



# **FCC 47 CFR PART 15 SUBPART C ANSI C63.4: 2009**

## **TEST REPORT**

**For**

**Industrial Radio Remote Controller**

**MODEL: SAGA1-V6plus Receiver**

**Data Applies To: SAGA1-V6 Receiver**

**BRAND: SAGA**

Issued to

**GAIN ELECTRONIC CO., LTD**

4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806), KAOHSIUNG,  
TAIWAN, ROC

Issued by

**Compliance Certification Services Inc.  
Tainan Lab.**

No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

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**Issued Date: August 16, 2013**





### **REVISION HISTORY**

| Rev. | Issue Date      | Revisions        | Effect Page | Revised By  |
|------|-----------------|------------------|-------------|-------------|
| 00   | July 23, 2013   | Initial Issue    | ALL         | Sunny Chang |
| 01   | August 16, 2013 | Update test data | ALL         | Sunny Chang |
|      |                 |                  |             |             |



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## 1. TEST RESULT CERTIFICATION

|                         |                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Product:</b>         | Industrial Radio Remote Controller                                                                       |
| <b>Model:</b>           | SAGA1-V6plus Receiver                                                                                    |
| <b>Data Applies To:</b> | SAGA1-V6 Receiver                                                                                        |
| <b>Brand Name:</b>      | SAGA                                                                                                     |
| <b>Applicant:</b>       | GAIN ELECTRONIC CO., LTD<br>4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806),<br>KAOHSIUNG, TAIWAN, ROC |
| <b>Manufacturer:</b>    | GAIN ELECTRONIC CO., LTD<br>4F-1, NO.288-5, HSIN YA RD, CHIEN CHEN ZONE (806),<br>KAOHSIUNG, TAIWAN, ROC |
| <b>Tested:</b>          | July 04, 2013 ~ July 23, 2013                                                                            |

| APPLICABLE STANDARDS                                    |                         |
|---------------------------------------------------------|-------------------------|
| STANDARD                                                | TEST RESULT             |
| FCC 47 CFR Part 15 Subpart C: 2012<br>ANSI C63.4 : 2009 | 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: 2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements emission limits of FCC Rules Part 15.107, 15.109, 15.207, 15.209 and 15.249.

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

**Approved by:**

**Jeter Wu**  
Assistant Manager

**Reviewed by:**

**Eric Huang**  
Assistant Section Manager



## 2. EUT DESCRIPTION

|                            |                                               |
|----------------------------|-----------------------------------------------|
| <b>Product</b>             | Industrial Radio Remote Controller            |
| <b>Model</b>               | SAGA1-V6plus Receiver                         |
| <b>Data Applies To</b>     | SAGA1-V6 Receiver                             |
| <b>Brand Name</b>          | SAGA                                          |
| <b>Received Date</b>       | July 01, 2013                                 |
| <b>Frequency Range</b>     | 904.000MHz to 926.138MHz                      |
| <b>Transmit Peak Power</b> | 95.10 dBμV/m                                  |
| <b>Data Rate</b>           | 9.6kbps                                       |
| <b>Number of Channels</b>  | 160 Channel                                   |
| <b>Type of Modulation</b>  | FSK                                           |
| <b>Power Supply</b>        | 10 ~ 42Vdc                                    |
| <b>Antenna Type</b>        | Planar inverted-F antenna (PIFA); Gain: 0 dBi |
| <b>Temperature Range</b>   | -40°C ~ +80°C                                 |

### Remark:

1. Client consigns only one model sample to test (Model Number: **SAGA1-V6plus Receiver** ). Therefore, the testing Lab. just guarantees the unit, which has been tested.
2. This submittal(s) (test report) is intended for FCC ID: **NCT137V6R** filing to comply with Section 15.107 & 15.109 (FCC Part 15, Subpart B) and Section 15.207, 15.209, 15.249.
3. For more details, please refer to the User's manual of the EUT.
4. To add a series model is for business necessary. The different of the each model is shown as bellows:

| Model number          | Difference               |
|-----------------------|--------------------------|
| SAGA1-V6plus Receiver | With pushbutton Panel    |
| SAGA1-V6 Receiver     | Without pushbutton Panel |



