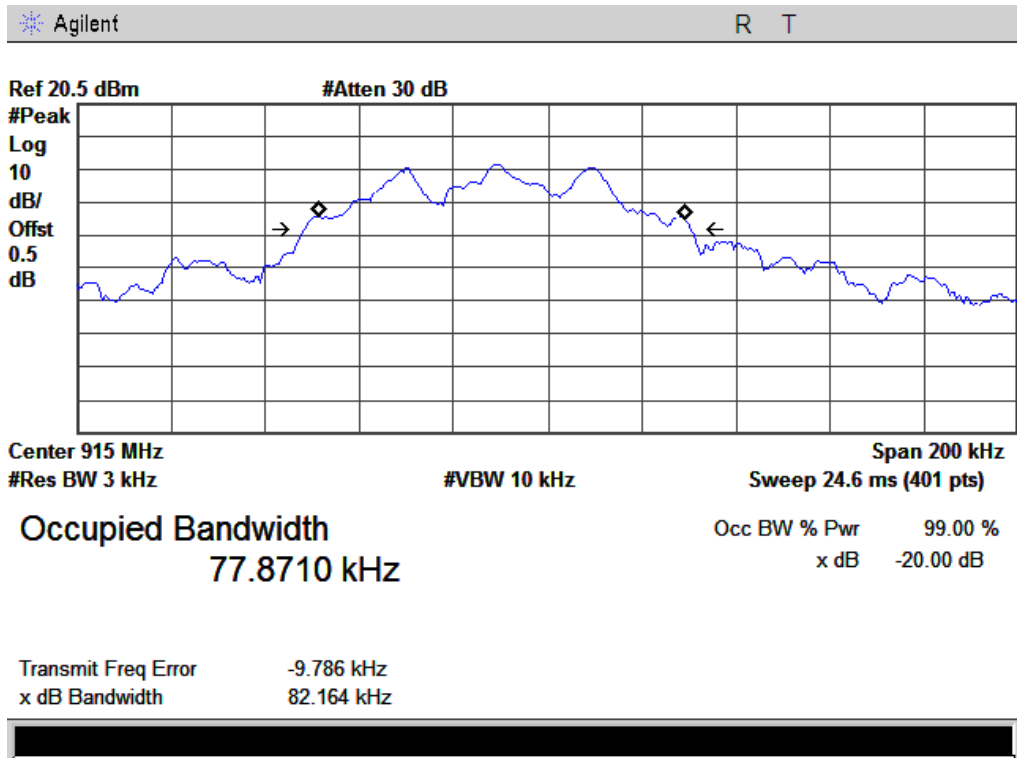
#### **Test Result: Pass**

|                   |                     |
|-------------------|---------------------|
| <b>Test Mode:</b> | <b>Transmitting</b> |
|-------------------|---------------------|

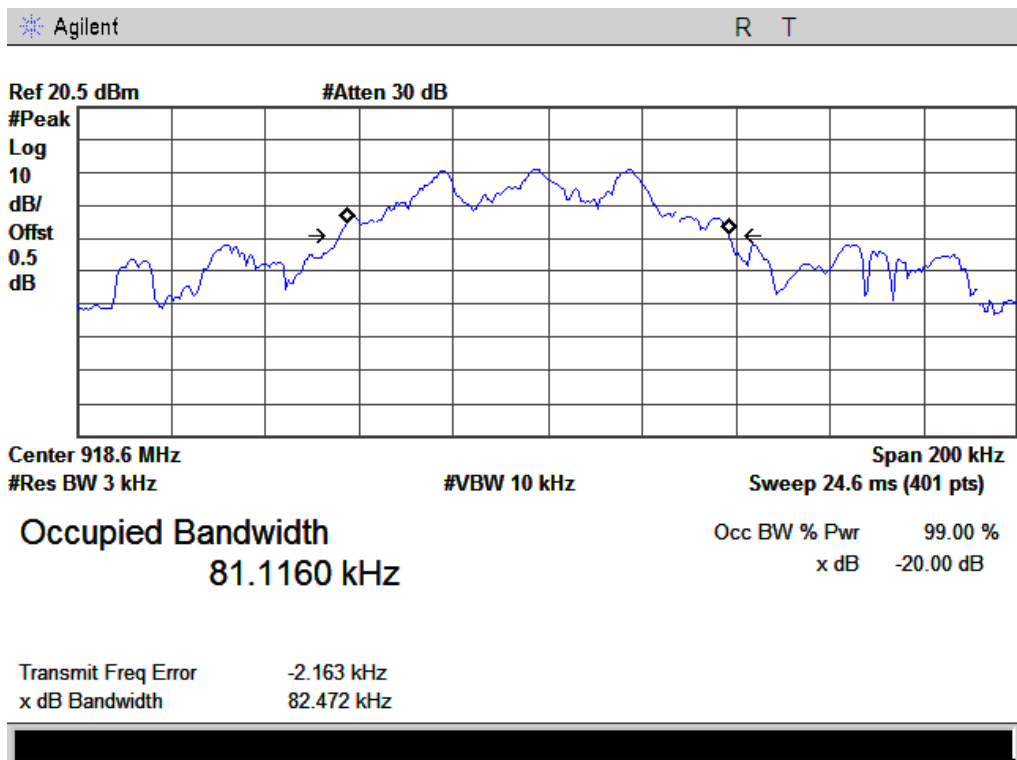
| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) | 99% Occupied Bandwidth (KHz) |
|---------|-----------------|----------------------|------------------------------|
| Low     | 915             | 82.164               | 77.871                       |
| High    | 918.6           | 82.472               | 81.116                       |

The 20dB&99% bandwidth:

### Low Channel



### High Channel



## 5.2 Field Strength Measurement

1. Radiated Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
2. 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 – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 22°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1008mbar |
4. Test date : April 24, 2014  
Tested By : David Huang

### Standard Requirement:

| Fundamental frequency | Field strength of fundamental (millivolts/ meter) | Field strength of harmonics (microvolts/ meter) |
|-----------------------|---------------------------------------------------|-------------------------------------------------|
| 902–928 MHz .....     | 50                                                | 500                                             |
| 2400–2483.5 MHz ..... | 50                                                | 500                                             |
| 5725–5875 MHz .....   | 50                                                | 500                                             |
| 24.0–24.25 GHz .....  | 250                                               | 2500                                            |

### Procedures:

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

**Test Result: Pass**

|                   |                     |
|-------------------|---------------------|
| <b>Test Mode:</b> | <b>Transmitting</b> |
|-------------------|---------------------|

### Fundamental Field Strength:

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------|----------------|-------------|
| 915             | 86.72               | PK               | H              | 22.5               | 0.9             | 22                 | 88.12               | 114            | -25.88      |
| 915             | 86.0                | QP               | H              | 22.5               | 0.9             | 22                 | 87.40               | 94             | -6.60       |
| 915             | 83.81               | PK               | V              | 22.5               | 0.9             | 22                 | 85.21               | 114            | -28.79      |
| 915             | 83.40               | QP               | V              | 22.5               | 0.9             | 22                 | 84.80               | 94             | -9.20       |
| 918.6           | 87.35               | PK               | H              | 22.5               | 0.9             | 22                 | 88.75               | 114            | -25.25      |
| 918.6           | 86.90               | QP               | H              | 22.5               | 0.9             | 22                 | 88.30               | 94             | -5.70       |
| 918.6           | 84.78               | PK               | V              | 22.5               | 0.9             | 22                 | 86.18               | 114            | -27.82      |
| 918.6           | 84.20               | QP               | V              | 22.5               | 0.9             | 22                 | 85.60               | 94             | -8.40       |

## 5.3 Conducted emissions Test Result

### Standard Requirement:

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | 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.

