



# **A Test Lab Techno Corp.**

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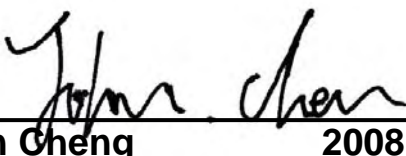
## **Part 15 C Measurement Report**



|                              |          |   |
|------------------------------|----------|---|
| <b>Report No.</b>            | <b>:</b> | <b>0810FR12-01</b>  |
| <b>Applicant</b>             | <b>:</b> | <b>Applied Wireless Identifications Group Inc.</b>  |
| <b>Trade Mark</b>            | <b>:</b> | <b>AWID</b>   |
| <b>Product Model</b>         | <b>:</b> | <b>NDK-2025</b>   |
| <b>Product Type</b>          | <b>:</b> | <b>RFID reader</b>  |
| <b>FCC ID</b>                | <b>:</b> | <b>OGSNDK2025</b>   |
| <b>Dates of Test</b>         | <b>:</b> | <b>Oct. 28 ~ Nov. 24, 2008</b>  |
| <b>Test Specification</b>    | <b>:</b> | <b>47 CFR §15.209</b><br><b>47 CFR §15.207</b><br><b>47 CFR §15.107</b><br><b>RSS-210 Issue 7</b> |
| <b>Location of Test Lab.</b> | <b>:</b> | <b>Chang-An</b>   |

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
3. The measurement report has to be written approval of A Test Lab Techno Corp. It may only be reproduced or published in full.

  
**Country Huang** 20081125  
**Measurement Center Manager**

  
**John Cheng** 20081125  
**Testing Engineer**



## CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2001. All test were conducted by *A Test Lab Techno Corp. No.140-1, Chang-an St., Bade City, Tao-Yuan County 334, Taiwan (R.O.C.)* Also, we attest to the accuracy of each.

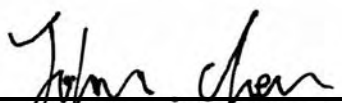
We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with Class B radiated and conducted emission limit of FCC Rules Part 15 Subpart C (15.209&15.207&15.107) & RSS-210 Issue 7(2007).

EUT : RFID reader  
Applicant : Applied Wireless Identifications Group Inc.  
18300 Sutter Blvd, Morgan Hill, CA 95037 USA  
Trade Mark : AWID  
Model No : NDK-2025  
FCC ID : OGSNDK2025

Approved by :

  
Country Huang 2008/11/25

Prepared by :

  
John Cheng 2008/11/25

***A Test Lab Techno Corp.***

*No.140-1, Chang-an St., Bade City, Tao-Yuan County 334, Taiwan (R.O.C.)  
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# Contents

|              |  |           |
|--------------|--|-----------|
| 1.           | <b>GENERAL.....</b>                          | <b>4</b>  |
| 2.           | <b>Conducted Emissions Requirements.....</b> | <b>8</b>  |
| 3.           | <b>Radiated Emissions Requirements .....</b> | <b>13</b> |
| 4.           | <b>Occupied Bandwidth Requirements.....</b>  | <b>21</b> |
| Appendix A - | <b>EUT Test SETUP .....</b>                  | <b>23</b> |



## 1. GENERAL

### 1.1 Description of Equipment under Test (EUT)

Applicant :

**Applied Wireless Identifications Group Inc.**  
**18300 Sutter Blvd, Morgan Hill, CA 95037 USA**

|                        |   |                      |
|------------------------|---|----------------------|
| Trade Mark             | : | AWID                 |
| Product Model          | : | NDK-2025             |
| Product Type           | : | RFID reader          |
| FCC ID                 | : | OGSNDK2025           |
| EUT Category:          | : | Radio Transmitter    |
| RF Operating Frequency | : | 125 KHz              |
| Number of Channels     | : | 1                    |
| Type of Antenna        | : | Loop coil/small loop |
| Antenna Gain           | : | 1.76 dBi             |
| Hardware Version       | : | 1.0                  |
| Software Version       | : | 1.0                  |

EUT is transmitting and receiving, simultaneously. This device operates with its transmit and receive circuitry on continuously.

During testing the EUT was operated at Tx / Rx mode for each emission measured. This was done in order to ensure that maximum emission levels were attained.



## 1.2 Introduction

The following measurement report is submitted on behalf of **Applied Wireless Identifications Group Inc.** In support of a Class B Digital Device certification in accordance with Part2 Subpart J and Part 15 Subpart A & B&C and RSS 210 Issue7(2007) of the Commission's and Regulations.

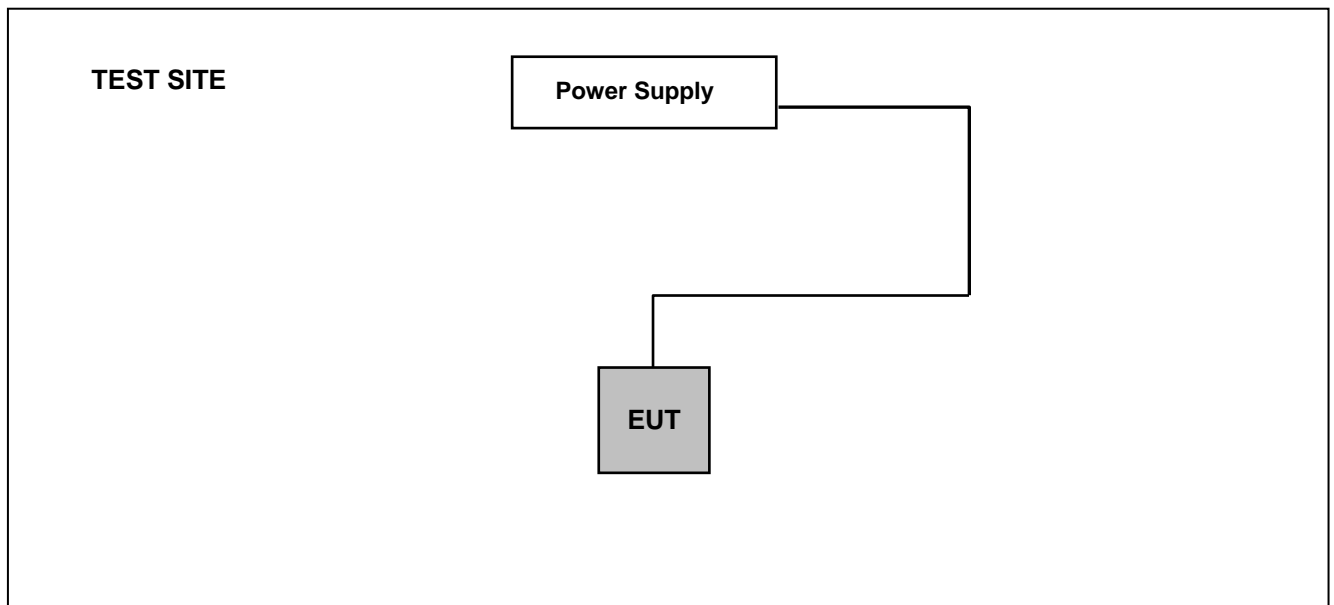
## 1.3 Summary of Tests

| 47 CFR Part 15 Subpart C & RSS 210 Issue7  |                |                             |         |         |
|--|----------------|-----------------------------|---------|---------|
| Reference  |                | Test                        | Results | Section |
| 47 CFR Part 15.209   | RSS 210 Issue7 |                             |         |         |
| 15.207(a)<br>15.107  | RSSGen(7.2.2)  | Conducted Emissions Voltage | PASS    | 2.6     |
| 15.209   | RSS210(A8.5)   | Radiated Emission Limits    | PASS    | 3.6     |
| CFR 47 Part 15.209 & 15.207 & 15.107/ RSS 210 Issue7 (2007) / ANSI C63.4: 2003 / RSS-Gen Issue 2: 2007 |                |                             |         |         |

## 1.4 Description of Support Equipment

The EUT itself forms a system. No support equipment is required for its normal operation.

## 1.5 Configuration of System under Test



**Figure 1. Configuration of System Under Test**

During EMI testing (LINK) the EUT (RFID reader)'s Power port was connected to DC power supply.



## **1.6 Test Procedure**

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4-2003 "Measurement of un-Intentional Radiators."

## **1.7 General Test Condition**

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated. The systems radiated and conducted emissions were investigated while the computer alternately transferred data to the EUT as well as to the monitor and printer. Using a test program which sent a continuous data and transferred data to and from the EUT was proven to worst case emissions. The system's physical layout and cabling was randomly arranged to ensure that maximum emission levels were attained.



