



**FCC 47 CFR PART 15 SUBPART C  
ANSI C63.4: 2003**

**TEST REPORT**

**For**

**WIRELESS SOUND SYSTEM**

**Model: 1201-CUBES2**

**Brand Name: EVOLVE**

*Issued to*

**Griffin Technology  
1930 Air Lane Drive Nashville TN 37210**

*Issued by*

**Compliance Certification Services Inc.  
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# 1. TEST RESULT CERTIFICATION

**Applicant:** Griffin Technology  
1930 Air Lane Drive Nashville TN 37210

**Equipment Under Test:** WIRELESS SOUND SYSTEM

**Model Number:** 1201-CUBES2

**Brand Name:** EVOLVE

**Date of Test:** September 4, 2007 ~ September 5, 2007

| APPLICABLE STANDARDS                              |                         |
|---|-------------------------|
| STANDARD  | TEST RESULT             |
| FCC 47 CFR Part 15 Subpart C<br>ANSI C63.4 : 2003 | No non-compliance noted |

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. 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: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and Part 15.231.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

**Jeter Wu**  
Section Manager  
Compliance Certification Services Inc.

Reviewed by:

**Eric Yang**  
Engineer  
Compliance Certification Services Inc.



## 2. EUT DESCRIPTION

|                            |  |
|----------------------------|--|
| <b>Product</b>             | WIRELESS SOUND SYSTEM                                      |
| <b>Model Number</b>        | 1201-CUBES2  |
| <b>Brand Name</b>          | EVOLVE   |
| <b>Operating Frequency</b> | 433.45MHz  |
| <b>Type of Modulation</b>  | FSK Modulation   |
| <b>EUT Description</b>     | N/A  |
| <b>Antenna Type</b>        | Transmitter : PCB Loop. ANTENNA<br>Receiver : Helical Type |
| <b>Power Source</b>        | 3.0 VDC from a battery                                     |

**Remark:**

1. This submittal(s) (test report) is intended for FCC ID: PAV1201R filing to comply with Section 15.207, 15.209 and 15.231 of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 (2001) and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.231.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.



### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                 | MHz             | GHz              |
|----------------------------|---------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423      | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614       | 5.35 - 5.46      |
| 2.1735 - 2.1905            | 16.80425 - 16.80475 | 960 - 1240      | 7.25 - 7.75      |
| 4.125 - 4.128              | 25.5 - 25.67        | 1300 - 1427     | 8.025 - 8.5      |
| 4.17725 - 4.17775          | 37.5 - 38.25        | 1435 - 1626.5   | 9.0 - 9.2        |
| 4.20725 - 4.20775          | 73 - 74.6           | 1645.5 - 1646.5 | 9.3 - 9.5        |
| 6.215 - 6.218              | 74.8 - 75.2         | 1660 - 1710     | 10.6 - 12.7      |
| 6.26775 - 6.26825          | 108 - 121.94        | 1718.8 - 1722.2 | 13.25 - 13.4     |
| 6.31175 - 6.31225          | 123 - 138           | 2200 - 2300     | 14.47 - 14.5     |
| 8.291 - 8.294              | 149.9 - 150.05      | 2310 - 2390     | 15.35 - 16.2     |
| 8.362 - 8.366              | 156.52475 -         | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.52525           | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 240 - 285           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              | 322 - 335.4         |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### 3.5 DESCRIPTION OF TEST MODES

The EUT( Model: 1201-CUBES2 ) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

## 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

CCS Tainan Lab.

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **5.2 EQUIPMENT**

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.







Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### **5.3 LABORATORY ACCREDITATIONS AND LISTING**

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200627-0 to perform Electromagnetic Interference tests according to FCC Part 15 And CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission ( registration no: 228014 ).

### 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency          | Scope of Accreditation   | Logo   |
|---------|-----------------|--|--|
| USA     | NVLAP           | EN 55014-1, AS/NZS 1044, CNS 13783-1, IEC/CISPR 14-1, IEC/CISPR 22, EN 55022, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, AS/NZS CISPR 22, AS/NZS 3548, IEC 61000-4-2/3/4/5/6/8/11 | <br>NVLAP LAB CODE 200627-0<br>200627-0                                 |
| USA     | FCC             | 3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements   | <br>228014  |
| Japan   | VCCI            | 3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements  | <br>R-1989<br>C-2142  |
| Taiwan  | CNLA            | CISPR 11 FCC METHOD-47 CFR Part 18 EN 55011 CNS 13803, CISPR 14 EN 55014 CNS 13783-1, CISPR 22 EN 55022 VCCI FCC Method-47 CFR Part 15 Subpart B CNS 13438                     | <br>Testing Laboratory<br>1109  |
| Taiwan  | BSMI            | CNS 13438, CNS 13783-1, CNS 13803, CNS13439  | <br>SL2-IS-E-0039<br>SL2-IN-E-0039<br>SL2-R1/R2-0039<br>SL2-A1-E-0039 |
| Canada  | Industry Canada | RSS212, Issue 1  | <br>IC 6192   |

*\* No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.*





## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

| No. | Product | Manufacturer | Model No. | Certify No. | Signal cable |
|-----|---------|--------------|-----------|-------------|--------------|
| 1   | N/A     | N/A          | N/A       | N/A         | N/A          |