| Frequency Listed                               |         |    |         |    |         |     |         |     |         |     |         |
|------------------------------------------------|---------|----|---------|----|---------|-----|---------|-----|---------|-----|---------|
| Frequency Range : 904MHz ~ 926.138 MHz         |         |    |         |    |         |     |         |     |         |     |         |
| Number of Channels : 160 Channels              |         |    |         |    |         |     |         |     |         |     |         |
| Type of Modulation : FSK (Frequency Shift Key) |         |    |         |    |         |     |         |     |         |     |         |
| No                                             | MHz     | No | MHz     | No | MHz     | No  | MHz     | No  | MHz     | No  | MHz     |
| 1                                              | 904.000 | 41 | 908.007 | 50 | 912.014 | 90  | 916.021 | 130 | 920.028 |     | 924.035 |
| 2                                              | 904.100 | 42 | 908.107 | 51 | 912.114 | 91  | 916.121 | 131 | 920.128 |     | 924.135 |
| 3                                              | 904.200 | 43 | 908.207 | 52 | 912.214 | 92  | 916.221 | 132 | 920.228 |     | 924.235 |
| 4                                              | 904.300 | 44 | 908.307 | 53 | 912.314 | 93  | 916.321 | 133 | 920.328 |     | 924.335 |
| 5                                              | 904.401 | 45 | 908.408 | 54 | 912.414 | 94  | 916.421 | 134 | 920.428 |     | 924.435 |
| 6                                              | 904.501 |    | 908.508 | 55 | 912.515 | 95  | 916.522 | 135 | 920.529 |     | 924.536 |
| 7                                              | 904.601 |    | 908.608 | 56 | 912.615 | 96  | 916.622 | 136 | 920.629 | 145 | 924.636 |
| 8                                              | 904.701 |    | 908.708 | 57 | 912.715 | 97  | 916.722 | 137 | 920.729 | 146 | 924.736 |
| 9                                              | 904.801 |    | 908.808 | 58 | 912.815 | 98  | 916.822 | 138 | 920.829 | 147 | 924.836 |
| 10                                             | 904.901 |    | 908.908 | 59 | 912.915 | 99  | 916.922 | 139 | 920.929 | 148 | 924.936 |
| 11                                             | 905.002 |    | 909.009 | 60 | 913.016 | 100 | 917.022 | 140 | 921.029 | 149 | 925.036 |
| 12                                             | 905.102 |    | 909.109 | 61 | 913.116 | 101 | 917.123 | 141 | 921.130 | 150 | 925.137 |
| 13                                             | 905.202 |    | 909.209 | 62 | 913.216 | 102 | 917.223 | 142 | 921.230 | 151 | 925.237 |
| 14                                             | 905.302 |    | 909.309 | 63 | 913.316 | 103 | 917.323 | 143 | 921.330 | 152 | 925.337 |
| 15                                             | 905.402 |    | 909.409 | 64 | 913.416 | 104 | 917.423 | 144 | 921.430 | 153 | 925.437 |
| 16                                             | 905.502 |    | 909.509 | 65 | 913.516 | 105 | 917.523 |     | 921.530 | 154 | 925.537 |
| 17                                             | 905.603 |    | 909.610 | 66 | 913.617 | 106 | 917.624 |     | 921.630 | 155 | 925.637 |
| 18                                             | 905.703 |    | 909.710 | 67 | 913.717 | 107 | 917.724 |     | 921.731 | 156 | 925.738 |
| 19                                             | 905.803 |    | 909.810 | 68 | 913.817 | 108 | 917.824 |     | 921.831 | 157 | 925.838 |
| 20                                             | 905.903 |    | 909.910 | 69 | 913.917 | 109 | 917.924 |     | 921.931 | 158 | 925.938 |
| 21                                             | 906.003 |    | 910.010 | 70 | 914.017 | 110 | 918.024 |     | 922.031 | 159 | 926.038 |
| 22                                             | 906.104 |    | 910.110 | 71 | 914.117 | 111 | 918.124 |     | 922.131 | 160 | 926.138 |
| 23                                             | 906.204 |    | 910.211 | 72 | 914.218 | 112 | 918.225 |     | 922.232 |     |         |
| 24                                             | 906.304 |    | 910.311 | 73 | 914.318 | 113 | 918.325 |     | 922.332 |     |         |
| 25                                             | 906.404 |    | 910.411 | 74 | 914.418 | 114 | 918.425 |     | 922.432 |     |         |
| 26                                             | 906.504 |    | 910.511 | 75 | 914.518 | 115 | 918.525 |     | 922.532 |     |         |
| 27                                             | 906.604 |    | 910.611 | 76 | 914.618 | 116 | 918.625 |     | 922.632 |     |         |
| 28                                             | 906.705 |    | 910.712 | 77 | 914.718 | 117 | 918.725 |     | 922.732 |     |         |
| 29                                             | 906.805 |    | 910.812 | 78 | 914.819 | 118 | 918.826 |     | 922.833 |     |         |
| 30                                             | 906.905 |    | 910.912 | 79 | 914.919 | 119 | 918.926 |     | 922.933 |     |         |
| 31                                             | 907.005 |    | 911.012 | 80 | 915.019 | 120 | 919.026 |     | 923.033 |     |         |
| 32                                             | 907.105 |    | 911.112 | 81 | 915.119 | 121 | 919.126 |     | 923.133 |     |         |
| 33                                             | 907.205 |    | 911.212 | 82 | 915.219 | 122 | 919.226 |     | 923.233 |     |         |
| 34                                             | 907.306 |    | 911.313 | 83 | 915.320 | 123 | 919.326 |     | 923.333 |     |         |
| 35                                             | 907.406 |    | 911.413 | 84 | 915.420 | 124 | 919.427 |     | 923.434 |     |         |
| 36                                             | 907.506 |    | 911.513 | 85 | 915.520 | 125 | 919.527 |     | 923.534 |     |         |
| 37                                             | 907.606 | 46 | 911.613 | 86 | 915.620 | 126 | 919.627 |     | 923.634 |     |         |
| 38                                             | 907.706 | 47 | 911.713 | 87 | 915.720 | 127 | 919.727 |     | 923.734 |     |         |
| 39                                             | 907.806 | 48 | 911.813 | 88 | 915.820 | 128 | 919.827 |     | 923.834 |     |         |
| 40                                             | 907.907 | 49 | 911.914 | 89 | 915.921 | 129 | 919.928 |     | 923.934 |     |         |



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.249.

#### **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.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.249 under the FCC Rules Part 15 Subpart C.

#### **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 new batteries are used during the measurement.

The EUT( **Model: SAGA1-V6plus Receiver** ) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.



## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING 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.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

| Open Area Test Site # 6         |                       |          |               |                 |
|---------------------------------|-----------------------|----------|---------------|-----------------|
| Name of Equipment               | Manufacturer          | Model    | Serial Number | Calibration Due |
| TYPE N COAXIAL CABLE            | SUHNER                | CHA9513  | 6             | DEC. 18, 2013   |
| BI-LOG Antenna                  | Sunol                 | JB1      | A070506-2     | SEP. 26, 2013   |
| LOOP ANTENNA                    | EMCO                  | 6502     | 8905-2356     | JUN. 10, 2014   |
| Pre-Amplifier                   | HP                    | 8447F    | NCR           | NCR             |
| EMI Receiver                    | R&S                   | ESVS10   | 833206/012    | JUN. 26, 2014   |
| Horn Antenna                    | Com-Power             | AH-118   | 071032        | DEC. 05, 2013   |
| 3116 Double Ridge Antenna (40G) | ETS-LINDGREN          | 3116     | 00078900      | DEC. 27, 2013   |
| Turn Table                      | Yo Chen               | 001      | -----         | N.C.R.          |
| Antenna Tower                   | AR                    | TP1000A  | 309874        | N.C.R.          |
| Controller                      | CT                    | SC101    | -----         | N.C.R.          |
| RF Switch                       | E-INSTRUMENT TELH LTD | ERS-180A | EC1204141     | N.C.R.          |
| Power Meter                     | Anritsu               | ML2487A  | 6K00003888    | JUN. 24, 2014   |
| Power Sensor                    | Anritsu               | MA2491A  | 33265         | JUN. 24, 2014   |
| Temp./Humidity Chamber          | K.SON                 | THS-M1   | 242           | AUG. 08, 2013   |
| DC Power Source                 | LOKO                  | DSP-5050 | L1507009282   | N.C.R.          |
| Spectrum Analyzer               | R&S                   | FSU      | 200789        | JUL. 01, 2014   |
| Spectrum Analyzer               | R&S                   | FSEK 30  | 835253/002    | SEP. 28, 2013   |

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



### 4.3 MEASUREMENT UNCERTAINTY

| Parameter                                                | Uncertainty            |
|----------------------------------------------------------|------------------------|
| Radiated Emission, 9 kHz to 30 MHz<br>Test Site : OATS-6 | $\pm 3.22\text{dB}$    |
| Radiated Emission, 30 to 200 MHz<br>Test Site : OATS-6   | $\pm 3.3456\text{dB}$  |
| Radiated Emission, 200 to 1000 MHz<br>Test Site : OATS-6 | $\pm 2.6828\text{dB}$  |
| Radiated Emission, 1 to 8 GHz                            | $\pm 2.6485\text{dB}$  |
| Radiated Emission, 8 to 18 GHz                           | $\pm 2.6852\text{dB}$  |
| Radiated Emission, 18 to 26.5 GHz                        | $\pm 2.6485\text{dB}$  |
| Radiated Emission, 26 to 40 GHz                          | $\pm 3.0295\text{dB}$  |
| Power Line Conducted Emission                            | $\pm 1.91\text{dB}$    |
| Band Width                                               | 136.49kHz              |
| Peak Output Power MU                                     | $\pm 1.904\text{dB}$   |
| Band Edge MU                                             | $\pm 0.302\text{dBuV}$ |
| Channel Separation MU                                    | 361.69Hz               |
| Duty Cycle MU                                            | 0.064ms                |
| Frequency Stability MU                                   | 0.223kHz               |

Uncertainty figures are valid to a confidence level of 95%, k=2



## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

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

☒ No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7:1992, ANSI C63.4 : 2003 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 LISTING**

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 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 TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW-1037).



## 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

|               |     |
|---------------|-----|
| <b>Taiwan</b> | TAF |
|---------------|-----|

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

|                |                 |
|----------------|-----------------|
| <b>Canada</b>  | Industry Canada |
| <b>Germany</b> | TUV NORD        |
| <b>Taiwan</b>  | BSMI            |
| <b>USA</b>     | FCC             |

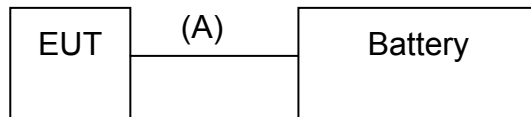
Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

#### RF Test



### 6.2 SUPPORT EQUIPMENT

#### RF test

| No. | Product | Manufacturer | Model No. | Certify No. | Signal cable |
|-----|---------|--------------|-----------|-------------|--------------|
| 1.  | Batter  | B.B          | HR9-12    | DOC         | N/A          |

| No. | Signal cable description |                        |
|-----|--------------------------|------------------------|
| A   | DC Power                 | Unshielded, 0.5m, 1pcs |

#### 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.

### 6.3 EUT OPERATING CONDITION

#### RF Setup

1. Setup a whole system as the setup diagram.
2. Turn on power.

#### NOTE:

The transmission is modified to continuously transmission by software.



## 7. FCC PART 15.249 REQUIREMENTS

### 7.1 20 DB BANDWIDTH

#### LIMIT

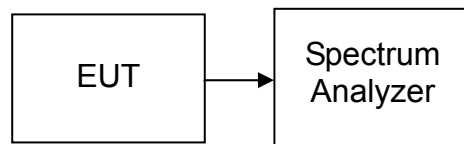
None; for reporting purposes only.

#### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|-------------------|--------------|-------|---------------|-----------------|
| SPECTRUM ANALYZER | R&S          | FSU   | 200789        | SEP. 29 , 2013  |