## 2. Conducted Emissions Requirements

### 2.1 General & Setup:

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 2.6.

### 2.2 Test Equipment List:

| Describe          | Manufacturer    | Model     | Serial Number | Calibration   |               |
|-------------------|-----------------|-----------|---------------|---------------|---------------|
|                   |                 |           |               | Cal. Date     | Due Date      |
| Spectrum Analyzer | Advantest       | R3132     | 160300103     | Mar. 06, 2008 | Mar. 06, 2009 |
| Test Receiver     | R&S             | ESCI      | 100367        | Jun. 05, 2008 | Jun. 05, 2009 |
| LISN              | EMCO            | 3816/2 SH | 00060110      | Jun. 04, 2008 | Jun. 04, 2009 |
| LISN              | EMCO            | 3816/2 SH | 00060111      | Jun. 13, 2008 | Jun. 13, 2009 |
| Transient Limiter | ELECTRO-METRICS | EM-7600   | 777           | Jun. 26, 2008 | Jun. 26, 2009 |



### 2.3 Test Configuration:



Figure 2. Front View of the Test Configuration

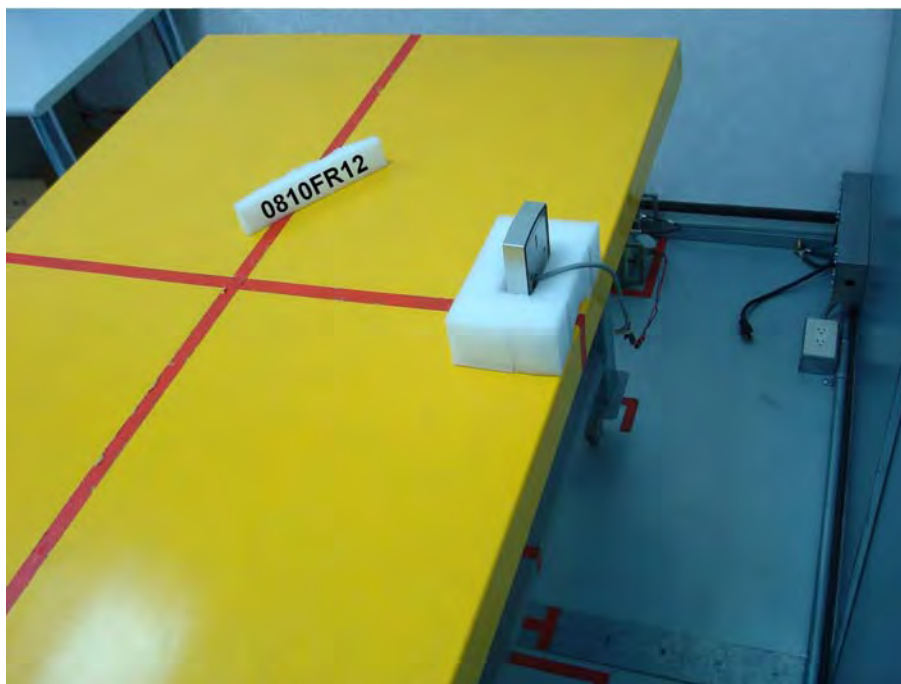


Figure 3. Rear View of the Test Configuration



## 2.4 Test condition:

EUT tested in accordance with the specifications given by the Manufacturer, and exercised in the most unfavorable manner.

### Spectrum Analyzer Settings

| Measurement Frequency | Preliminary Peak Scan |                 | Final Detection      |                         |
|-----------------------|-----------------------|-----------------|----------------------|-------------------------|
|                       | Resolution Bandwidth  | Video Bandwidth | Quasi-Peak Bandwidth | Average Video Bandwidth |
| 9kHz to 150kHz        | 10kHz                 | 10kHz           | 200Hz                | 10Hz                    |
| 150kHz to 30MHz       | 100kHz                | 100kHz          | 9kHz                 | 10Hz                    |

## 2.5 Conducted Emissions Limits:

| Frequency range (MHz) | Limits (dBuV) |          |
|-----------------------|---------------|----------|
|                       | Quasi-peak    | Average  |
| 0.15 to 0.50          | 66 to 56      | 56 to 46 |
| 0.50 to 5.0           | 56            | 46       |
| 5.0 to 30             | 60            | 50       |



## 2.6 Measurement Data of Conducted Emissions:

### Conducted Emissions (15.207\_Dummy Load Mode)

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : Applied Wireless Identifications Group Inc.  
Model No : NDK-2025  
EUT : RFID reader  
Test Mode : Dummy Load Mode  
Test Date : 11/24/2008

Please refer to next pager of detail testing data.

Notes:

1. L1: One end & Ground L2: The other end & Ground
2. Height of table on which the EUT was placed: 0.8 m.
3. The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
4. The above test results are obtained under the normal condition.
5. The test results are the worse case.



File :NDK-2025(IDEL)

Data :#1

Date: 2008-11-24

Time: 上午 10:31:27

80.0 dBuV



Site site#1

Phase: **L1**

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: AC 110V/60Hz

Humidity: 55 %

EUT:

M/N: 08-0247-E

Mode: 12V

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   | *   | 1.0125       | 43.12                    | 9.80                    | 52.92                    | 56.00         | -3.08      | peak     |         |
| 2   |     | 1.0125       | 39.25                    | 9.80                    | 49.05                    | 56.00         | -6.95      | QP       |         |
| 3   |     | 1.0125       | 30.38                    | 9.80                    | 40.18                    | 46.00         | -5.82      | AVG      |         |
| 4   |     | 1.1834       | 39.22                    | 9.80                    | 49.02                    | 56.00         | -6.98      | peak     |         |
| 5   |     | 1.1834       | 27.83                    | 9.80                    | 37.63                    | 46.00         | -8.37      | AVG      |         |
| 6   |     | 1.5439       | 31.01                    | 9.81                    | 40.82                    | 56.00         | -15.18     | peak     |         |
| 7   |     | 3.6589       | 38.69                    | 9.93                    | 48.62                    | 56.00         | -7.38      | peak     |         |
| 8   |     | 3.6589       | 27.47                    | 9.93                    | 37.40                    | 46.00         | -8.60      | AVG      |         |
| 9   |     | 4.4508       | 38.62                    | 10.02                   | 48.64                    | 56.00         | -7.36      | peak     |         |
| 10  |     | 4.4508       | 27.14                    | 10.02                   | 37.16                    | 46.00         | -8.84      | AVG      |         |
| 11  |     | 6.1500       | 35.59                    | 10.08                   | 45.67                    | 60.00         | -14.33     | peak     |         |
| 12  |     | 20.2500      | 26.36                    | 10.31                   | 36.67                    | 60.00         | -23.33     | peak     |         |

\*:Maximum data x:Over limit !:over margin

●Reference Only



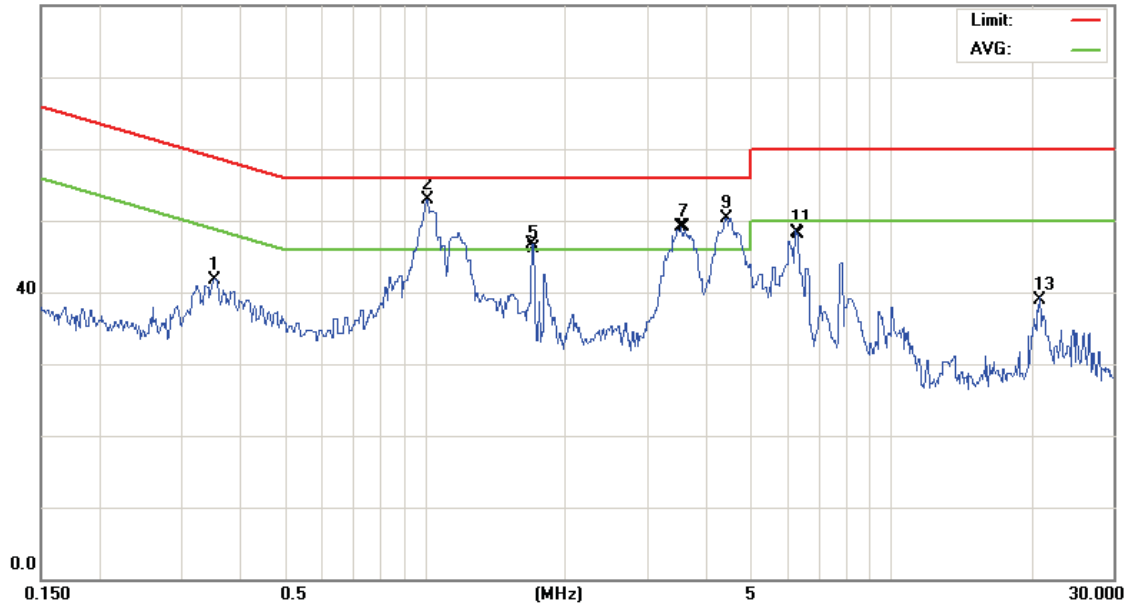
File :NDK-2025(IDEL)