**Remark:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



## 7. FCC PART 15.231 REQUIREMENTS

### 7.1 20 DB BANDWIDTH

#### LIMIT

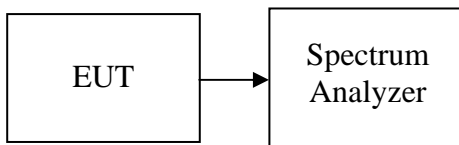
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

#### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|-------------------|--------------|-------|---------------|-----------------|
| SPECTRUM ANALYZER | R&S          | FSEM  | 829054/017    | MAR. 13, 2008   |

*Remark: Each piece of equipment is scheduled for calibration once a year.*

#### Test Configuration



#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 10 kHz and VBW is set 30kHz.

#### TEST RESULTS

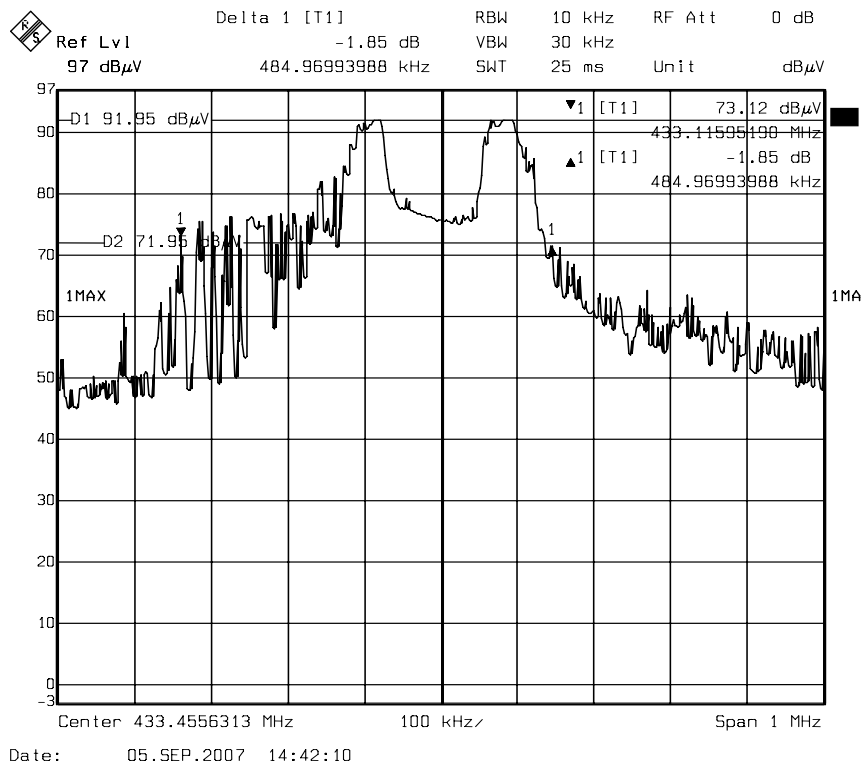
*No non-compliance noted.*

#### TEST DATA

| Frequency<br>(MHz) | 20dB Bandwidth<br>(KHz) | Limit<br>(KHz) | Result |
|--------------------|-------------------------|----------------|--------|
| 433.45             | 484.969                 | 1083.625       | PASS   |



**Test Plot**





## 7.2 LIMIT OF TRANSMISSION TIME

### LIMIT

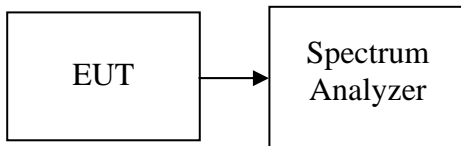
According to 15.231 (a)(2), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|-------------------|--------------|-------|---------------|-----------------|
| SPECTRUM ANALYZER | R&S          | FSEM  | 829054/017    | MAR. 13, 2008   |

*Remark: Each piece of equipment is scheduled for calibration once a year.*

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW and VBW are set to 1MHz.