**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 30 kHz and VBW is set 100kHz..

#### TEST RESULTS

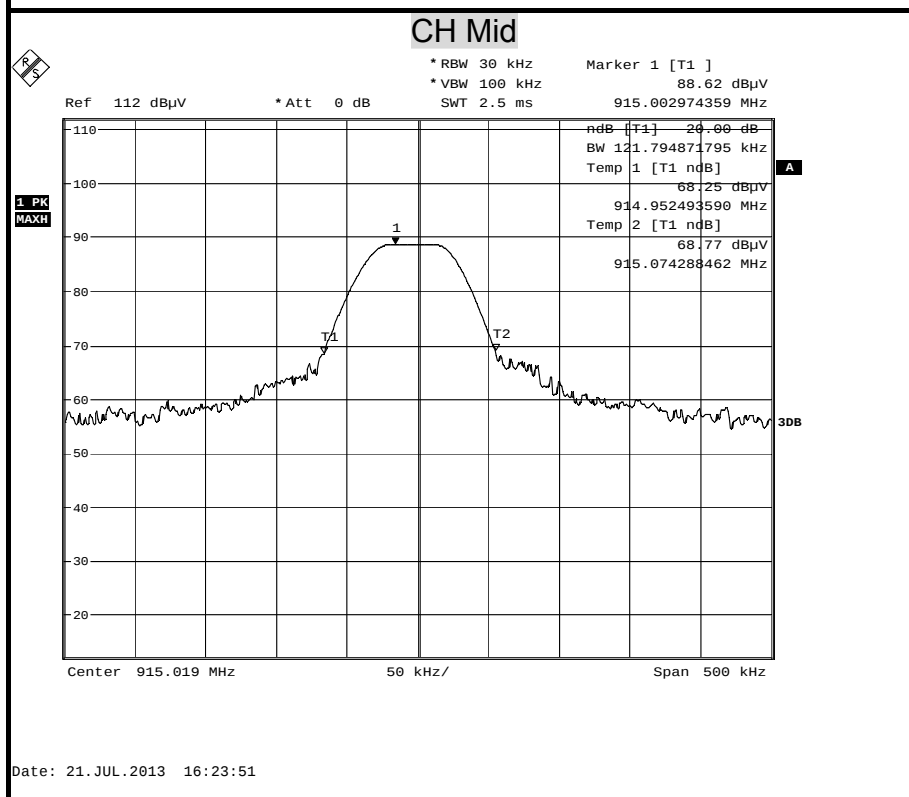
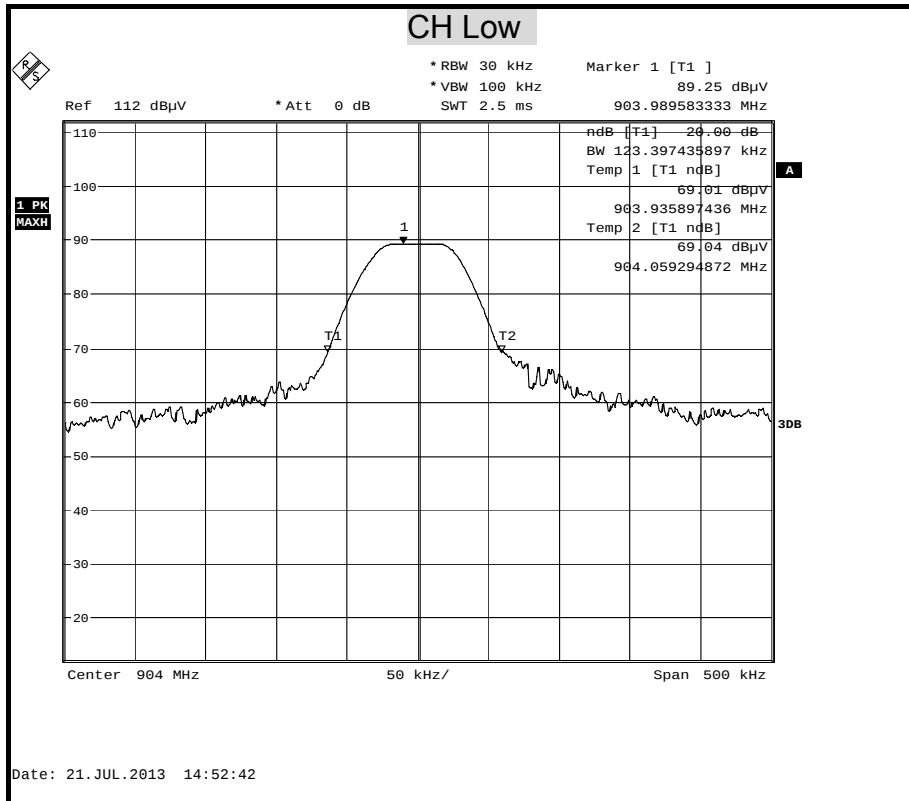
No non-compliance noted.