Data :#2

Date: 2008-11-24

Time: 上午 10:37:19

80.0 dBuV



Site site#1

Phase: **L2**

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: AC 110V/60Hz

Humidity: 55 %

EUT:

M/N: 08-0247-E

Mode: 12V

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.3536       | 31.93                    | 9.78                    | 41.71                    | 58.88         | -17.17     | peak     |         |
| 2   | *   | 1.0126       | 43.04                    | 9.80                    | 52.84                    | 56.00         | -3.16      | peak     |         |
| 3   |     | 1.0126       | 40.17                    | 9.80                    | 49.97                    | 56.00         | -6.03      | QP       |         |
| 4   |     | 1.0126       | 30.26                    | 9.80                    | 40.06                    | 46.00         | -5.94      | AVG      |         |
| 5   |     | 1.7056       | 36.36                    | 9.82                    | 46.18                    | 56.00         | -9.82      | peak     |         |
| 6   |     | 1.7056       | 18.48                    | 9.82                    | 28.30                    | 46.00         | -17.70     | AVG      |         |
| 7   |     | 3.5690       | 39.26                    | 9.94                    | 49.20                    | 56.00         | -6.80      | peak     |         |
| 8   |     | 3.5690       | 27.52                    | 9.94                    | 37.46                    | 46.00         | -8.54      | AVG      |         |
| 9   |     | 4.4149       | 40.21                    | 10.02                   | 50.23                    | 56.00         | -5.77      | peak     |         |
| 10  |     | 4.4149       | 26.57                    | 10.02                   | 36.59                    | 46.00         | -9.41      | AVG      |         |
| 11  |     | 6.2500       | 38.14                    | 10.09                   | 48.23                    | 60.00         | -11.77     | peak     |         |
| 12  |     | 6.3000       | 23.29                    | 10.09                   | 33.38                    | 50.00         | -16.62     | AVG      |         |
| 13  |     | 20.8000      | 28.53                    | 10.34                   | 38.87                    | 60.00         | -21.13     | peak     |         |

\*:Maximum data x:Over limit !:over margin

●Reference Only



### 2.6.1 Conducted Emissions (15.107\_RFID Continue Read Mode )

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : Applied Wireless Identifications Group Inc.

Model No : NDK-2025

EUT : RFID reader

Test Mode : Continue Read Mode

Test Date : 11/24/2008

Please refer to next pager of detail testing data.

Notes:

1. L1: One end & Ground L2: The other end & Ground
2. Height of table on which the EUT was placed: 0.8 m.
3. The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
4. The above test results are obtained under the normal condition.
5. The test results are the worse case.

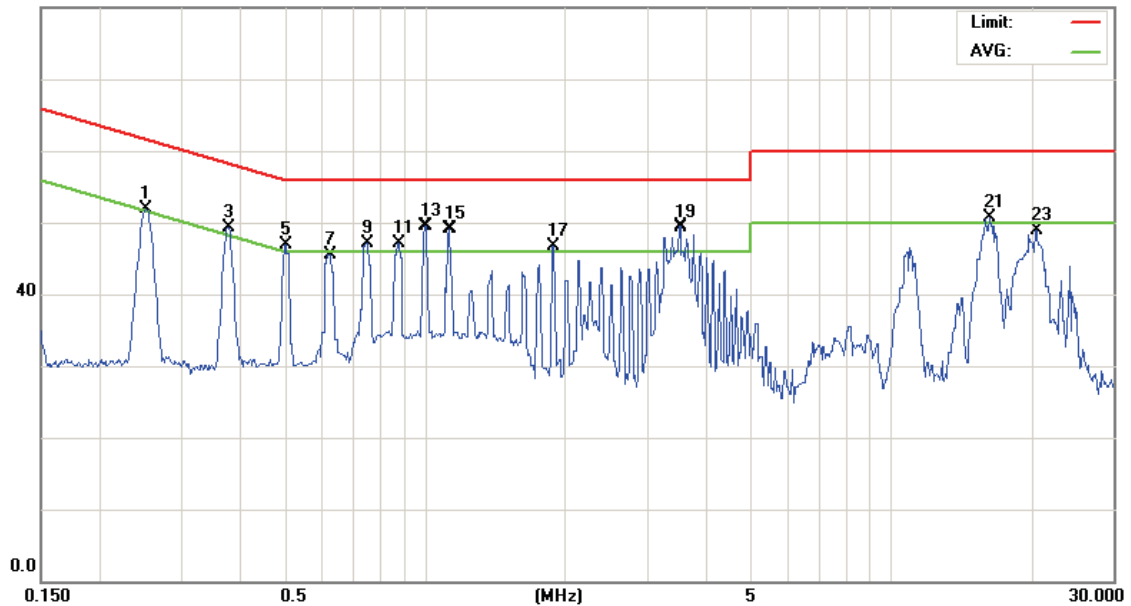


File :NDK-2025  
80.0 dBuV

Data :#1

Date: 2008/11/24

Time: 上午 10:03:25



Site site#1

Phase: **L1**

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: DC 12V

Humidity: 55 %

EUT:

M/N: 08-0247-SEO

Mode:

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.2515       | 42.09                    | 9.75                    | 51.84                    | 61.70         | -9.86      | peak     |         |
| 2   | *   | 0.2515       | 40.38                    | 9.75                    | 50.13                    | 51.70         | -1.57      | AVG      |         |
| 3   |     | 0.3774       | 39.59                    | 9.78                    | 49.37                    | 58.34         | -8.97      | peak     |         |
| 4   |     | 0.3774       | 36.81                    | 9.78                    | 46.59                    | 48.34         | -1.75      | AVG      |         |
| 5   |     | 0.5000       | 37.11                    | 9.78                    | 46.89                    | 56.00         | -9.11      | peak     |         |
| 6   |     | 0.5000       | 34.15                    | 9.78                    | 43.93                    | 46.00         | -2.07      | AVG      |         |
| 7   |     | 0.6260       | 35.64                    | 9.79                    | 45.43                    | 56.00         | -10.57     | peak     |         |
| 8   |     | 0.6260       | 34.53                    | 9.79                    | 44.32                    | 46.00         | -1.68      | AVG      |         |
| 9   |     | 0.7520       | 37.25                    | 9.80                    | 47.05                    | 56.00         | -8.95      | peak     |         |
| 10  |     | 0.7520       | 34.46                    | 9.80                    | 44.26                    | 46.00         | -1.74      | AVG      |         |
| 11  |     | 0.8780       | 37.24                    | 9.80                    | 47.04                    | 56.00         | -8.96      | peak     |         |
| 12  |     | 0.8780       | 33.82                    | 9.80                    | 43.62                    | 46.00         | -2.38      | AVG      |         |
| 13  |     | 1.0040       | 39.76                    | 9.80                    | 49.56                    | 56.00         | -6.44      | peak     |         |

\*:Maximum data x:Over limit !:over margin

●Reference Only



Site site#1 Phase: **L1** Temperature: 26 °C  
 Limit: CISPR22 Class B Conduction(QP) Power: DC 12V Humidity: 55 %  
 EUT:  
 M/N: 08-0247-SEO  
 Mode:  
 Note:

| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measurement | Limit | Over   |          |         |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV          | dB             | dBuV        | dBuV  | dB     | Detector | Comment |
| 14  |     | 1.0040  | 33.93         | 9.80           | 43.73       | 46.00 | -2.27  | AVG      |         |
| 15  |     | 1.1300  | 39.34         | 9.80           | 49.14       | 56.00 | -6.86  | peak     |         |
| 16  |     | 1.1300  | 34.55         | 9.80           | 44.35       | 46.00 | -1.65  | AVG      |         |
| 17  |     | 1.8850  | 36.87         | 9.83           | 46.70       | 56.00 | -9.30  | peak     |         |
| 18  |     | 1.8850  | 34.04         | 9.83           | 43.87       | 46.00 | -2.13  | AVG      |         |
| 19  |     | 3.5148  | 39.46         | 9.94           | 49.40       | 56.00 | -6.60  | peak     |         |
| 20  |     | 3.5148  | 31.74         | 9.94           | 41.68       | 46.00 | -4.32  | AVG      |         |
| 21  |     | 16.2500 | 40.49         | 10.25          | 50.74       | 60.00 | -9.26  | peak     |         |
| 22  |     | 16.2500 | 25.06         | 10.25          | 35.31       | 50.00 | -14.69 | AVG      |         |
| 23  |     | 20.4000 | 38.55         | 10.38          | 48.93       | 60.00 | -11.07 | peak     |         |
| 24  |     | 20.4000 | 34.89         | 10.38          | 45.27       | 50.00 | -4.73  | AVG      |         |