### TEST RESULTS

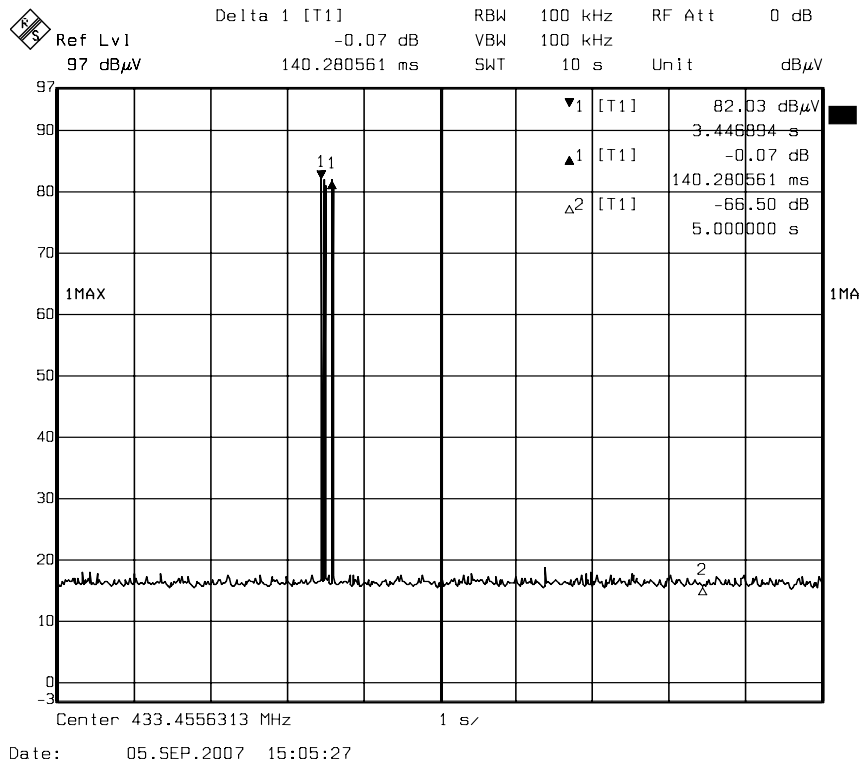
*No non-compliance noted*

### TEST DATA

| Frequency<br>(MHz) | Transmission Time<br>(s) | Limit<br>(Second) | Result |
|--------------------|--------------------------|-------------------|--------|
| 433.45             | 0.14028                  | 5                 | PASS   |



**Test Plot**





### 7.3 DUTY CYCLE

#### LIMIT

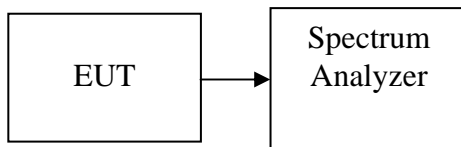
Nil (No dedicated limit specified in the Rules)

#### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|-------------------|--------------|-------|---------------|-----------------|
| SPECTRUM ANALYZER | R&S          | FSEM  | 829054/017    | MAR. 13, 2008   |

**REMARK:** Each piece of equipment is scheduled for calibration once a year.

#### TEST CONFIGURATION



#### TEST PROCEDURE

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 center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 0Hz, Adjust Sweep = 100s.
5. Repeat above procedures until all frequency measured were complete.

#### TEST RESULTS

No non-compliance noted

#### TEST DATA

$$T_p = 100\text{ms}$$

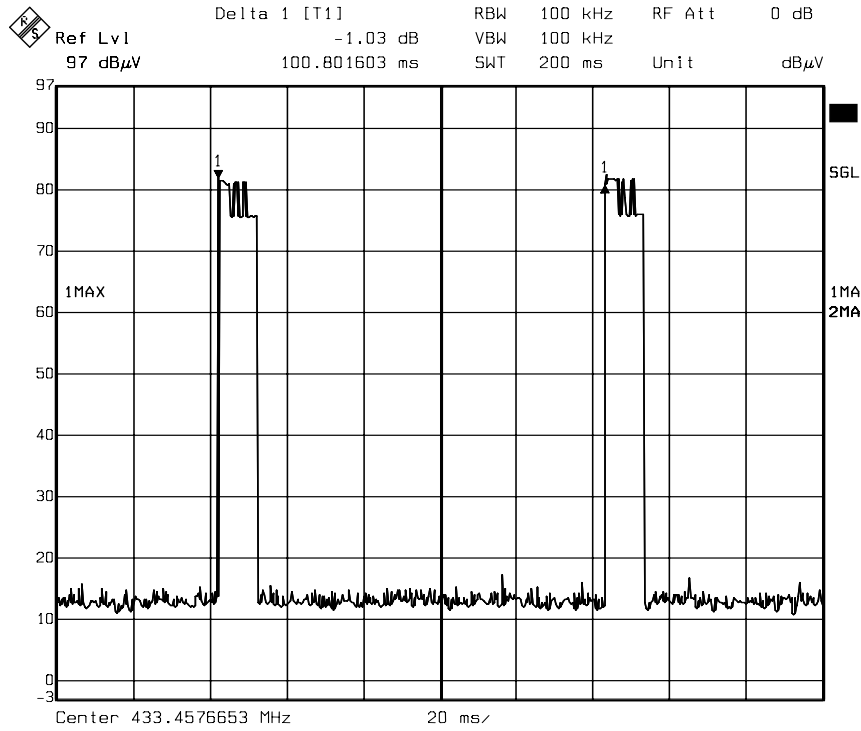
$$T_{on} = 10.460 * 1 = 10.461 \text{ (ms)}$$

$$\text{Factor} = 20 * \log(T_{on} / T_p) = 20 * \log(10.461/100) = -19.61\text{dB}$$