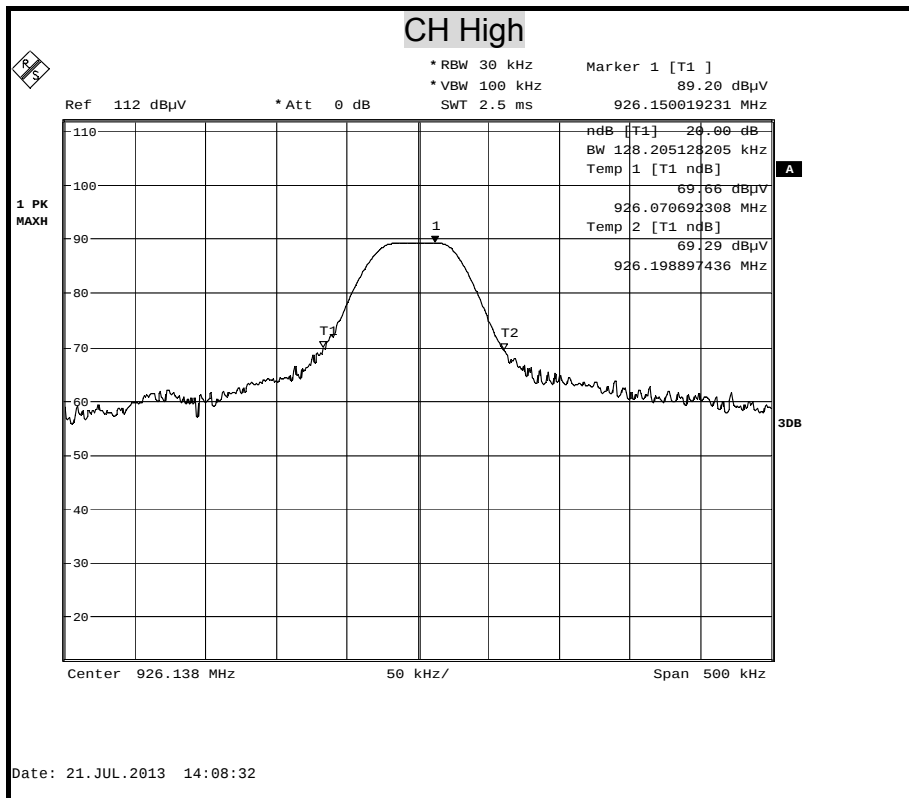
#### Test Data

| Channel | Frequency<br>(MHz) | 20dB Bandwidth<br>(KHz) |
|---------|--------------------|-------------------------|
| Low     | 904.000            | 123.40                  |
| Middle  | 915.019            | 121.79                  |
| High    | 926.138            | 128.21                  |



Test Plot







## 7.2 BAND EDGES MEASUREMENT

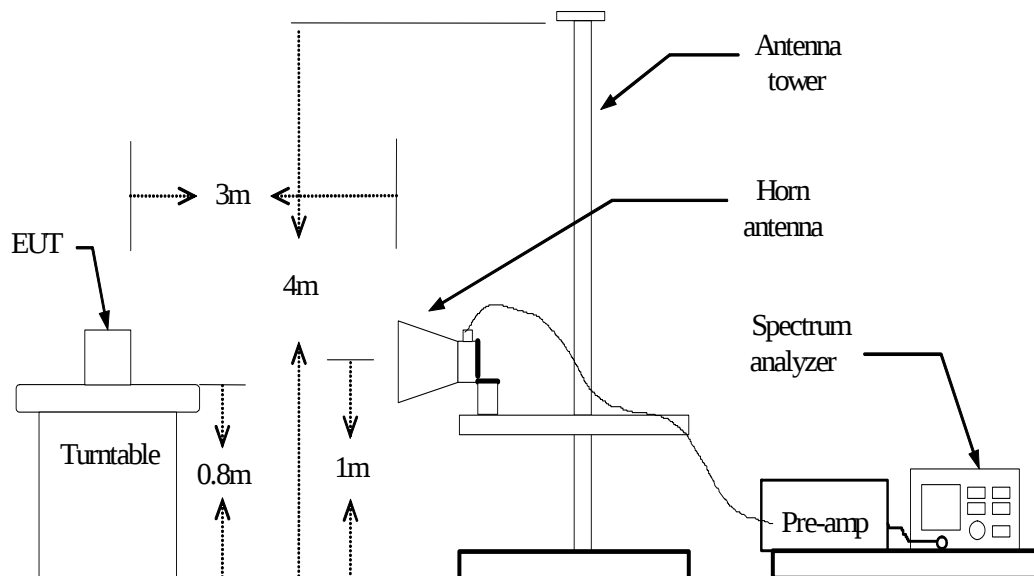
### LIMIT

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

| Frequency (MHz) | Field Strength ( $\mu\text{V}/\text{m}$ at 3-meter) | Field Strength ( $\text{dB}\mu\text{V}/\text{m}$ at 3-meter) |
|-----------------|-----------------------------------------------------|--------------------------------------------------------------|
| 0.009-0.490     | 2400/F(kHz)                                         | 300                                                          |
| 0.490-1.705     | 24000/F(kHz)                                        | 30                                                           |
| 1.705-30.0      | 30                                                  | 30                                                           |
| 30-88           | 100                                                 | 3                                                            |
| 88-216          | 150                                                 | 3                                                            |
| 216-960         | 200                                                 | 3                                                            |
| Above 960       | 500                                                 | 3                                                            |

2. As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

### TEST CONFIGURATION





## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above the 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 emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: Peak Level + Duty Factor
5. Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

## **TEST RESULTS**

After estimate 20dB bandwidth of 1st and last channel ,the declared frequency will not invade restrict band. There is no requirement for this test.



### 7.3 DUTY CYCLE

#### LIMIT

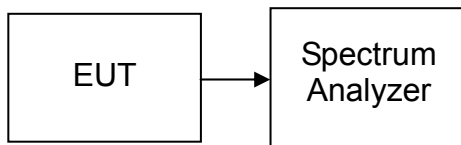
Nil (No dedicated limit specified in the Rules)

#### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model   | Serial Number | Calibration Due |
|-------------------|--------------|---------|---------------|-----------------|
| SPECTRUM ANALYZER | R&S          | FSEK 30 | 835253/002    | SEP, 29, 2013   |

**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=100kHz, VBW=300KHz, Span = 0Hz, a suitable Sweep Time.
5. Repeat above procedures until all frequency measured were complete.



## TEST RESULTS

No non-compliance noted.