\*:Maximum data x:Over limit !:over margin

●Reference Only



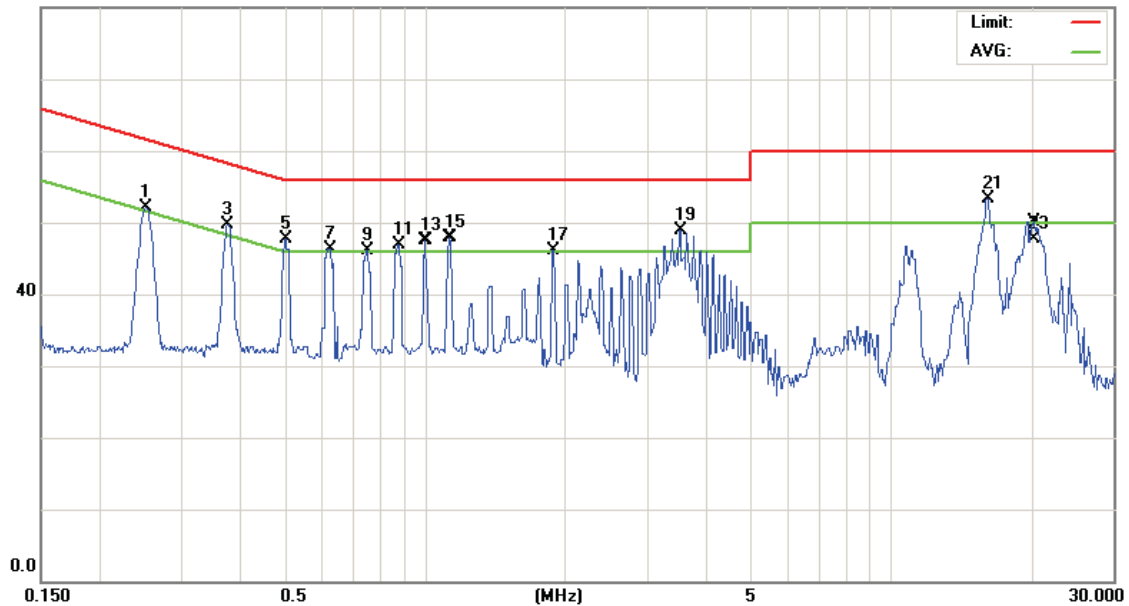


File :NDK-2025  
80.0 dBuV

Data :#2

Date: 2008/11/24

Time: 上午 10:24:15



Site site#1

Phase: L2

Temperature: 26 °C

Limit: CISPR22 Class B Conduction(QP)

Power: DC 12V

Humidity: 55 %

EUT:

M/N: 08-0247-SEO

Mode:

Note:

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.2515       | 42.34                    | 9.75                    | 52.09                    | 61.70         | -9.61      | peak     |         |
| 2   |     | 0.2515       | 40.15                    | 9.75                    | 49.90                    | 51.70         | -1.80      | AVG      |         |
| 3   |     | 0.3765       | 39.86                    | 9.78                    | 49.64                    | 58.35         | -8.71      | peak     |         |
| 4   |     | 0.3765       | 36.72                    | 9.78                    | 46.50                    | 48.35         | -1.85      | AVG      |         |
| 5   |     | 0.5000       | 37.86                    | 9.78                    | 47.64                    | 56.00         | -8.36      | peak     |         |
| 6   |     | 0.5000       | 34.48                    | 9.78                    | 44.26                    | 46.00         | -1.74      | AVG      |         |
| 7   |     | 0.6260       | 36.52                    | 9.79                    | 46.31                    | 56.00         | -9.69      | peak     |         |
| 8   | *   | 0.6260       | 34.68                    | 9.79                    | 44.47                    | 46.00         | -1.53      | AVG      |         |
| 9   |     | 0.7520       | 36.32                    | 9.80                    | 46.12                    | 56.00         | -9.88      | peak     |         |
| 10  |     | 0.7520       | 34.48                    | 9.80                    | 44.28                    | 46.00         | -1.72      | AVG      |         |
| 11  |     | 0.8780       | 37.13                    | 9.80                    | 46.93                    | 56.00         | -9.07      | peak     |         |
| 12  |     | 0.8780       | 34.56                    | 9.80                    | 44.36                    | 46.00         | -1.64      | AVG      |         |
| 13  |     | 1.0040       | 37.64                    | 9.80                    | 47.44                    | 56.00         | -8.56      | peak     |         |

\*:Maximum data x:Over limit !:over margin

●Reference Only



Site site#1 Phase: **L2** Temperature: 26 °C  
 Limit: CISPR22 Class B Conduction(QP) Power: DC 12V Humidity: 55 %  
 EUT:  
 M/N: 08-0247-SEO  
 Mode:  
 Note:

| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measurement | Limit | Over   |                  |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|------------------|
|     |     | MHz     | dBuV          | dB             | dBuV        | dBuV  | dB     | Detector Comment |
| 14  |     | 1.0040  | 34.36         | 9.80           | 44.16       | 46.00 | -1.84  | AVG              |
| 15  |     | 1.1300  | 38.07         | 9.80           | 47.87       | 56.00 | -8.13  | peak             |
| 16  |     | 1.1300  | 34.36         | 9.80           | 44.16       | 46.00 | -1.84  | AVG              |
| 17  |     | 1.8852  | 36.22         | 9.83           | 46.05       | 56.00 | -9.95  | peak             |
| 18  |     | 1.8852  | 34.30         | 9.83           | 44.13       | 46.00 | -1.87  | AVG              |
| 19  |     | 3.5148  | 38.90         | 9.94           | 48.84       | 56.00 | -7.16  | peak             |
| 20  |     | 3.5148  | 30.23         | 9.94           | 40.17       | 46.00 | -5.83  | AVG              |
| 21  |     | 16.1000 | 43.13         | 10.25          | 53.38       | 60.00 | -6.62  | peak             |
| 22  |     | 16.1000 | 25.07         | 10.25          | 35.32       | 50.00 | -14.68 | AVG              |
| 23  |     | 20.2500 | 37.38         | 10.31          | 47.69       | 60.00 | -12.31 | peak             |
| 24  |     | 20.2500 | 34.92         | 10.31          | 45.23       | 50.00 | -4.77  | AVG              |

\*:Maximum data x:Over limit !:over margin

●Reference Only



### **3. Radiated Emissions Requirements**

#### **3.1 Final radiation measurements were made on a three-meter:**

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

ETS-Lindgren Loop Antenna (Model 6502) was used in frequencies 9kHz - 30MHz at a distance of 3 Meter and SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (model VULB9163) was used in frequencies 30MHz - 1GHz at a distance of 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 - 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post - detector video filters were used in the test.



The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in decibels referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency :

Transmitter Output < +30dBm

(b) For spurious frequency :

Spurious emission limits = fundamental emission limit /10



### 3.2 Test Equipment List:

| Describe          | Manufacturer                   | Model     | Serial Number | Calibration   |               |
|-------------------|--------------------------------|-----------|---------------|---------------|---------------|
|                   |                                |           |               | Cal. Date     | Due Date      |
| Spectrum Analyzer | Agilent                        | E4408B    | MY45107753    | Jun. 05, 2008 | Jun. 05, 2009 |
| Pre Amplifier     | Agilent                        | 8449B     | 3008A02237    | Jun. 03, 2008 | Jun. 03, 2009 |
| Pre Amplifier     | Agilent                        | 8447D     | 2944A10961    | Jun. 10, 2008 | Jun. 10, 2009 |
| Test Receiver     | R&S                            | ESCI      | 100367        | Jun. 05, 2008 | Jun. 05, 2009 |
| Biconilog Antenna | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163  | 9163-270      | Jun. 26, 2008 | Jun. 26, 2009 |
| Horn Antenna      | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9120D | 9120D-550     | Jun. 26, 2008 | Jun. 26, 2009 |
| Horn Antenna      | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9170  | 9170-320      | Jun. 09, 2008 | Jun. 09, 2009 |
| Horn Antenna      | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9120E | 0899          | Jun. 26, 2008 | Jun. 26, 2009 |
| Loop Antenna      | ETS-Lindgren                   | 6502      | 00042960      | Jan. 14, 2008 | Jan. 14, 2009 |