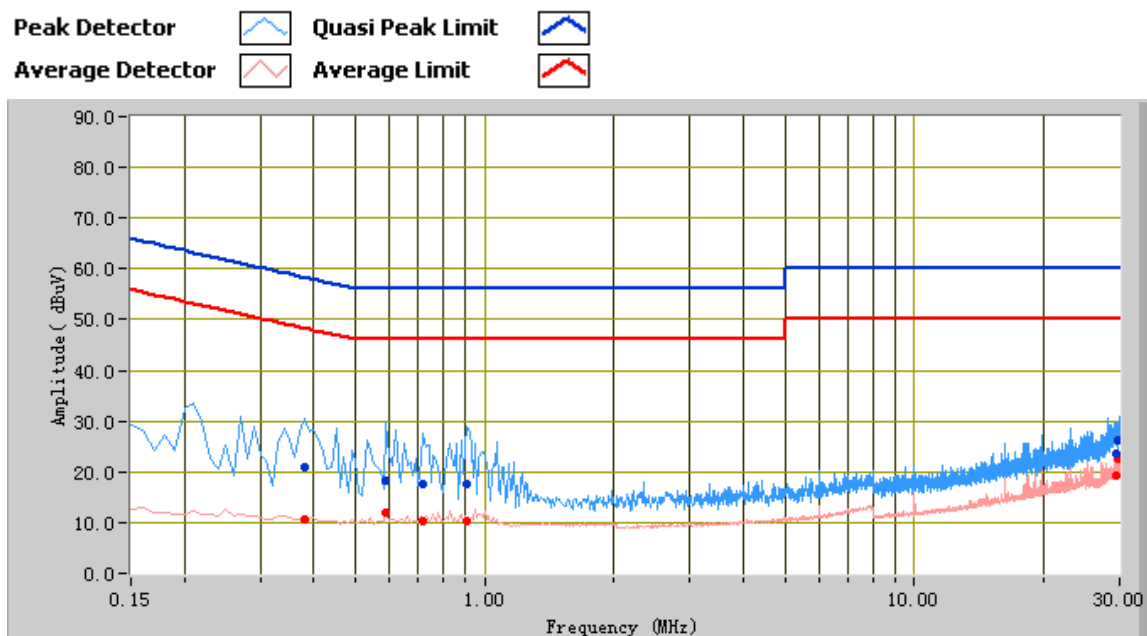
### Procedures:

- 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  $\pm 3.5$ dB.
- Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 19°C     |
| Relative Humidity    | 55%      |
| Atmospheric Pressure | 1007mbar |
- Test date : April 02, 2014  
Tested By : David Huang

**Test Result: Pass**

|                   |                |
|-------------------|----------------|
| <b>Test Mode:</b> | <b>Running</b> |
|-------------------|----------------|



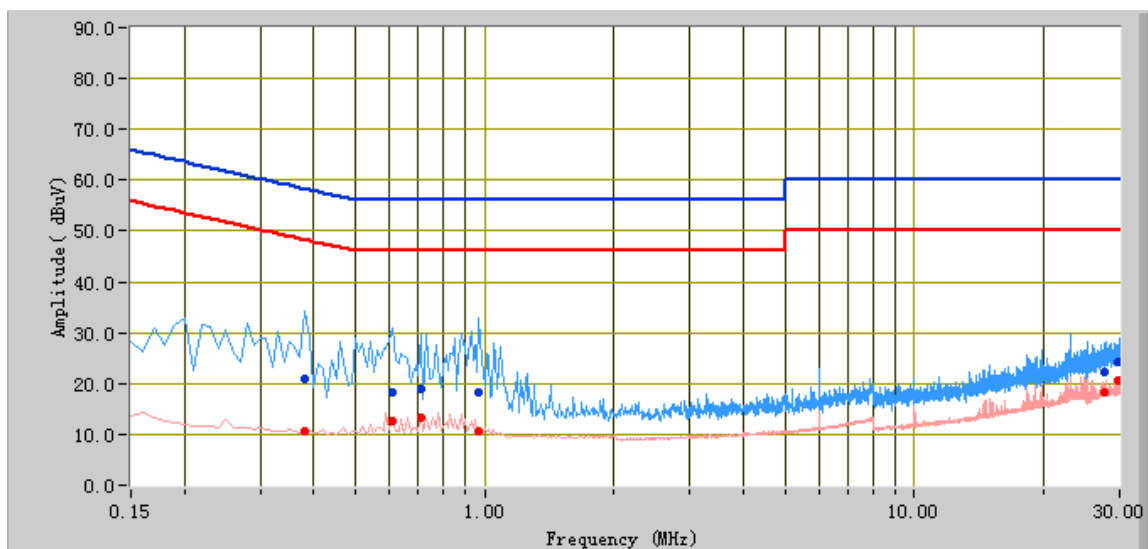
### Test Data

#### Phase Line Plot at 120V AC, 60Hz

| Frequency (MHz) | Quasi Peak (dBuV) | Limit (dBuV) | Margin (dB) | Average (dBuV) | Limit (dBuV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 0.59            | 18.43             | 56.00        | -37.57      | 11.82          | 46.00        | -34.18      | 10.51        |
| 0.91            | 17.47             | 56.00        | -38.53      | 10.30          | 46.00        | -35.70      | 10.34        |
| 0.38            | 20.93             | 58.28        | -37.35      | 10.61          | 48.28        | -37.67      | 11.08        |
| 0.72            | 17.69             | 56.00        | -38.31      | 10.38          | 46.00        | -35.62      | 10.44        |
| 29.66           | 26.33             | 60.00        | -33.67      | 22.54          | 50.00        | -27.46      | 16.19        |
| 29.42           | 23.62             | 60.00        | -36.38      | 19.40          | 50.00        | -30.60      | 16.14        |

|            |         |
|------------|---------|
| Test Mode: | Running |
|------------|---------|

Peak Detector  Quasi Peak Limit   
 Average Detector  Average Limit 



### 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) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 0.97            | 18.20             | 56.00        | -37.80      | 10.79          | 46.00        | -35.21      | 10.31        |
| 0.38            | 20.85             | 58.28        | -37.43      | 10.61          | 48.28        | -37.67      | 11.08        |
| 0.61            | 18.30             | 56.00        | -37.70      | 12.47          | 46.00        | -33.53      | 10.50        |
| 0.71            | 18.79             | 56.00        | -37.21      | 13.40          | 46.00        | -32.60      | 10.44        |
| 27.74           | 22.35             | 60.00        | -37.65      | 18.35          | 50.00        | -31.65      | 15.98        |
| 29.66           | 24.28             | 60.00        | -35.72      | 20.50          | 50.00        | -29.50      | 16.19        |

## **5.4 Radiated Emissions (TX)**

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 ( 3m & 10m ) & 1GHz above ( 3m ) is +5.6/-4.5dB.
4. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 22°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1008mbar |
5. Test date : April 24, 2014  
Tested By : David Huang