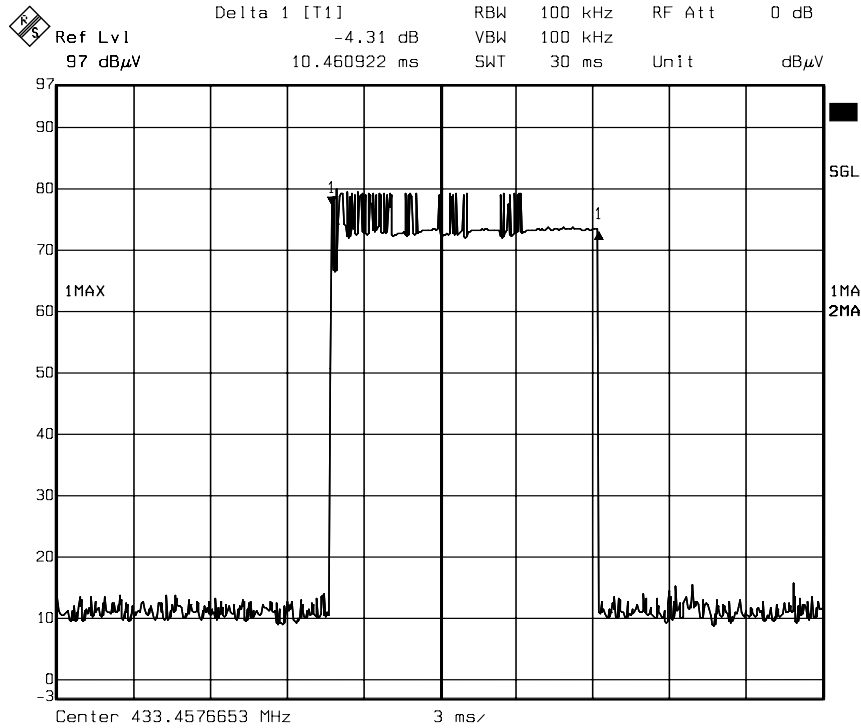
**Test Plot**

**Tp**



Date: 04.SEP.2007 10:03:25

**Ton**



Date: 04.SEP.2007 10:04:09



### 7.4 RADIATED EMISSIONS

#### LIMIT

1. 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) | Field Strength (dBµV/m at 3-meter) | Measurement Distance (m) |
|-----------------|-----------------------|------------------------------------|--------------------------|
| 30-88           | 100*                  | 40                                 | 3                        |
| 88-216          | 150*                  | 43.5                               | 3                        |
| 216-960         | 200*                  | 46                                 | 3                        |
| Above 960       | 500                   | 54                                 | 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.

- 2 For intentional device, according to § 15.231(e), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

| Fundamental Frequency (MHz) | Field Strength of Fundamental (µV/M) | Field Strength of Spurious Emission (µV/M) |
|-----------------------------|--------------------------------------|--|
| 40.66-40.70                 | 1000                                 | 100  |
| 70-130                      | 500                                  | 50   |
| 130-174                     | 500 to 1500**                        | 50 to 150**                                |
| 174-260                     | 1500                                 | 150  |
| 260-470                     | 1500 to 5000**                       | 150 to 500**                               |
| Above 470                   | 5000                                 | 500  |

Note :

1. “ \*\* ” linear interpolations.
2. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 22.72727(F) - 2454.545; for the band 260-470 MHz, uV/m at 3 meters = 16.6667(F) – 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.