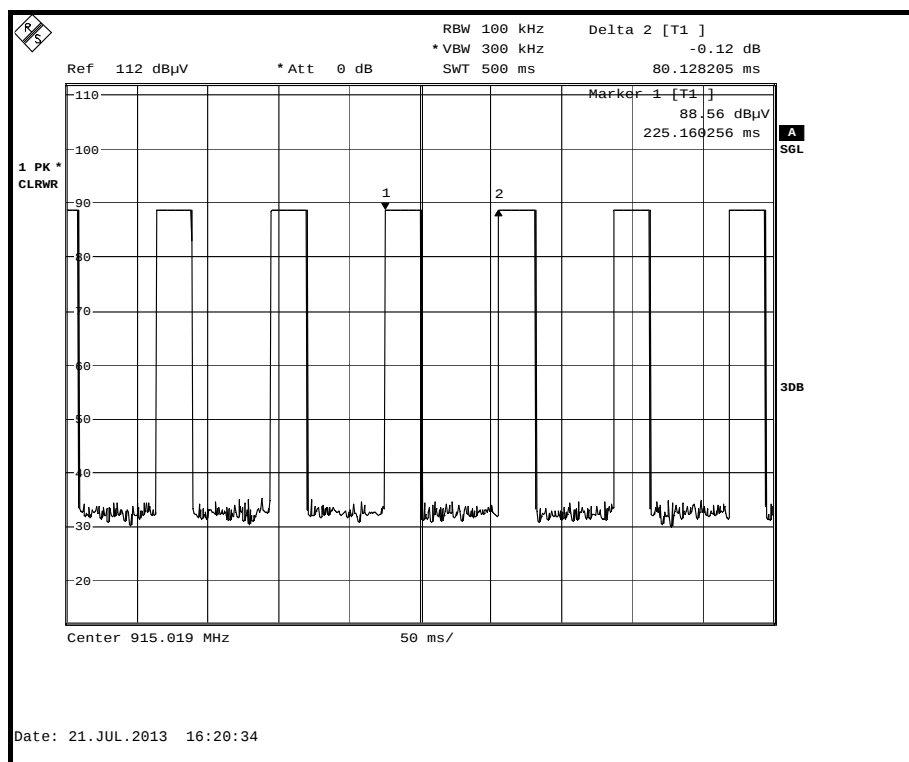
## TEST DATA

|      | us        | Times | Ton       | Total Ton time(ms) |
|------|-----------|-------|-----------|--------------------|
| Ton1 | 25480.769 | 1     | 25480.769 | 25.481             |
| Ton2 |           | 0     | 0.000     |                    |
| Ton3 |           | 0     | 0.000     |                    |
| Tp   |           |       |           | 81.635             |

|              |         |               |
|--------------|---------|---------------|
| Ton          | 25.481  | 31.21319185 % |
| Tp(Ton+Toff) | 81.635  |               |
| Duty Cycle   | 0.312   |               |
| Duty Factor  | -10.113 |               |