### **Standard Requirement:**

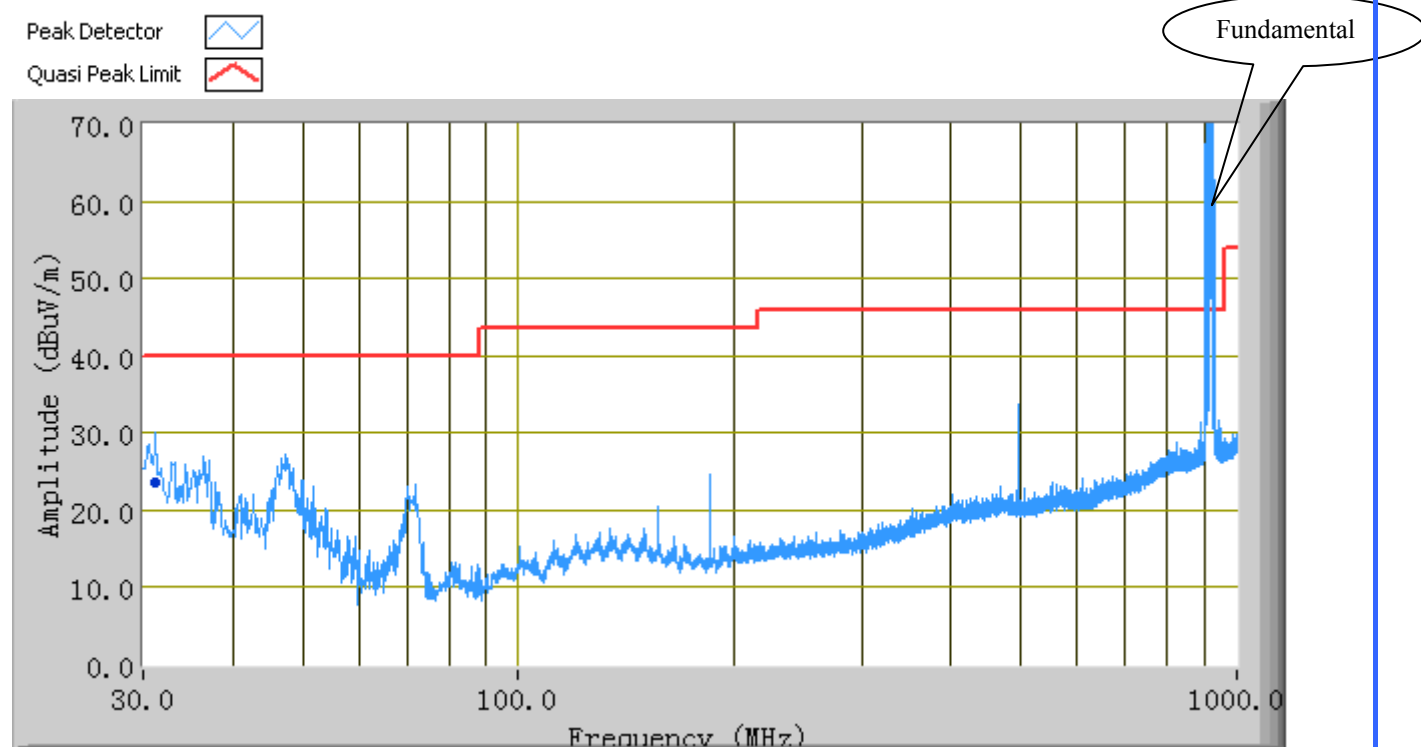
The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

The spurious emission scanned frequency range is 30MHz – 25GHz.

**Test Result: Pass**

**Test Mode:** Transmitting

### Below 1GHz



### Test Data

| Frequency (MHz) | Quasi Peak (dBuV/m) | Azimuth | Polarity(H/V ) | Height (cm) | Factors (dB) | Limit (dBuV) | Margin (dB) |
|-----------------|---------------------|---------|----------------|-------------|--------------|--------------|-------------|
| 31.23           | 23.59               | 238.00  | V              | 115.00      | -2.30        | 40.00        | -16.41      |

|                   |                     |
|-------------------|---------------------|
| <b>Test Mode:</b> | <b>Transmitting</b> |
|-------------------|---------------------|

*Above 1 GHz*

**Low Channel (915 MHz)**

| Frequency<br>(MHz) | S.A.<br>Reading<br>(dBμV) | Detector<br>(PK/AV) | Direction<br>(degree) | Height<br>(m) | Polarity<br>(H/V) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>Gain<br>(dB) | Cord.<br>Amp.<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------|---------------------------|---------------------|-----------------------|---------------|-------------------|--------------------------|-----------------------|------------------------------|---------------------------|-------------------|----------------|
| 1830               | 42.56                     | PK                  | 182                   | 1.2           | V                 | 28.41                    | 1.8                   | 24                           | 48.77                     | 74                | -25.23         |
| 1830               | 40.89                     | AV                  | 182                   | 1.2           | V                 | 28.41                    | 1.8                   | 24                           | 47.10                     | 54                | -6.90          |
| 1830               | 43.94                     | PK                  | 105                   | 1.3           | H                 | 28.41                    | 1.8                   | 24                           | 50.15                     | 74                | -23.85         |
| 1830               | 42.55                     | AV                  | 105                   | 1.3           | H                 | 28.41                    | 1.8                   | 24                           | 48.76                     | 54                | -5.24          |
| 2745               | 39.50                     | PK                  | 167                   | 1.3           | V                 | 30.35                    | 3.67                  | 24                           | 49.52                     | 74                | -24.48         |
| 2745               | 38.12                     | AV                  | 167                   | 1.3           | V                 | 30.35                    | 3.67                  | 24                           | 48.14                     | 54                | -5.86          |
| 2745               | 39.16                     | PK                  | 125                   | 1.4           | H                 | 30.35                    | 3.67                  | 24                           | 49.18                     | 74                | -24.82         |
| 2745               | 38.47                     | AV                  | 125                   | 1.4           | H                 | 30.35                    | 3.67                  | 24                           | 48.49                     | 54                | -5.51          |
| 2282               | 40.71                     | PK                  | 172                   | 1.2           | V                 | 29.24                    | 3.63                  | 24                           | 49.58                     | 74                | -24.42         |
| 2282               | 39.23                     | AV                  | 172                   | 1.2           | V                 | 29.24                    | 3.63                  | 24                           | 48.10                     | 54                | -5.90          |
| 2282               | 40.78                     | PK                  | 110                   | 1.3           | H                 | 29.24                    | 3.63                  | 24                           | 49.65                     | 74                | -24.35         |
| 2282               | 38.79                     | AV                  | 110                   | 1.3           | H                 | 29.24                    | 3.63                  | 24                           | 47.66                     | 54                | -6.34          |

**High Channel (918.6 MHz)**

| Frequency<br>(MHz) | S.A.<br>Reading<br>(dBμV) | Detector<br>(PK/AV) | Direction<br>(degree) | Height<br>(m) | Polarity<br>(H/V) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>Gain<br>(dB) | Cord.<br>Amp.<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------|---------------------------|---------------------|-----------------------|---------------|-------------------|--------------------------|-----------------------|------------------------------|---------------------------|-------------------|----------------|
| 1837.2             | 45.09                     | PK                  | 43                    | 1.6           | V                 | 28.41                    | 1.8                   | 24                           | 51.30                     | 74                | -22.70         |
| 1837.2             | 42.03                     | AV                  | 43                    | 1.6           | V                 | 28.41                    | 1.8                   | 24                           | 48.24                     | 54                | -5.76          |
| 1837.2             | 42.41                     | PK                  | 127                   | 1.4           | H                 | 28.41                    | 1.8                   | 24                           | 48.62                     | 74                | -25.38         |
| 1837.2             | 41.55                     | AV                  | 127                   | 1.4           | H                 | 28.41                    | 1.8                   | 24                           | 47.76                     | 54                | -6.24          |
| 2755.8             | 37.59                     | PK                  | 145                   | 1.3           | V                 | 30.35                    | 3.67                  | 24                           | 47.61                     | 74                | -26.39         |
| 2755.8             | 36.44                     | AV                  | 145                   | 1.3           | V                 | 30.35                    | 3.67                  | 24                           | 46.46                     | 54                | -7.54          |
| 2755.8             | 41.41                     | PK                  | 64                    | 1.6           | H                 | 30.35                    | 3.67                  | 24                           | 51.43                     | 74                | -22.57         |
| 2755.8             | 40.88                     | AV                  | 64                    | 1.6           | H                 | 30.35                    | 3.67                  | 24                           | 50.90                     | 54                | -3.10          |
| 2282               | 39.04                     | PK                  | 148                   | 1.1           | V                 | 29.24                    | 3.63                  | 24                           | 47.91                     | 74                | -26.09         |
| 2282               | 38.21                     | AV                  | 148                   | 1.1           | V                 | 29.24                    | 3.63                  | 24                           | 47.08                     | 54                | -6.92          |
| 2282               | 39.90                     | PK                  | 75                    | 1.4           | H                 | 29.24                    | 3.63                  | 24                           | 48.77                     | 74                | -25.23         |
| 2282               | 38.57                     | AV                  | 75                    | 1.4           | H                 | 29.24                    | 3.63                  | 24                           | 47.44                     | 54                | -6.56          |

**Spurious emissions in restricted band for FCC:**

The Spurious Emission was checked in restricted band. No emissions were found and only noise floor.