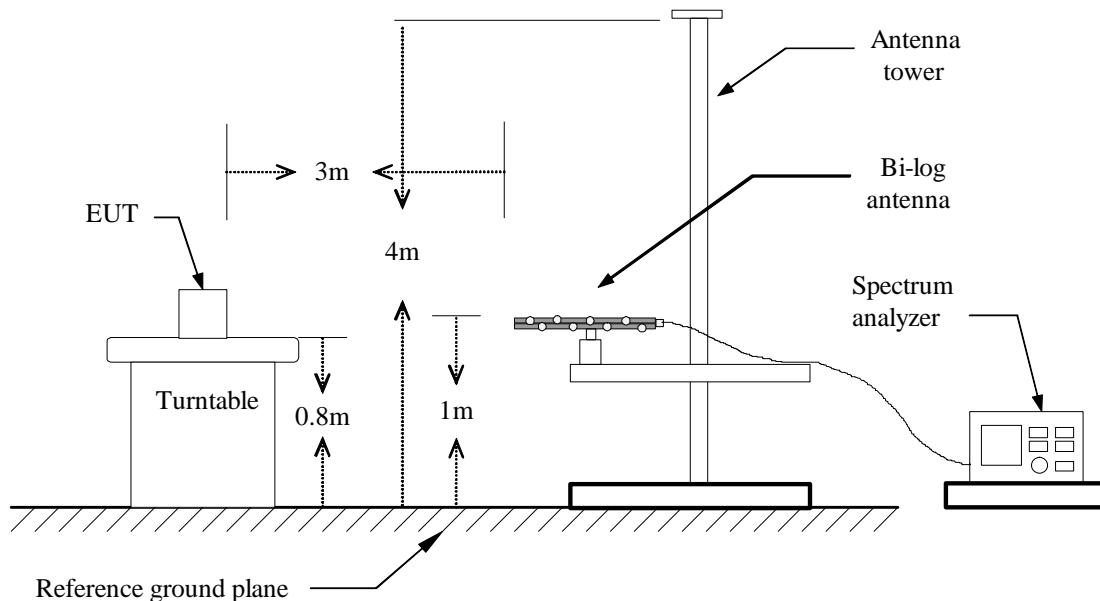
**MEASUREMENT EQUIPMENT USED**

| Open Area Test Site # 6 |                |                          |               |                 |
|-------------------------|----------------|--------------------------|---------------|-----------------|
| Name of Equipment       | Manufacturer   | Model                    | Serial Number | Calibration Due |
| O.A.T.S                 | -----          | -----                    | No.6          | NOV. 07, 2007   |
| EMI Receiver            | R&S            | ESCI                     | 100005        | FEB.13, 2008    |
| Spectrum Analyzer       | R&S            | FSEM                     | 829054/017    | MAR. 13, 2008   |
| BI-LOG Antenna          | Sunol          | JB1                      | A070506-2     | JUL. 11, 2008   |
| Horn Antenna            | Com-Power      | AH-118                   | 071032        | NOV. 23, 2007   |
| SMA RF CABLE            | SUHNER         | SUCOFLEX104PEA           | 20520/4PEA    | NOV. 22, 2007   |
| Pre-Amplifier           | MITEQ          | AFS44-00108650-42-10P-44 | 1052908       | OCT. 25, 2007   |
| Signal Generator        | HP             | 8673C                    | 2938A00663    | JUL. 23, 2008   |
| Pre-Amplifier           | HP             | 8447F                    | 2944A03817    | SEP. 04, 2008   |
| Turn Table              | Yo Chen        | 001                      | -----         | N.C.R.          |
| Antenna Tower           | AR             | TP1000A                  | 309874        | N.C.R.          |
| Controller              | CT             | SC101                    | -----         | N.C.R.          |
| Test S/W                | e-3 (5.04303e) |                          |               |                 |

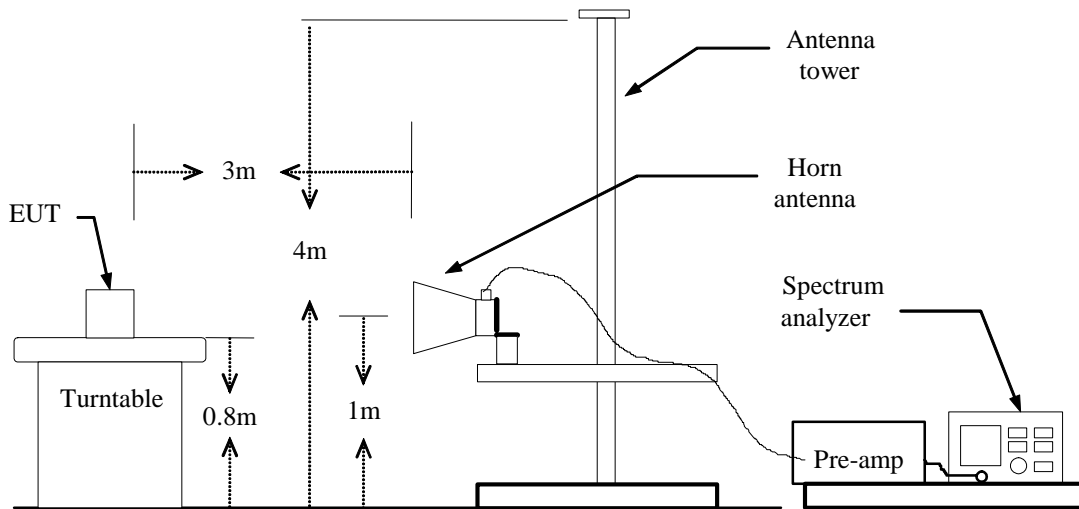
**Remark:** Each piece of equipment is scheduled for calibration once a year.

**TEST CONFIGURATION**

**Below 1 GHz**



### Above 1 GHz



### TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.



### TEST RESULTS

#### Below 1 GHz

**Operation Mode:** TX / X Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                                      **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                      **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br>(MHz) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Meter Reading<br>at 3 m(dB μ V) |          | Limits<br>(dB μ V/m) | Duty Cycle<br>Factor<br>(dB) | Emission Level<br>at 3 m(dB μ V/m) |          | Margin     |          | Detector<br>Mode |
|-------------------------|-----------------------------|-----------------------|---------------------------------|----------|----------------------|------------------------------|------------------------------------|----------|------------|----------|------------------|
|                         |                             |                       | Horizontal                      | Vertical |                      |                              | Horizontal                         | Vertical | Horizontal | Vertical |                  |
| 433.47                  | 16.80                       | 2.82                  | 79.70                           | 70.59    | 100.81               | -19.61                       | 99.33                              | 90.22    | -1.48      | -10.59   | PK               |
| 433.47                  | 16.80                       | 2.82                  | N/A                             | N/A      | 80.81                | -19.61                       | 79.72                              | 70.61    | -1.09      | -10.20   | AVG              |
| 866.89                  | 22.40                       | 4.39                  | 30.25                           | 23.13    | 80.81                | -19.61                       | 57.04                              | 49.92    | -23.77     | -30.89   | PK               |
| 866.89                  | 22.40                       | 4.39                  | N/A                             | N/A      | 60.81                | -19.61                       | 37.43                              | 30.31    | -23.38     | -30.50   | AVG              |
| N/A                     | -----                       | -----                 | -----                           | -----    | -----                | -----                        | -----                              | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Average level=Peak level +Duty factor.