### 3.3 Test Configuration:

Loop antenna positioned at 0 degrees



Figure 4. Front View of the Test Configuration



Figure 5. Rear View of the Test Configuration



Loop antenna positioned at 90 degrees



Figure 6. Front View of the Test Configuration



Figure 7. Rear View of the Test Configuration

Below 1GHz



Figure 8. Front View of the Test Configuration

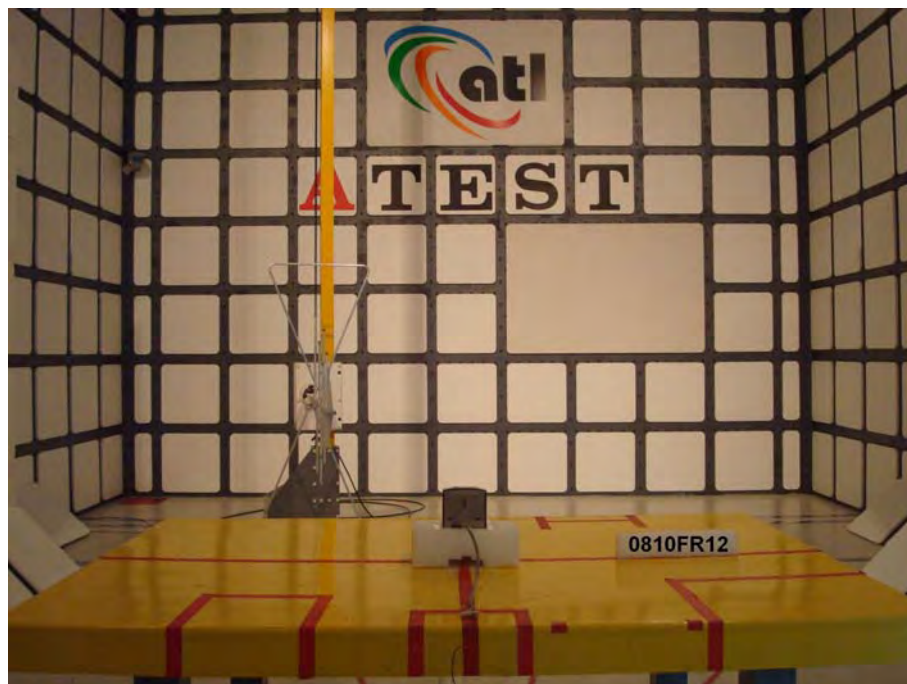


Figure 9. Rear View of the Test Configuration





### 3.4 Test condition:

EUT tested in accordance with the specifications given by the manufacturer, and exercised in the most unfavorable manner.

#### Spectrum Analyzer Settings

| Measurement Frequency | Preliminary Peak Scan |                 | Final Detection      |                         |
|-----------------------|-----------------------|-----------------|----------------------|-------------------------|
|                       | Resolution Bandwidth  | Video Bandwidth | Quasi-Peak Bandwidth | Average Video Bandwidth |
| 9kHz to 150kHz        | 10kHz                 | 1MHz            | 200Hz                | 10Hz                    |
| 150kHz to 30MHz       | 100kHz                | 1MHz            | 9kHz                 | 10Hz                    |
| 30 to 1000 MHz        | 120KHz                | 120KHz          | 120KHz               | 10Hz                    |

### 3.5 Radiated Emissions Limits:

| Frequency range (MHz) | Limit (dBuV/m) |
|-----------------------|----------------|
| 0.009 to 0.490        | 128.5 - 93.8   |
| 0.490 to 1.705        | 73.8 - 62.97   |
| 1.705 to 30           | 69.5           |
| 30 to 88              | 40             |
| 88 to 216             | 43.5           |
| 216 to 960            | 46             |
| Above 960             | 54             |



### 3.6 Measurement Data of Radiated Emissions:

#### 3.6.1 Open Field Radiated Emissions (Subpart C)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Applicant : Applied Wireless Identifications Group Inc.

Model No : NDK-2025

EUT : RFID reader

Test Mode : Continue Read Mode

Test Date : 11/18/2008

Please refer to next pager of detail testing data.

Notes:

1. Margin= Amplitude - Limits
2. Distance of Measurement: 3 Meter (30-1000MHz) & (1-10GHz), 1 Meter (10-26.5GHz)
3. Height of table for EUT placed: 0.8 Meter.
4. ANT= Antenna height.
5. Amplitude= Reading Amplitude - Amplifier gain + Cable loss + Antenna factor  
(Auto calculate in spectrum analyzer)
6. The EUT was worst case on X axis after pretest on X & Y & Z axis setting.
7. The testing data only show below 18GHz's data because measure data above 18GHz was only ambient noise.
8. All frequencies from 30MHz to 26.5GHz have been tested

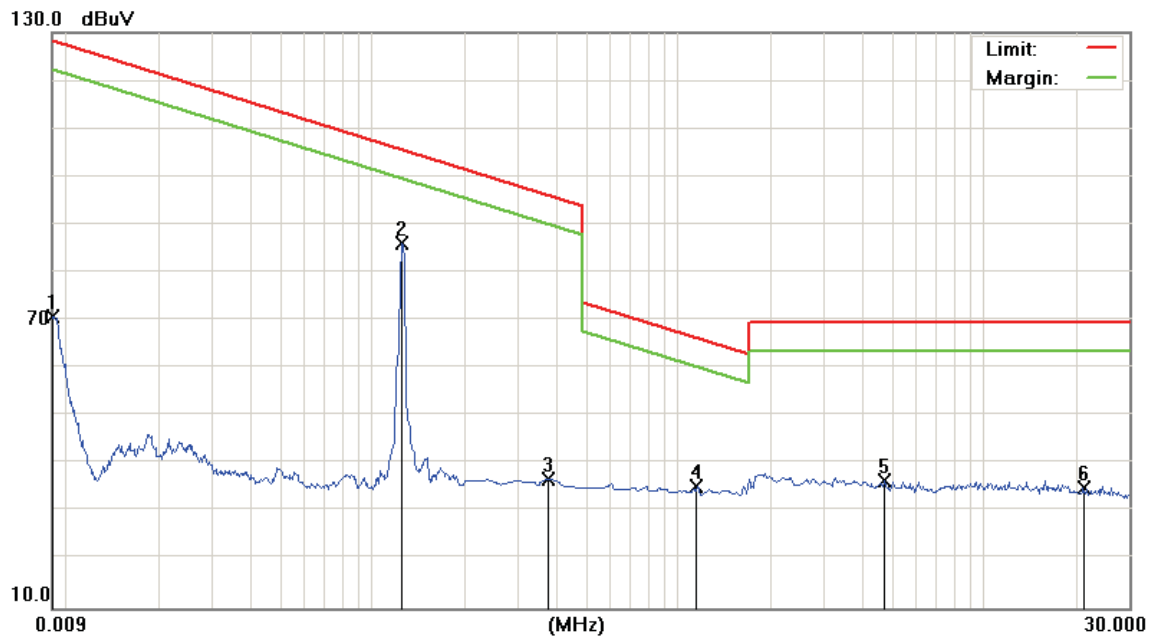


File :NDK-2025(12V)

Data :#17

Date: 2008/10/18

Time: 下午 07:12:34



Site: site #1

Limit: FCC 3M Radiation(9K-30MHz)

EUT:

M/N:

Mode:

Note: Loop antenna positioned at 0 degrees

Polarization:

Power:

Distance: 3m

Temperature: 22 °C

Humidity: 60 %

| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measure-ment | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|---------|---------------|----------------|--------------|--------|--------|----------------|--------------|--------|
|     |     | MHz     | dBuV          | dB             | dBuV         | dBuV   | dB     | Detector       | cm           | degree |
| 1   |     | 0.0088  | 65.11         | 5.50           | 70.61        | 128.70 | -58.09 | peak           |              |        |
| 2   | *   | 0.1237  | 80.57         | 5.49           | 86.06        | 105.75 | -19.69 | peak           |              |        |
| 3   |     | 0.3744  | 31.50         | 5.47           | 36.97        | 96.14  | -59.17 | peak           |              |        |
| 4   |     | 1.1491  | 29.89         | 5.41           | 35.30        | 66.40  | -31.10 | peak           |              |        |
| 5   |     | 4.7465  | 31.34         | 5.11           | 36.45        | 69.50  | -33.05 | peak           |              |        |
| 6   |     | 21.2990 | 31.39         | 3.72           | 35.11        | 69.50  | -34.39 | peak           |              |        |