## 5.5 Band-Edge

1. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.
2. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 20°C     |
| Relative Humidity    | 60%      |
| Atmospheric Pressure | 1008mbar |
3. Test date : April 01, 2014  
Tested By : David Huang

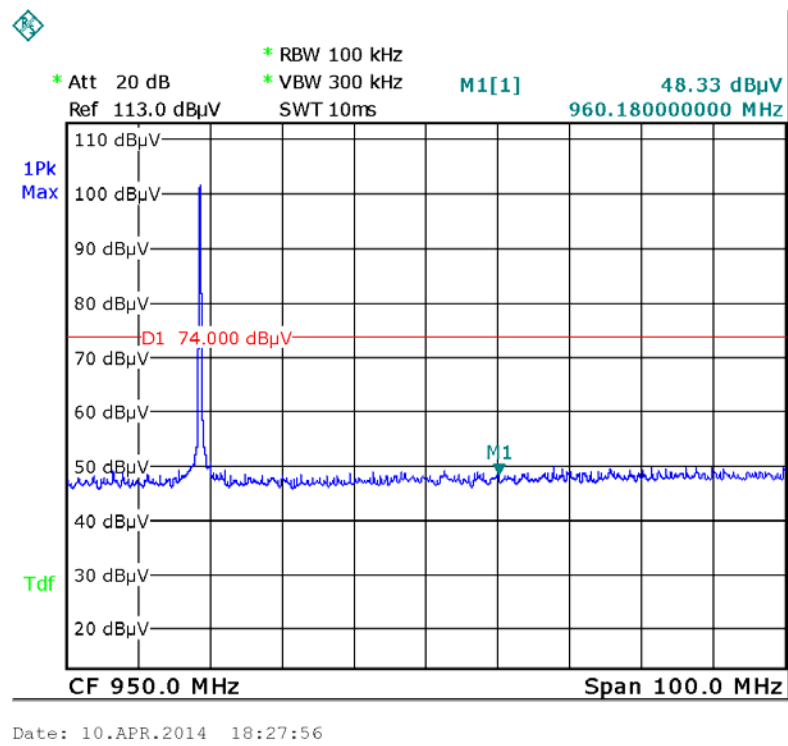
### Procedures: (Radiated Method Only)

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the rotated table inside the anechoic chamber without connection to measurement instrument. Turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. Repeat above procedures until all measured frequencies were complete.
3. Set band RBW=1MHz, VBW=3MHz with a convenient frequency span from band edge.
4. Find the highest point in edge frequency, and then calculated results.
5. Repeat above procedures until all measured frequencies were complete.

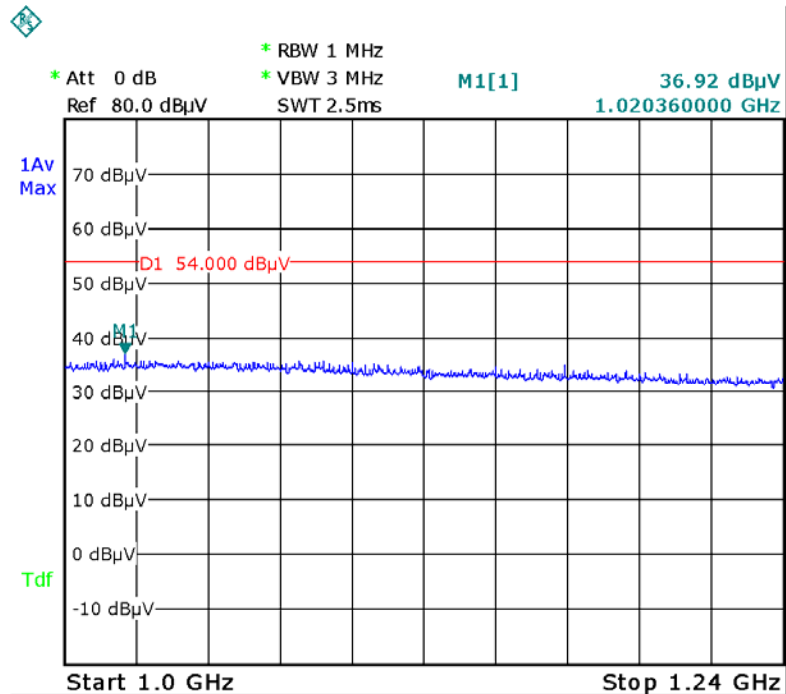
### Test Result: Pass

Please refer to the following tables and plots.

Band Edge, 960M-1G (Peak)

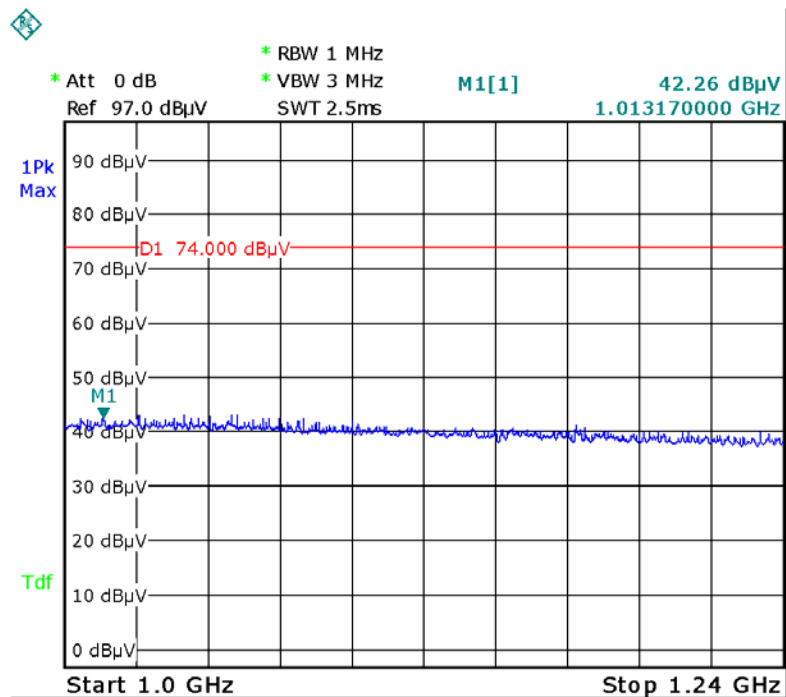


### Band Edge, 1G-1.24G (Average)



Date: 10.APR.2014 21:51:55

### Band Edge, 1G-1.24G (Peak)



Date: 10.APR.2014 21:52:47

## **Annex A. TEST INSTRUMENT & METHOD**

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

| Instrument                             | Model    | Serial #   | Calibration Date | Calibration Due Date |
|----------------------------------------|----------|------------|------------------|----------------------|
| <b>AC Line Conducted Emissions</b>     |          |            |                  |                      |
| EMI test receiver                      | ESCS30   | 8471241027 | 05/27/2013       | 05/26/2014           |
| Line Impedance Stabilization Network   | LI-125A  | 191106     | 11/14/2013       | 11/13/2014           |
| Line Impedance Stabilization Network   | LI-125A  | 191107     | 11/14/2013       | 11/13/2014           |
| LISN                                   | ISN T800 | 34373      | 01/11/2014       | 01/10/2015           |
| Double Ridge Horn Antenna (1 ~18GHz)   | AH-118   | 71283      | 11/20/2013       | 11/19/2014           |
| Transient Limiter                      | LIT-153  | 531118     | 09/02/2013       | 09/01/2014           |
| <b>RF conducted test</b>               |          |            |                  |                      |
| Agilent ESA-E SERIES SPECTRUM ANALYZER | E4407B   | MY45108319 | 09/17/2013       | 09/16/2014           |
| Power Splitter                         | 1#       | 1#         | 09/02/2013       | 09/01/2014           |
| DC Power Supply                        | E3640A   | MY40004013 | 09/17/2013       | 09/16/2014           |
| Wireless Connectivity Test Set         | N4010A   | GB44440198 | 03/20/2014       | 03/19/2015           |