**Operation Mode:** TX / Y Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                                **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                 **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br>(MHz) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Meter Reading<br>at 3 m(dB μ V) |          | Limits<br>(dB μ V/m) | Duty Cycle<br>Factor<br>(dB) | Emission Level<br>at 3 m(dB μ V/m) |          | Margin     |          | Detector<br>Mode |
|-------------------------|-----------------------------|-----------------------|---------------------------------|----------|----------------------|------------------------------|------------------------------------|----------|------------|----------|------------------|
|                         |                             |                       | Horizontal                      | Vertical |                      |                              | Horizontal                         | Vertical | Horizontal | Vertical |                  |
| 433.32                  | 16.80                       | 2.82                  | 75.25                           | 79.36    | 100.81               | -19.61                       | 94.87                              | 98.98    | -5.94      | -1.83    | PK               |
| 433.32                  | 16.80                       | 2.82                  | N/A                             | N/A      | 80.81                | -19.61                       | 75.26                              | 79.37    | -5.55      | -1.44    | AVG              |
| 867.06                  | 22.40                       | 4.39                  | 26.24                           | 28.05    | 80.81                | -19.61                       | 53.03                              | 54.84    | -27.78     | -25.97   | PK               |
| 867.06                  | 22.40                       | 4.39                  | N/A                             | N/A      | 60.81                | -19.61                       | 33.42                              | 35.23    | -27.39     | -25.58   | AVG              |
| N/A                     | -----                       | -----                 | -----                           | -----    | -----                | -----                        | -----                              | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Average level=Peak level +Duty factor.



**Operation Mode:** TX / Z Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                                **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                 **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br>(MHz) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Meter Reading<br>at 3 m(dB μ V) |          | Limits<br>(dB μ V/m) | Duty Cycle<br>Factor<br>(dB) | Emission Level<br>at 3 m(dB μ V/m) |          | Margin     |          | Detector<br>Mode |
|-------------------------|-----------------------------|-----------------------|---------------------------------|----------|----------------------|------------------------------|------------------------------------|----------|------------|----------|------------------|
|                         |                             |                       | Horizontal                      | Vertical |                      |                              | Horizontal                         | Vertical | Horizontal | Vertical |                  |
| 433.52                  | 16.80                       | 2.82                  | 79.51                           | 77.74    | 100.81               | -19.61                       | 99.14                              | 97.37    | -1.67      | -3.44    | PK               |
| 433.52                  | 16.80                       | 2.82                  | N/A                             | N/A      | 80.81                | -19.61                       | 79.46                              | 77.69    | -1.35      | -3.12    | AVG              |
| 860.61                  | 22.35                       | 4.36                  | 31.25                           | 28.74    | 80.81                | -19.61                       | 57.96                              | 55.45    | -22.85     | -25.36   | PK               |
| 860.61                  | 22.35                       | 4.36                  | N/A                             | N/A      | 60.81                | -19.61                       | 38.28                              | 35.77    | -22.53     | -25.04   | AVG              |
| N/A                     | -----                       | -----                 | -----                           | -----    | -----                | -----                        | -----                              | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Average level=Peak level +Duty factor.



**Above 1 GHz**

**Operation Mode:** TX / X Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                                **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                 **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br><br>(MHz) | Antenna<br>Factor<br><br>(dB/m) | Cable<br>Loss<br><br>(dB) | Meter Reading<br>at 3 m(dB μ V) |          | Limits<br><br>(dB μ V/m) | Duty Cycle<br>Factor<br><br>(dB) | Emission Level<br>at 3 m(dB μ V/m) |          | Margin     |          | Detector<br>Mode |
|-----------------------------|---------------------------------|---------------------------|---------------------------------|----------|--------------------------|----------------------------------|------------------------------------|----------|------------|----------|------------------|
|                             |                                 |                           | Horizontal                      | Vertical |                          |                                  | Horizontal                         | Vertical | Horizontal | Vertical |                  |
| * 1300.45                   | 25.82                           | 1.87                      | 29.65                           | 26.54    | 74.00                    | -19.61                           | 57.35                              | 54.24    | -16.65     | -19.76   | PK               |
| * 1300.45                   | 25.82                           | 1.87                      | N/A                             | N/A      | 54.00                    | -19.61                           | 37.74                              | 34.63    | -16.26     | -19.37   | AVG              |
| 1766.56                     | 28.53                           | 2.20                      | 28.76                           | 26.14    | 80.81                    | -19.61                           | 59.49                              | 56.87    | -21.32     | -23.94   | PK               |
| 1766.56                     | 28.53                           | 2.20                      | N/A                             | N/A      | 60.81                    | -19.61                           | 39.88                              | 37.26    | -20.93     | -23.55   | AVG              |
| 2167.23                     | 30.20                           | 2.33                      | 28.59                           | 26.23    | 80.81                    | -19.61                           | 61.12                              | 58.76    | -19.69     | -22.05   | PK               |
| 2167.23                     | 30.20                           | 2.33                      | N/A                             | N/A      | 60.81                    | -19.61                           | 41.51                              | 39.15    | -19.30     | -21.66   | AVG              |
| 2600.69                     | 29.98                           | 2.36                      | 28.74                           | 25.87    | 80.81                    | -19.61                           | 61.08                              | 58.21    | -19.73     | -22.60   | PK               |
| 2600.69                     | 29.98                           | 2.36                      | N/A                             | N/A      | 60.81                    | -19.61                           | 41.47                              | 38.60    | -19.34     | -22.21   | AVG              |
| 3034.15                     | 29.92                           | 2.48                      | 29.11                           | 25.92    | 80.81                    | -19.61                           | 61.51                              | 58.32    | -19.30     | -22.49   | PK               |
| 3034.15                     | 29.92                           | 2.48                      | N/A                             | N/A      | 60.81                    | -19.61                           | 41.91                              | 38.72    | -18.90     | -22.09   | AVG              |
| 3467.52                     | 30.18                           | 3.16                      | 28.57                           | 26.34    | 80.81                    | -19.61                           | 61.91                              | 59.68    | -18.90     | -21.13   | PK               |
| 3467.52                     | 30.18                           | 3.16                      | N/A                             | N/A      | 60.81                    | -19.61                           | 42.30                              | 40.07    | -18.51     | -20.74   | AVG              |
| * 4334.45                   | 31.70                           | 3.48                      | 27.69                           | 26.25    | 74.00                    | -19.61                           | 62.87                              | 61.43    | -11.13     | -12.57   | PK               |
| * 4334.45                   | 31.70                           | 3.48                      | N/A                             | N/A      | 54.00                    | -19.61                           | 43.26                              | 41.82    | -10.74     | -12.18   | AVG              |
| N/A                         | -----                           | -----                     | -----                           | -----    | -----                    | -----                            | -----                              | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark "\*" means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
6. Average level=Peak level +Duty factor.