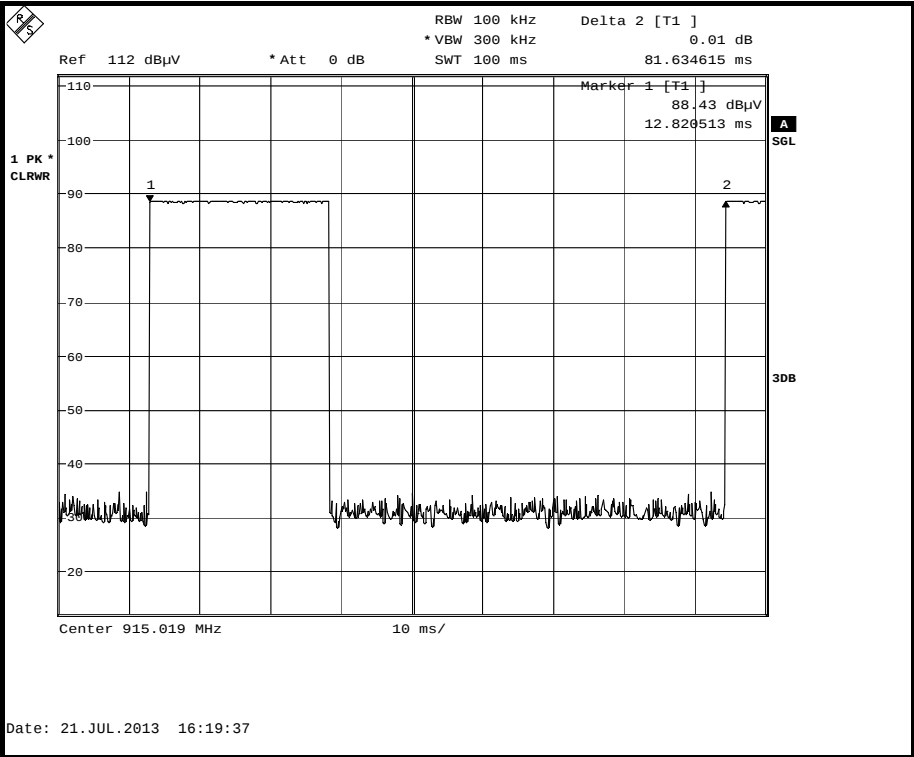
## Test Plot

### TP1

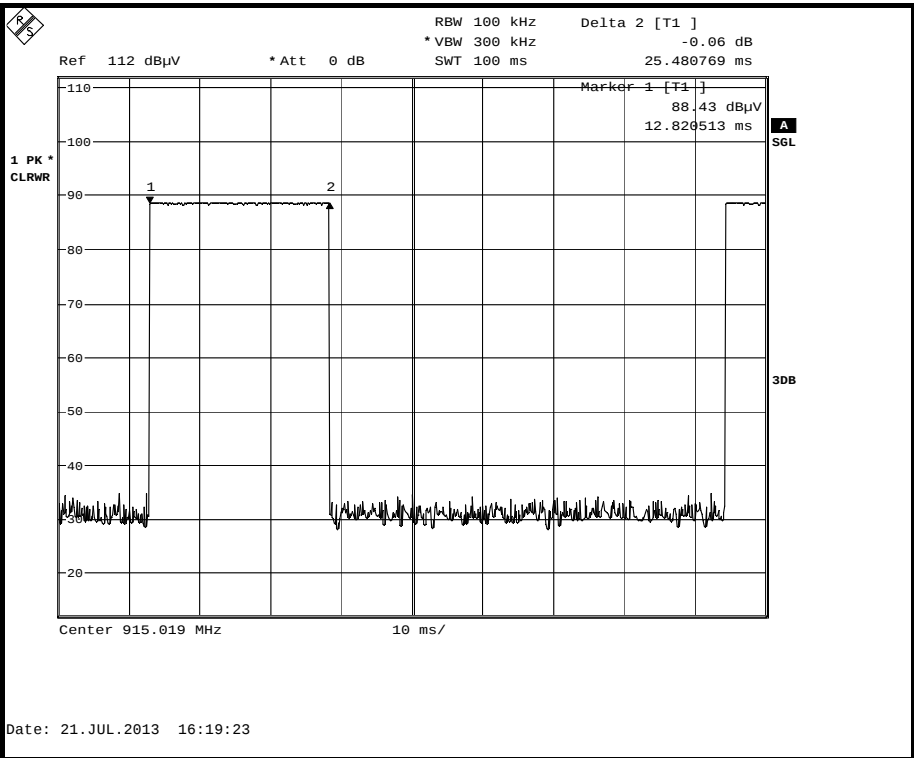




TP2



Ton





## 7.4 SPURIOUS EMISSION

### LIMIT

1. In the section 15.249(a):

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental Field Strength (mV/m) | Field Strength of Harmonics (µV/m) |
|-----------------------------|-----------------------------------------------------|------------------------------------|
| 902-928 MHz                 | 50                                                  | 500                                |
| 2400 - 2483.5 MHz           | 50                                                  | 500                                |
| 5725 - 5875 MHz             | 50                                                  | 500                                |
| 24.0 - 24.25 GHz            | 250                                                 | 2500                               |

2. 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 (µV/m at 3-meter) | Field Strength (dBµV/m at 3-meter) |
|-----------------|----------------------------------|------------------------------------|
| 0.009-0.490     | 2400/F(kHz)                      | 300                                |
| 0.490-1.705     | 24000/F(kHz)                     | 30                                 |
| 1.705-30.0      | 30                               | 30                                 |
| 30-88           | 100                              | 3                                  |
| 88-216          | 150                              | 3                                  |
| 216-960         | 200                              | 3                                  |
| Above 960       | 500                              | 3                                  |

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

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

| Frequency (MHz) | Field Strength (µV/m at 3-meter) | Field Strength (dBµV/m at 3-meter) |
|-----------------|----------------------------------|------------------------------------|
| 0.009-0.490     | 2400/F(kHz)                      | 300                                |
| 0.490-1.705     | 24000/F(kHz)                     | 30                                 |
| 1.705-30.0      | 30                               | 30                                 |
| 30-88           | 100                              | 3                                  |
| 88-216          | 150                              | 3                                  |
| 216-960         | 200                              | 3                                  |
| Above 960       | 500                              | 3                                  |

**MEASUREMENT EQUIPMENT USED**

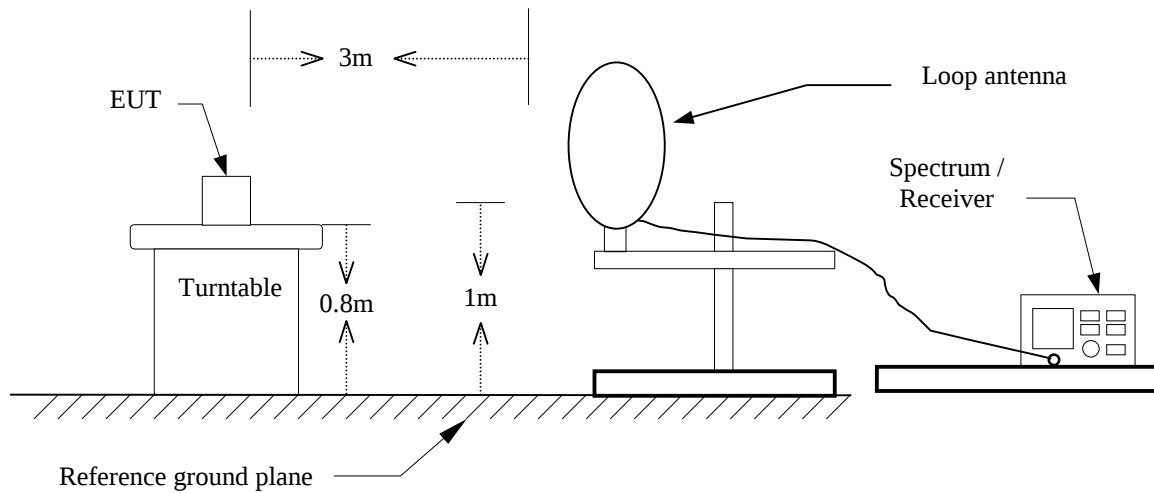
| Open Area Test Site # 6         |                          |          |               |                 |
|---------------------------------|--------------------------|----------|---------------|-----------------|
| Name of Equipment               | Manufacturer             | Model    | Serial Number | Calibration Due |
| TYPE N COAXIAL CABLE            | SUHNER                   | CHA9513  | 6             | DEC. 18, 2013   |
| BI-LOG Antenna                  | Sunol                    | JB1      | A070506-2     | SEP. 26, 2013   |
| LOOP ANTENNA                    | EMCO                     | 6502     | 8905-2356     | JUN. 10, 2014   |
| Pre-Amplifier                   | HP                       | 8447F    | NCR           | NCR             |
| EMI Receiver                    | R&S                      | ESVS10   | 833206/012    | JUN. 26, 2014   |
| Horn Antenna                    | Com-Power                | AH-118   | 071032        | DEC. 05, 2013   |
| 3116 Double Ridge Antenna (40G) | ETS-LINDGREN             | 3116     | 00078900      | DEC. 27, 2013   |
| Turn Table                      | Yo Chen                  | 001      | -----         | N.C.R.          |
| Antenna Tower                   | AR                       | TP1000A  | 309874        | N.C.R.          |
| Controller                      | CT                       | SC101    | -----         | N.C.R.          |
| RF Swicth                       | E-INSTRUMENT<br>TELH LTD | ERS-180A | EC1204141     | N.C.R           |
| Power Meter                     | Anritsu                  | ML2487A  | 6K00003888    | JUN. 24, 2014   |
| Power Sensor                    | Anritsu                  | MA2491A  | 33265         | JUN. 24, 2014   |
| Temp./Humidity Chamber          | K.SON                    | THS-M1   | 242           | AUG. 08, 2013   |
| DC Power Source                 | LOKO                     | DSP-5050 | L1507009282   | N.C.R           |
| Spectrum Analyzer               | R&S                      | FSU      | 200789        | JUL. 01, 2014   |
| Spectrum Analyzer               | R&S                      | FSEK 30  | 835253/002    | SEP. 28, 2013   |