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

### **Limit**

- Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (mV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 30-88           | 100*                  | 3                        |
| 88-216          | 150*                  | 3                        |
| 216-960         | 200*                  | 3                        |
| Above 960       | 500                   | 3                        |

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

- In the above emission table, the tighter limit applies at the band edges.

| Frequency (Hz) | Field Strength<br>( $\mu$ V/m at 3-meter) | Field Strength<br>(dB $\mu$ V/m at 3-meter) |
|----------------|-------------------------------------------|---------------------------------------------|
| 30-88          | 100                                       | 40                                          |
| 88-216         | 150                                       | 43.5                                        |
| 216-960        | 200                                       | 46                                          |
| Above 960      | 500                                       | 54                                          |

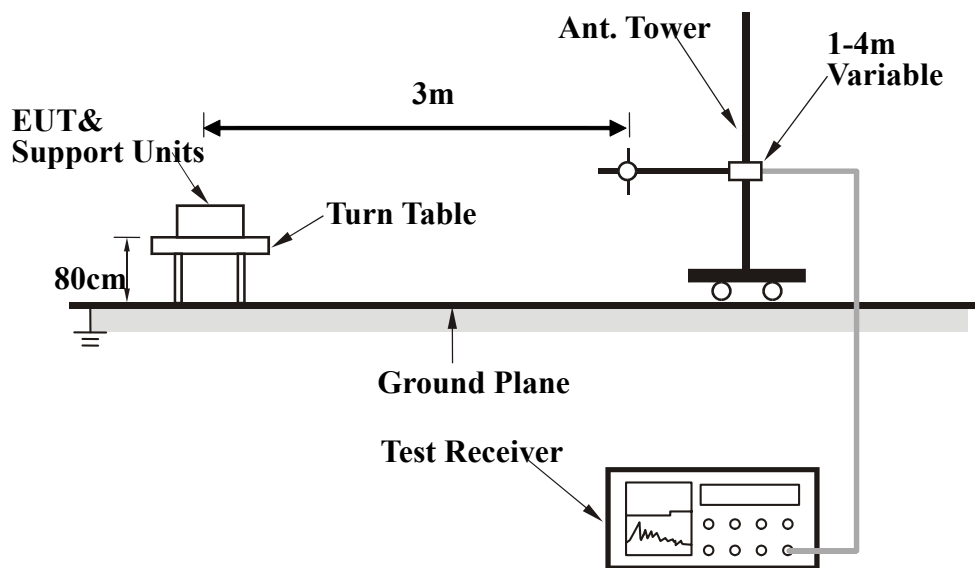
### **EUT Characterisation**

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) 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 1.5m 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 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     | 100 kHz              | 100 kHz         |
| Above 1000           | Peak     | 1 MHz                | 1 MHz           |
|                      | Average  | 1 MHz                | 10 Hz           |

### **Description of Radiated Emissions 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

Corr. Factor = Antenna Factor + Cable Factor - 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:

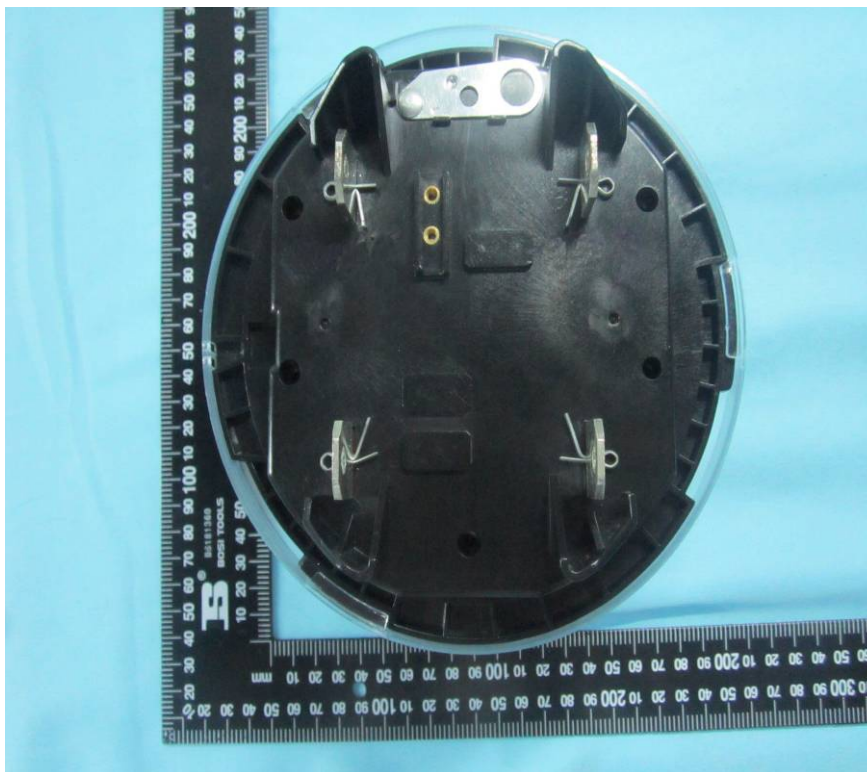
If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

## Annex B. EUT AND TEST SETUP PHOTOGRAPHS

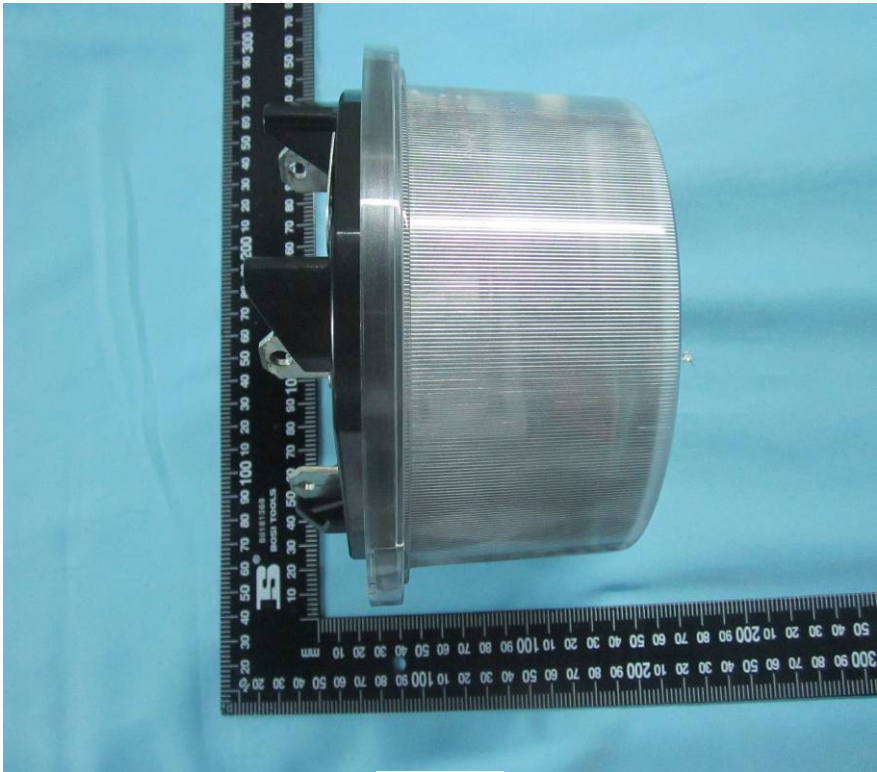
### Annex B.i. Photograph 1: EUT External Photo