\*:Maximum data x:Over limit !:over margin



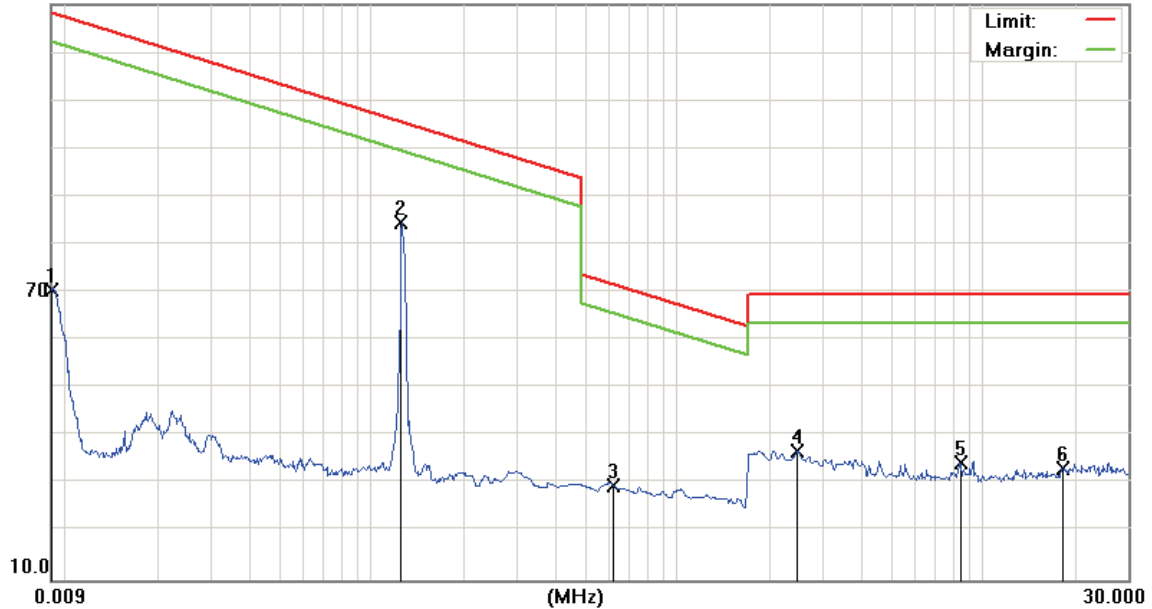
File :NDK-2025(12V)

Data :#20

Date: 2008/10/18

Time: 下午 07:43:18

130.0 dBuV



Site: site #1

Polarization: *Horizontal*

Temperature: 22 °C

Limit: FCC 3M Radiation(9K-30MHz)

Power:

Humidity: 60 %

EUT:

Distance: 3m

M/N:

Mode:

Note: Loop antenna positioned at 90 degrees

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|-------------------------|---------------------------|---------|
| 1   |     | 0.0088       | 70.57                    | 0.00                    | 70.57                    | 128.70        | -58.13     | peak                    |                           |         |
| 2   | *   | 0.1247       | 79.10                    | 5.49                    | 84.59                    | 105.68        | -21.09     | peak                    |                           |         |
| 3   |     | 0.6195       | 24.19                    | 5.45                    | 29.64                    | 71.76         | -42.12     | peak                    |                           |         |
| 4   |     | 2.4830       | 31.53                    | 5.30                    | 36.83                    | 69.50         | -32.67     | peak                    |                           |         |
| 5   |     | 8.4250       | 29.57                    | 4.80                    | 34.37                    | 69.50         | -35.13     | peak                    |                           |         |
| 6   |     | 18.2576      | 29.31                    | 3.98                    | 33.29                    | 69.50         | -36.21     | peak                    |                           |         |

\*:Maximum data x:Over limit !:over margin



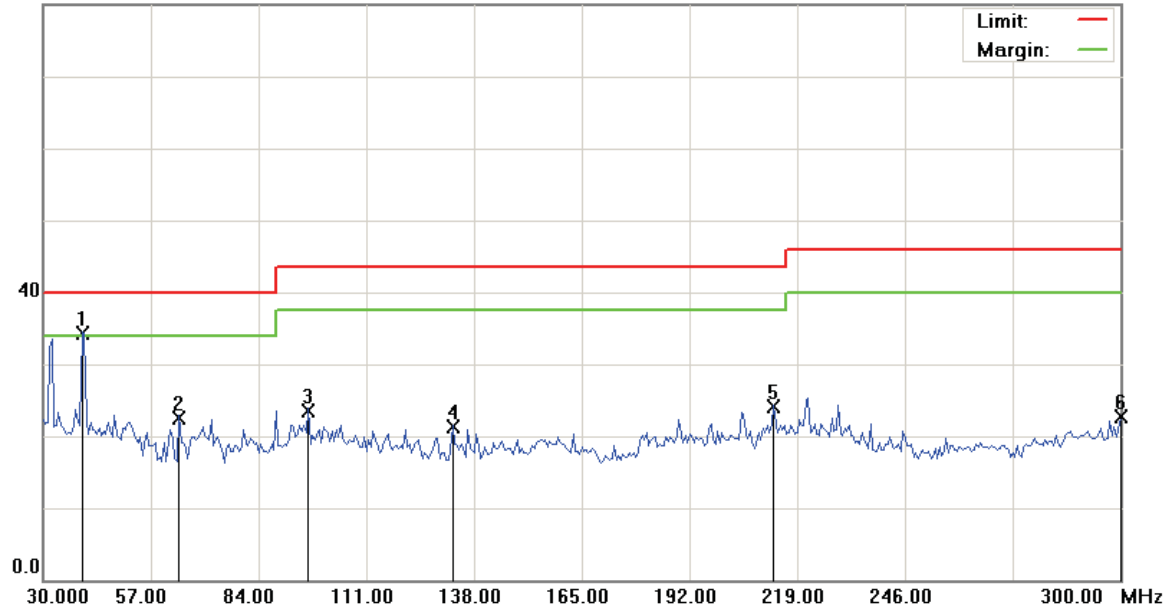
File :NDK-2025

Data :#1

Date: 2008/10/18

Time: 下午 08:02:18

80.0 dBuV



Site: site #1

Limit: FCC Class B 3M Radiation

EUT:

M/N: 08-0247-E

Mode:

Note:

Polarization: *Vertical*

Power: DC 12V

Distance: 3m

Temperature: 22 °C

Humidity: 60 %

| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|--------------|-------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV         | dBuV  | dB     | cm             | degree       | Comment |
| 1   | *   | 39.7200  | 46.32         | -11.96         | 34.36        | 40.00 | -5.64  | peak           |              |         |
| 2   |     | 64.0200  | 36.56         | -13.99         | 22.57        | 40.00 | -17.43 | peak           |              |         |
| 3   |     | 96.4200  | 35.49         | -11.96         | 23.53        | 43.50 | -19.97 | peak           |              |         |
| 4   |     | 132.6000 | 37.12         | -15.81         | 21.31        | 43.50 | -22.19 | peak           |              |         |
| 5   |     | 213.0600 | 36.83         | -12.74         | 24.09        | 43.50 | -19.41 | peak           |              |         |
| 6   |     | 300.0000 | 32.59         | -9.98          | 22.61        | 46.00 | -23.39 | peak           |              |         |

\*:Maximum data x:Over limit !:over margin



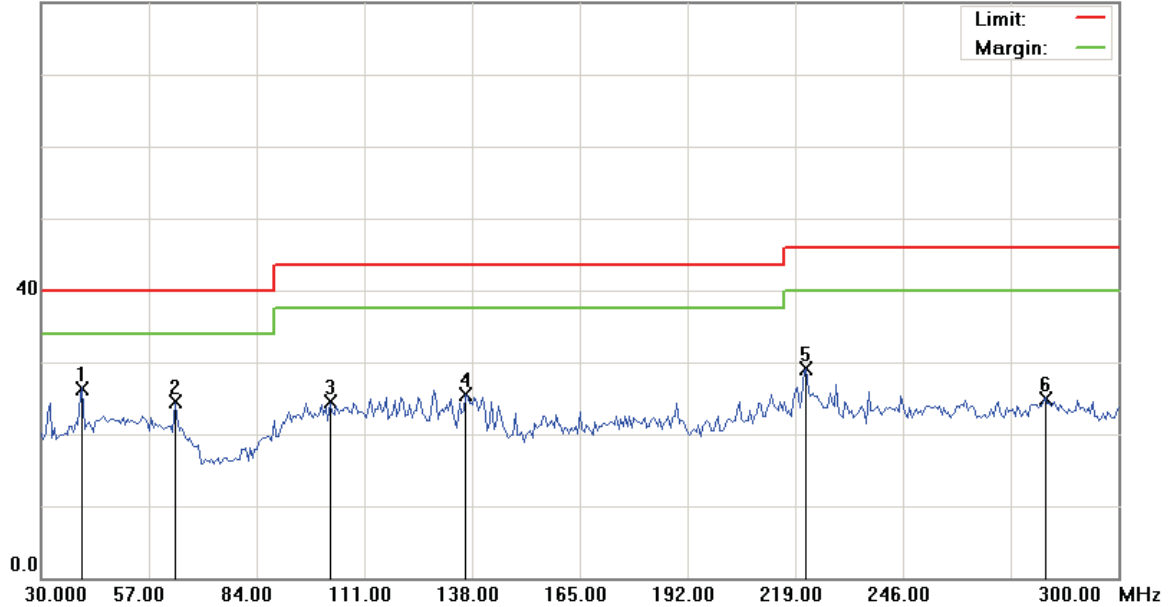
File :NDK-2025

Data :#3

Date: 2008/10/18

Time: 下午 08:10:27

80.0 dBuV



Site: site #1

Limit: FCC Class B 3M Radiation

EUT:

M/N: 08-0247-E

Mode:

Note:

Polarization: *Horizontal*

Power: DC 12V

Distance: 3m

Temperature: 22 °C

Humidity: 60 %

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|-------------------------|---------------------------|---------|
| 1   | *   | 40.2600      | 38.23                    | -11.88                  | 26.35                    | 40.00         | -13.65     | peak                    |                           |         |
| 2   |     | 63.4800      | 38.38                    | -13.80                  | 24.58                    | 40.00         | -15.42     | peak                    |                           |         |
| 3   |     | 102.3600     | 36.45                    | -11.91                  | 24.54                    | 43.50         | -18.96     | peak                    |                           |         |
| 4   |     | 136.3800     | 41.58                    | -16.07                  | 25.51                    | 43.50         | -17.99     | peak                    |                           |         |
| 5   |     | 221.7000     | 41.37                    | -12.29                  | 29.08                    | 46.00         | -16.92     | peak                    |                           |         |
| 6   |     | 281.6400     | 35.21                    | -10.38                  | 24.83                    | 46.00         | -21.17     | peak                    |                           |         |

\*:Maximum data x:Over limit !:over margin

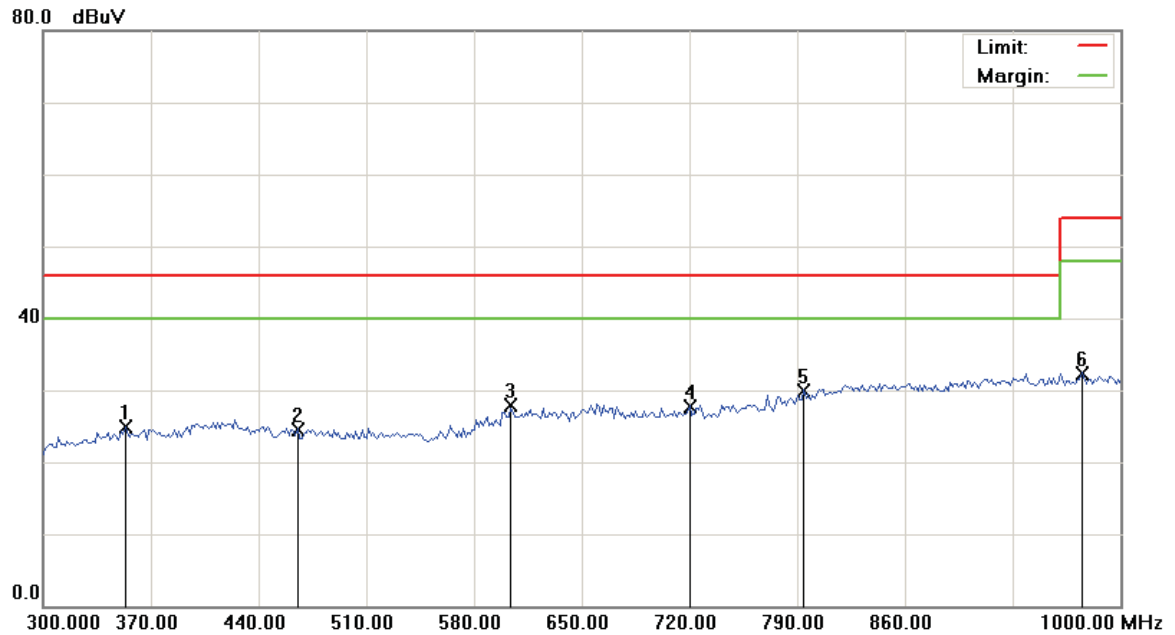


File :NDK-2025

Data :#2

Date: 2008/10/18

Time: 下午 08:06:34



Site: site #1

Limit: FCC Class B 3M Radiation

EUT:

M/N: 08-0247-E

Mode:

Note:

Polarization: **Vertical**

Power: DC 12V

Distance: 3m

Temperature: 22 °C

Humidity: 60 %

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|-------------------------|---------------------------|---------|
| 1   |     | 353.2000     | 33.86                    | -8.87                   | 24.99                    | 46.00         | -21.01     | peak                    |                           |         |
| 2   |     | 465.2000     | 32.34                    | -7.85                   | 24.49                    | 46.00         | -21.51     | peak                    |                           |         |
| 3   |     | 603.8000     | 32.58                    | -4.66                   | 27.92                    | 46.00         | -18.08     | peak                    |                           |         |
| 4   |     | 720.0000     | 31.32                    | -3.55                   | 27.77                    | 46.00         | -18.23     | peak                    |                           |         |
| 5   | *   | 794.2000     | 32.29                    | -2.34                   | 29.95                    | 46.00         | -16.05     | peak                    |                           |         |
| 6   |     | 974.8000     | 31.74                    | 0.65                    | 32.39                    | 54.00         | -21.61     | peak                    |                           |         |

\*:Maximum data x:Over limit !:over margin



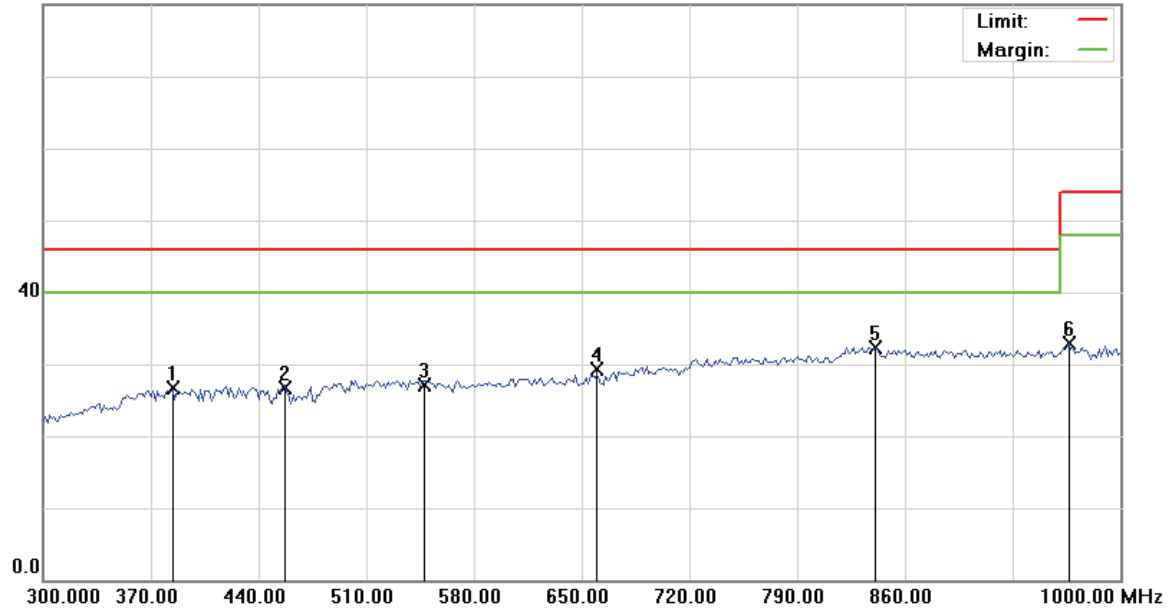
File :NDK-2025

Data :#4

Date: 2008/10/18

Time: 下午 08:14:21

80.0 dBuV



Site: site #1

Limit: FCC Class B 3M Radiation

EUT:

M/N: 08-0247-E

Mode:

Note:

Polarization: *Horizontal*

Power: DC 12V

Distance: 3m

Temperature: 22 °C

Humidity: 60 %

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Antenna<br>Height<br>cm | Table<br>Degree<br>degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|-------------------------|---------------------------|---------|
| 1   |     | 384.0000     | 35.23                    | -8.62                   | 26.61                    | 46.00         | -19.39     | peak                    |                           |         |
| 2   |     | 456.8000     | 34.72                    | -7.97                   | 26.75                    | 46.00         | -19.25     | peak                    |                           |         |
| 3   |     | 547.8000     | 33.21                    | -6.03                   | 27.18                    | 46.00         | -18.82     | peak                    |                           |         |
| 4   |     | 659.8000     | 33.56                    | -4.31                   | 29.25                    | 46.00         | -16.75     | peak                    |                           |         |
| 5   | *   | 840.4000     | 33.76                    | -1.41                   | 32.35                    | 46.00         | -13.65     | peak                    |                           |         |
| 6   |     | 966.4000     | 32.30                    | 0.69                    | 32.99                    | 54.00         | -21.01     | peak                    |                           |         |

\*:Maximum data x:Over limit !:over margin



## 4. Occupied Bandwidth Requirements

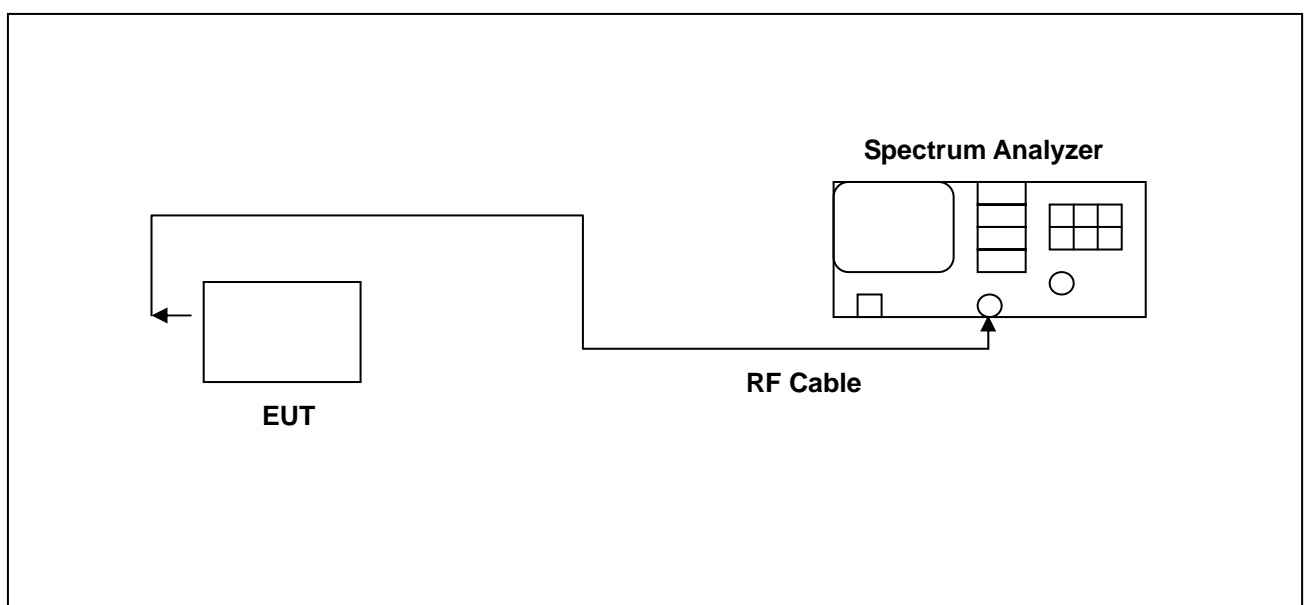
### 4.1 Test Condition & Setup:

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 30 kHz
2. RBW  $\geq$  1% of the 20dB span
3. VBW  $\geq$  RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

### 4.2 Test Instruments Configuration:





#### 4.3 Test Equipment List:

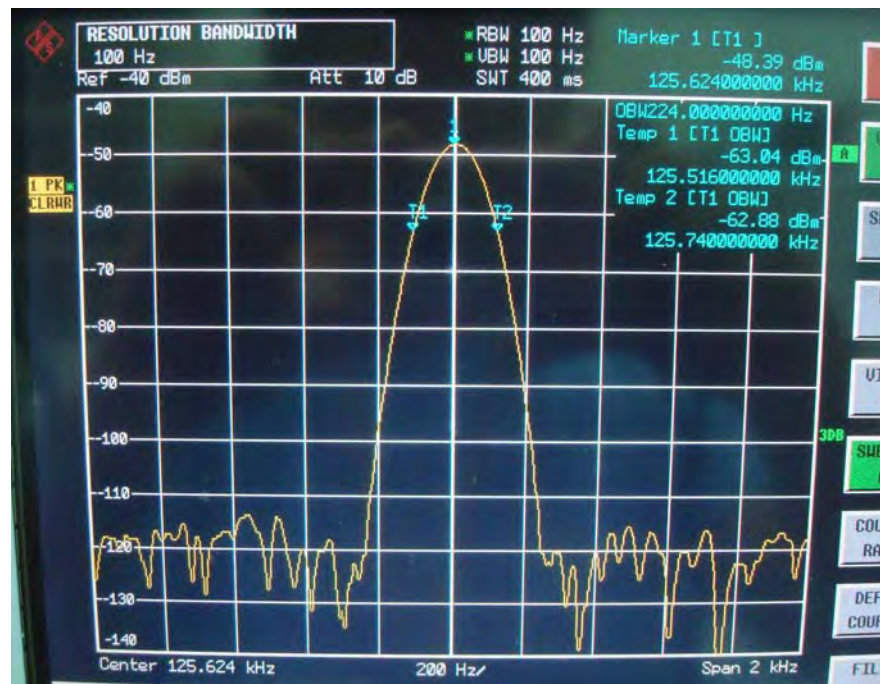
| Describe          | Manufacturer | Model  | Serial Number | Calibration   |               |
|-------------------|--------------|--------|---------------|---------------|---------------|
|                   |              |        |               | Cal. Date     | Due Date      |
| Spectrum Analyzer | Agilent      | E4445A | MY45300744    | Nov. 29, 2008 | Nov. 29, 2009 |

#### 4.4 Test Result

| Frequency (MHz) | 99 % Bandwidth (KHz) |
|-----------------|----------------------|
| 0.125           | 224                  |

#### 4.5 Test Graphs

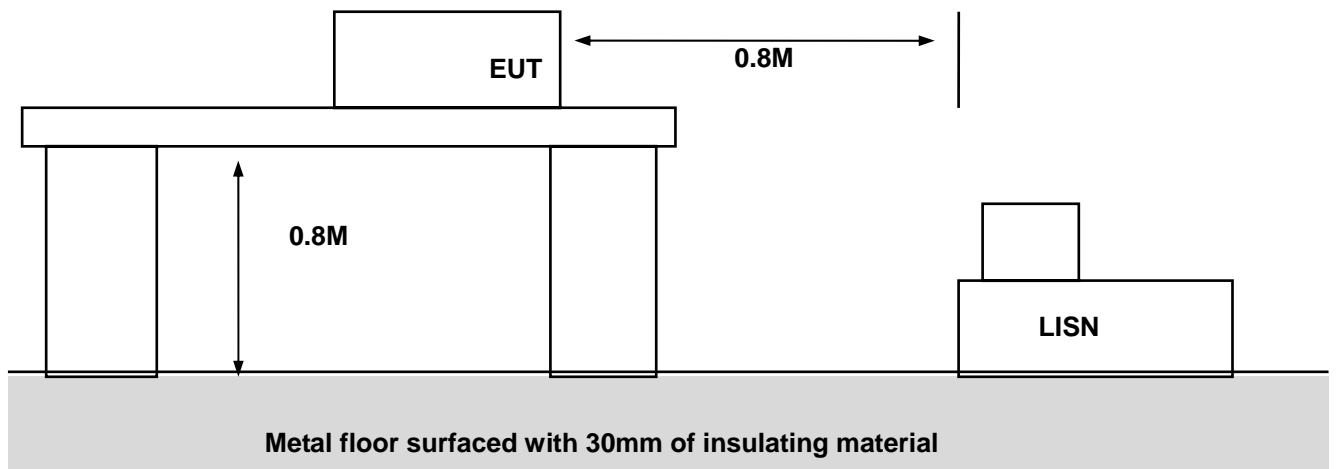
99% Bandwidth





## Appendix A - EUT Test SETUP

### MEASUREMENT OF POWER LINE CONDUCTED RFI VOLTAGE



## MEASUREMENT OF RADIATED EMISSION