**Operation Mode:** TX / Y Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                              **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br><br>(MHz) | Antenna | Cable | Meter Reading  |          | Limits     | Duty Cycle | Emission Level   |          | Margin     |          | Detector<br>Mode |
|-----------------------------|---------|-------|----------------|----------|------------|------------|------------------|----------|------------|----------|------------------|
|                             | Factor  | Loss  | at 3 m(dB μ V) |          |            | Factor     | at 3 m(dB μ V/m) |          | Horizontal | Vertical |                  |
|                             | (dB/m)  | (dB)  | Horizontal     | Vertical | (dB μ V/m) | (dB)       | Horizontal       | Vertical | Horizontal | Vertical |                  |
| *1300.41                    | 25.82   | 1.87  | 26.58          | 28.57    | 74.00      | -19.61     | 54.28            | 56.27    | -19.72     | -17.73   | PK               |
| *1300.41                    | 25.82   | 1.87  | N/A            | N/A      | 54.00      | -19.61     | 34.67            | 36.66    | -19.33     | -17.34   | AVG              |
| 1733.62                     | 28.28   | 2.18  | 25.93          | 27.63    | 80.81      | -19.61     | 56.39            | 58.09    | -24.42     | -22.72   | PK               |
| 1733.62                     | 28.28   | 2.18  | N/A            | N/A      | 60.81      | -19.61     | 36.78            | 38.48    | -24.03     | -22.33   | AVG              |
| 2467.20                     | 30.02   | 2.34  | 26.25          | 27.89    | 80.81      | -19.61     | 58.61            | 60.25    | -22.20     | -20.56   | PK               |
| 2467.20                     | 30.02   | 2.34  | N/A            | N/A      | 60.81      | -19.61     | 39.00            | 40.64    | -21.81     | -20.17   | AVG              |
| 2600.67                     | 29.98   | 2.36  | 26.57          | 28.76    | 80.81      | -19.61     | 58.91            | 61.10    | -21.90     | -19.71   | PK               |
| 2600.67                     | 29.98   | 2.36  | N/A            | N/A      | 60.81      | -19.61     | 39.30            | 41.49    | -21.51     | -19.32   | AVG              |
| 3034.15                     | 29.92   | 2.48  | 26.32          | 28.49    | 80.81      | -19.61     | 58.72            | 60.89    | -22.09     | -19.92   | PK               |
| 3034.15                     | 29.92   | 2.48  | N/A            | N/A      | 60.81      | -19.61     | 39.12            | 41.29    | -21.69     | -19.52   | AVG              |
| 3467.46                     | 30.18   | 3.16  | 25.96          | 27.64    | 80.81      | -19.61     | 59.30            | 60.98    | -21.51     | -19.83   | PK               |
| 3467.46                     | 30.18   | 3.16  | N/A            | N/A      | 60.81      | -19.61     | 39.69            | 41.37    | -21.12     | -19.44   | AVG              |
| *4334.41                    | 31.70   | 3.48  | 26.02          | 26.11    | 74.00      | -19.61     | 61.20            | 61.29    | -12.80     | -12.71   | PK               |
| *4334.41                    | 31.70   | 3.48  | N/A            | N/A      | 54.00      | -19.61     | 41.59            | 41.68    | -12.41     | -12.32   | AVG              |
| N/A                         | -----   | ----- | -----          | -----    | -----      | -----      | -----            | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark "\*" means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Spectrum AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
6. Average level=Peak level +Duty factor.