Top view

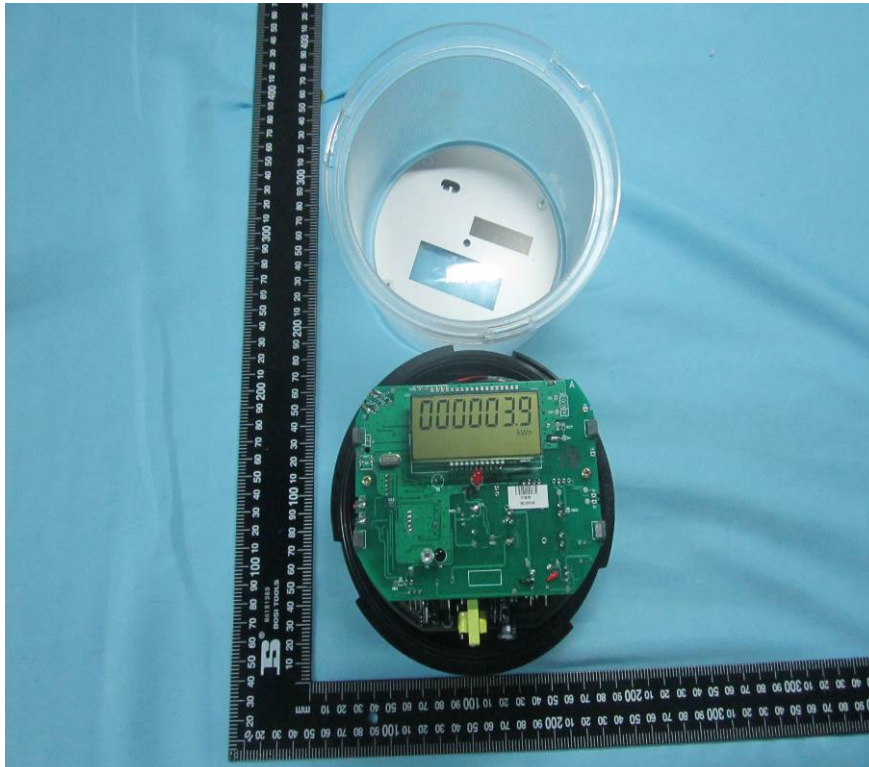


Bottom view

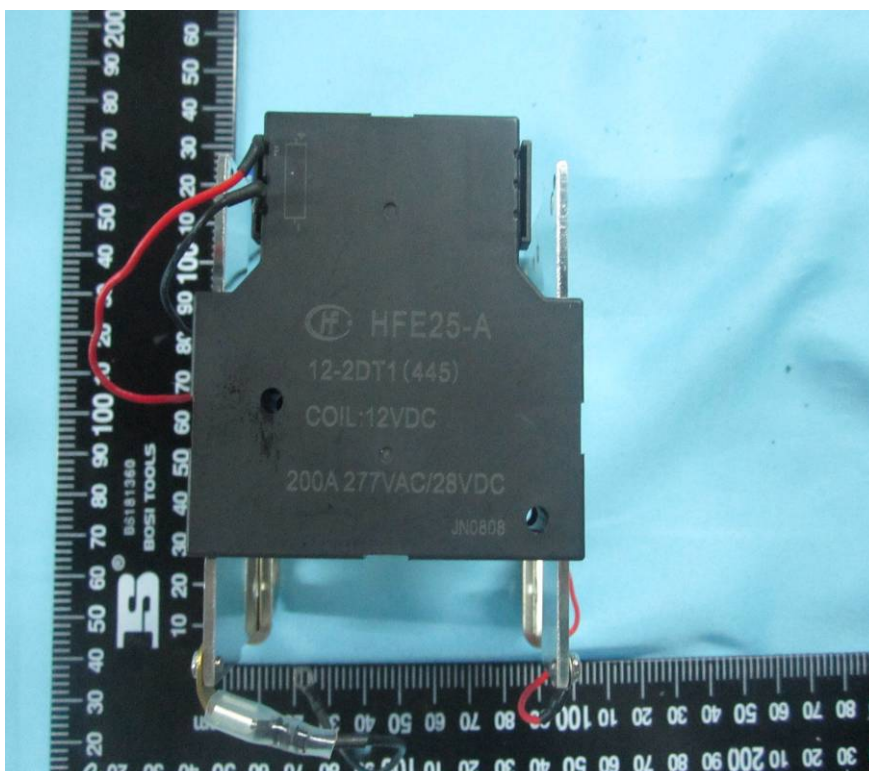


Side view

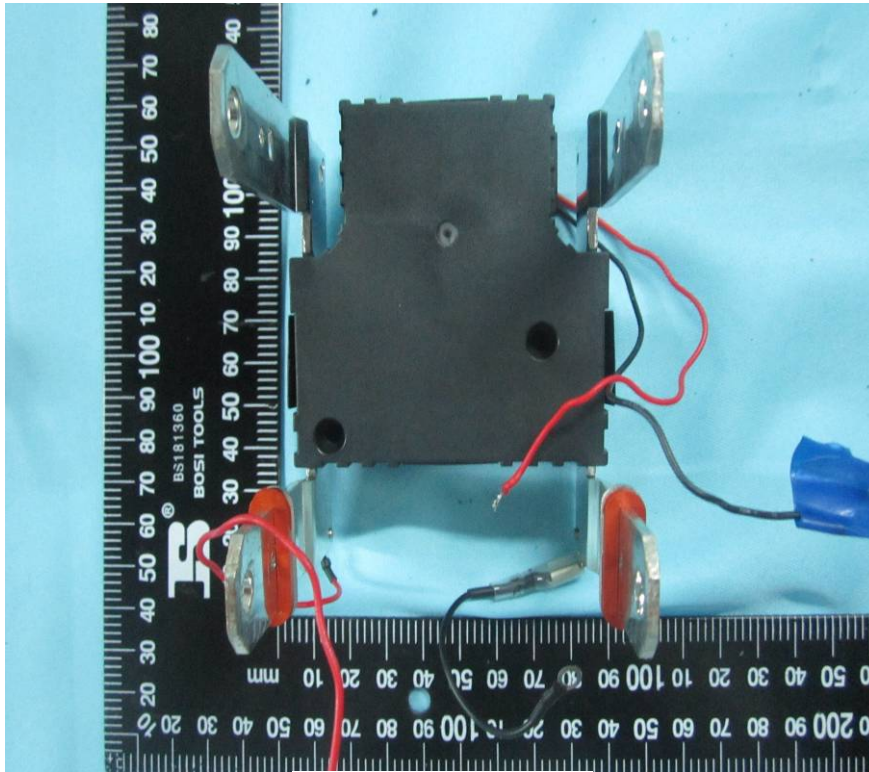
**Annex B.i. Photograph 1: EUT Internal Photo**



Uncover view



HFE25-A Top view



HFE25-A Bottom view



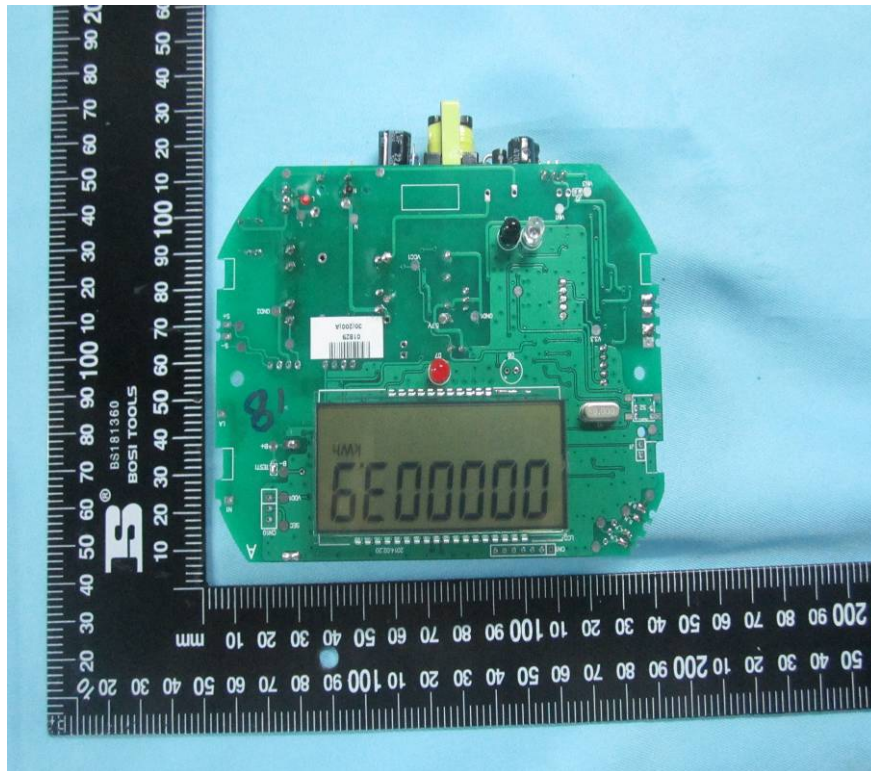
JSMCT152 top view



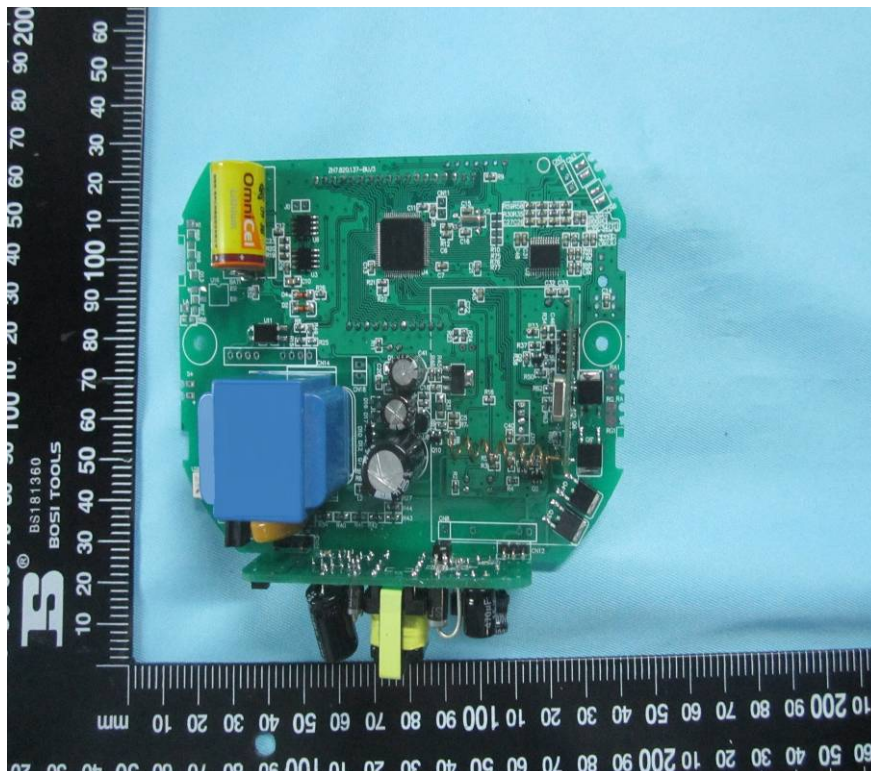
JSMCT152 bottom view



JSMCT152 label view



Main board top view



Main board bottom view

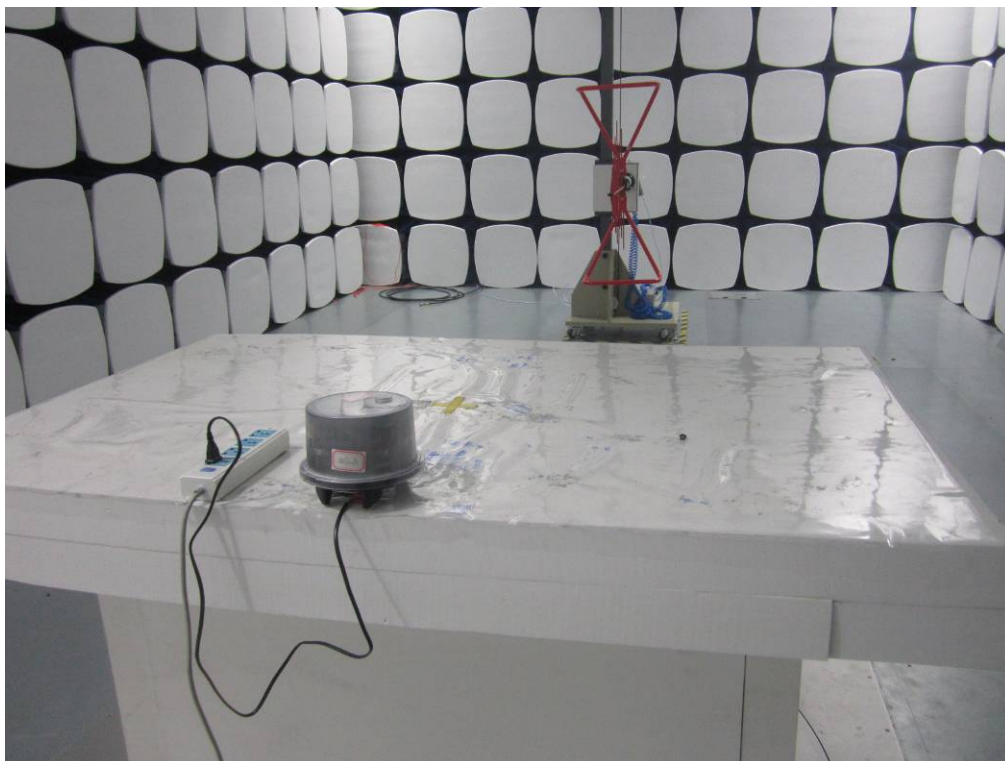
**Annex B.iii. Photograph 2: Test Setup Photo**