**Operation Mode:** TX / Z Mode                      **Test Date:** September 4, 2007  
**Temperature:** 26.5°C                              **Tested by:** Eric Yang  
**Humidity:** 57 % RH                                **Polarity:** Ver. / Hor.

| Freq-<br>Uency<br><br>(MHz) | Antenna | Cable | Meter Reading  |          | Limits     | Duty Cycle | Emission Level   |          | Margin     |          | Detector<br>Mode |
|-----------------------------|---------|-------|----------------|----------|------------|------------|------------------|----------|------------|----------|------------------|
|                             | Factor  | Loss  | at 3 m(dB μ V) |          |            | Factor     | at 3 m(dB μ V/m) |          | Horizontal | Vertical |                  |
|                             | (dB/m)  | (dB)  | Horizontal     | Vertical | (dB μ V/m) | (dB)       | Horizontal       | Vertical | Horizontal | Vertical |                  |
| *1300.35                    | 25.82   | 1.87  | 29.51          | 25.46    | 74.00      | -19.61     | 57.21            | 53.16    | -16.79     | -20.84   | PK               |
| *1300.35                    | 25.82   | 1.87  | N/A            | N/A      | 54.00      | -19.61     | 37.60            | 33.55    | -16.40     | -20.45   | AVG              |
| 1733.59                     | 28.28   | 2.18  | 28.54          | 25.67    | 80.81      | -19.61     | 59.00            | 56.13    | -21.81     | -24.68   | PK               |
| 1733.59                     | 28.28   | 2.18  | N/A            | N/A      | 60.81      | -19.61     | 39.39            | 36.52    | -21.42     | -24.29   | AVG              |
| 2167.18                     | 30.20   | 2.33  | 27.69          | 25.32    | 80.81      | -19.61     | 60.22            | 57.85    | -20.59     | -22.96   | PK               |
| 2167.18                     | 30.20   | 2.33  | N/A            | N/A      | 60.81      | -19.61     | 40.61            | 38.24    | -20.20     | -22.57   | AVG              |
| 2600.71                     | 29.98   | 2.36  | 28.53          | 25.64    | 80.81      | -19.61     | 60.87            | 57.98    | -19.94     | -22.83   | PK               |
| 2600.71                     | 29.98   | 2.36  | N/A            | N/A      | 60.81      | -19.61     | 41.26            | 38.37    | -19.55     | -22.44   | AVG              |
| 3034.12                     | 29.92   | 2.48  | 28.57          | 25.33    | 80.81      | -19.61     | 60.97            | 57.73    | -19.84     | -23.08   | PK               |
| 3034.12                     | 29.92   | 2.48  | N/A            | N/A      | 60.81      | -19.61     | 41.37            | 38.13    | -19.44     | -22.68   | AVG              |
| 3467.48                     | 30.18   | 3.16  | 27.96          | 25.73    | 80.81      | -19.61     | 61.30            | 59.07    | -19.51     | -21.74   | PK               |
| 3467.48                     | 30.18   | 3.16  | N/A            | N/A      | 60.81      | -19.61     | 41.69            | 39.46    | -19.12     | -21.35   | AVG              |
| *4334.46                    | 31.70   | 3.48  | 28.59          | 26.24    | 74.00      | -19.61     | 63.77            | 61.42    | -10.23     | -12.58   | PK               |
| *4334.46                    | 31.70   | 3.48  | N/A            | N/A      | 54.00      | -19.61     | 44.16            | 41.81    | -9.84      | -12.19   | AVG              |
| N/A                         | -----   | ----- | -----          | -----    | -----      | -----      | -----            | -----    | -----      | -----    | -----            |

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark "\*" means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Spectrum AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
6. Average level=Peak level +Duty factor.





### 7.5 POWERLINE CONDUCTED EMISSIONS

#### LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBµV) |          |
|-----------------------|---------------|----------|
|                       | Quasi-peak    | Average  |
| 0.15 to 0.50          | 66 to 56      | 56 to 46 |
| 0.50 to 5             | 56            | 46       |
| 5 to 30               | 60            | 50       |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

#### MEASUREMENT EQUIPMENT USED

| Conducted Emission room |                              |              |               |                                     |
|-------------------------|------------------------------|--------------|---------------|-------------------------------------|
| Name of Equipment       | Manufacturer                 | Model        | Serial Number | Calibration Due                     |
| L.I.S.N.                | SCHWARZBECK                  | NNLK<br>8121 | 8121-446      | OCT. 31, 2007<br>For Insertion loss |
|                         | Rohde & Schwarz              | ESH-Z5       | 840062/021    | SEP. 22 , 2007                      |
| TEST RECEIVER           | Rohde & Schwarz              | ESCS 30      | 100348        | JUN. 28, 2008                       |
| TYPE N COAXIAL CABLE    | SUHNER                       | -----        | -----         | FEB. 26, 2008                       |
| Test S/W                | e-3 (5.04211c)<br>R&S (2.27) |              |               |                                     |

*Remark: Each piece of equipment is scheduled for calibration once a year.*

#### TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

#### TEST PROCEDURE

Since this EUT is battery powered, this test item is not applicable.

#### TEST RESULTS

Since this EUT is battery powered, this test item is not applicable.