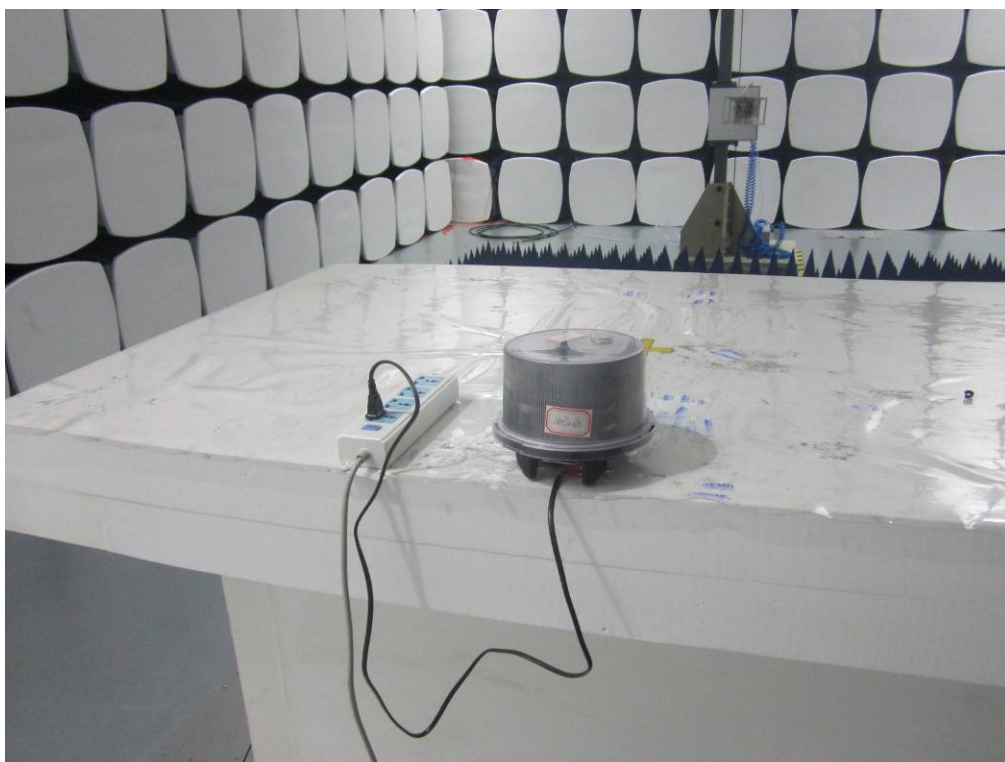
Conducted Emissions Test Setup Front View



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

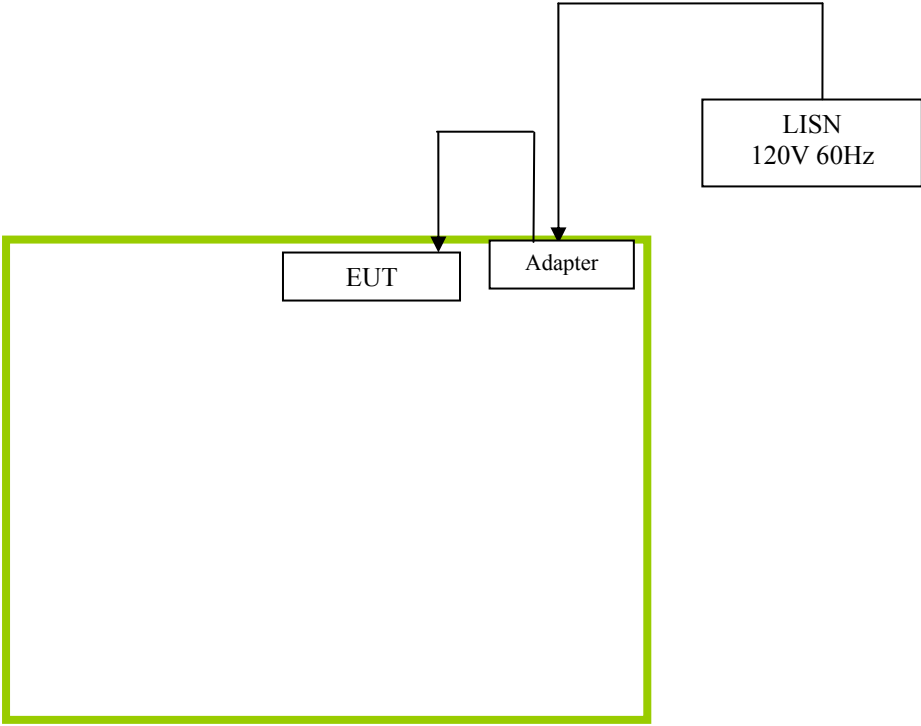
### EUT TEST CONDITIONS

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

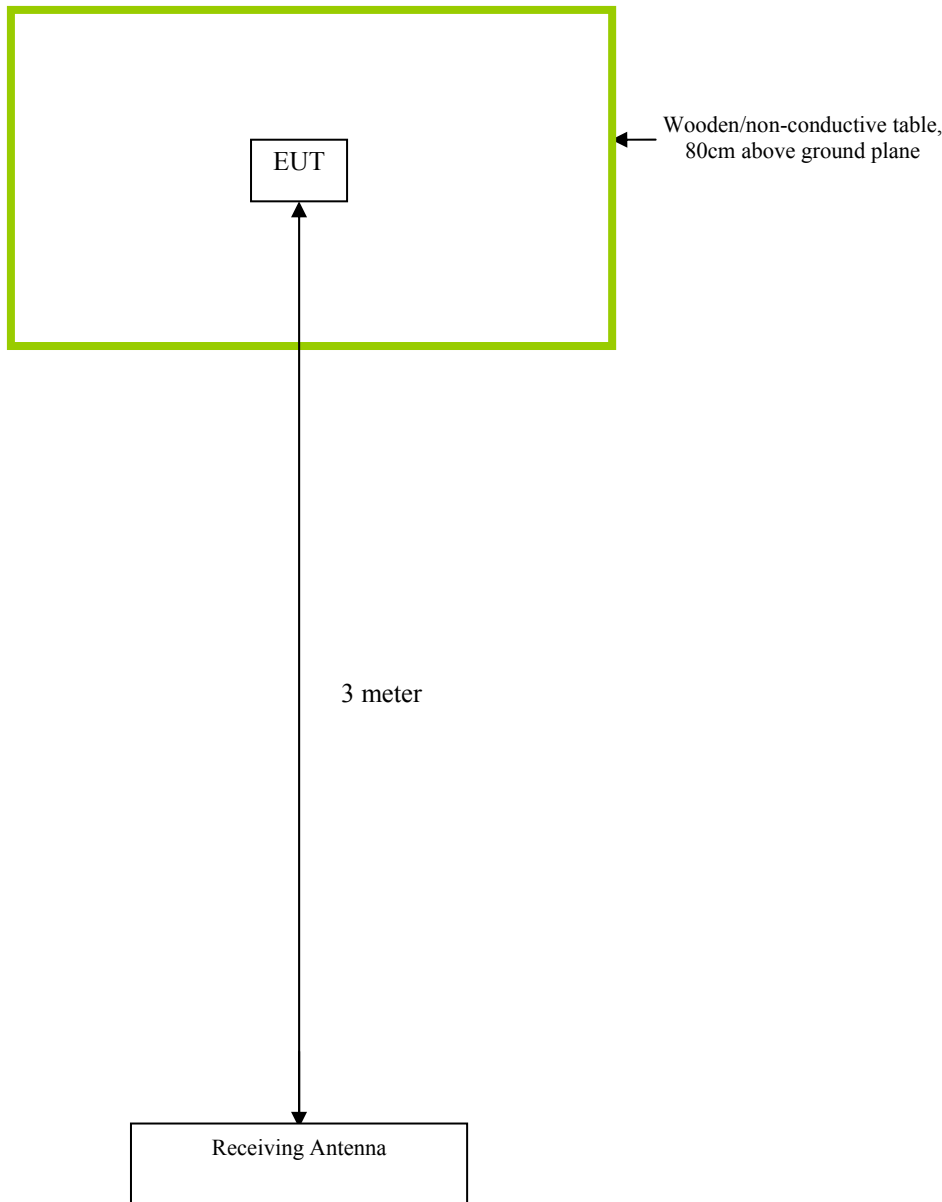
The following is a description of supporting equipment and details of cables used with the EUT.

| Equipment Description<br>(Including Brand Name) | Model & Serial Number | Cable Description<br>(List Length, Type & Purpose) |
|-------------------------------------------------|-----------------------|----------------------------------------------------|
| N/A                                             | N/A                   | N/A                                                |

**Block Configuration Diagram for Conducted Emissions**



**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                                           |
|-------------------|--------------------------------------------------------------------|
| Emissions Testing | The EUT was continuously transmitting to stimulate the worst case. |

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

**Please see attachment**

## **Annex E. DECLARATION OF SIMILARITY**

NONE