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

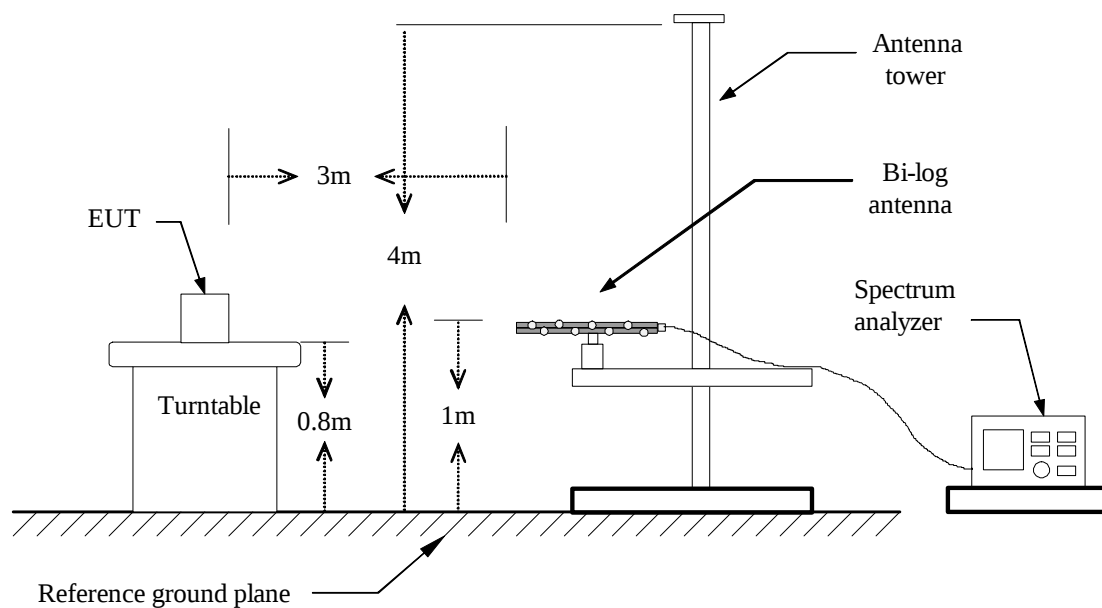


## TEST CONFIGURATION

9kHz ~ 30MHz

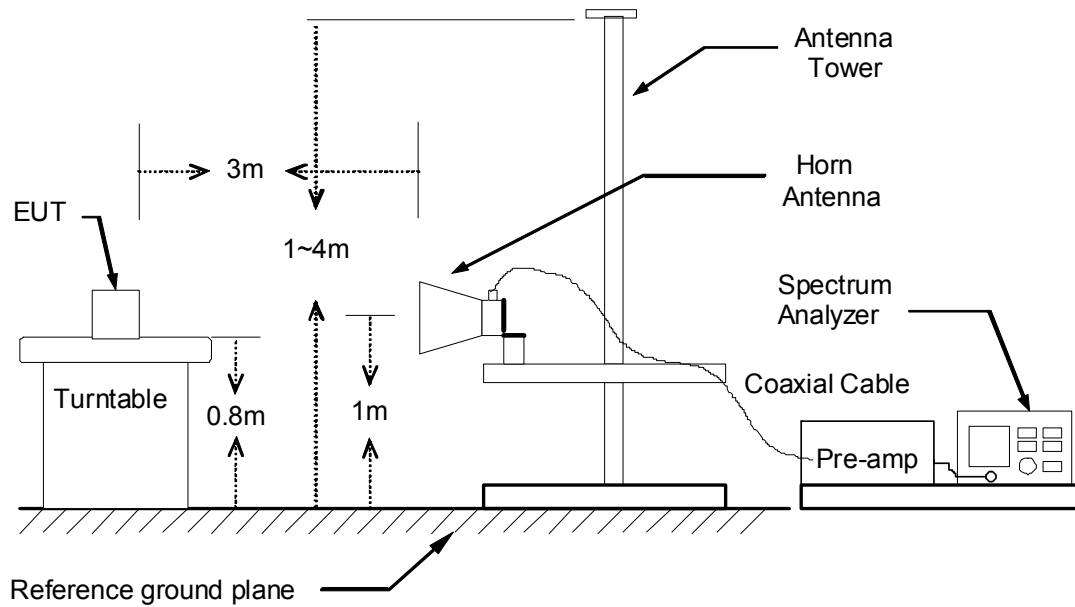


30MHz ~ 1GHz





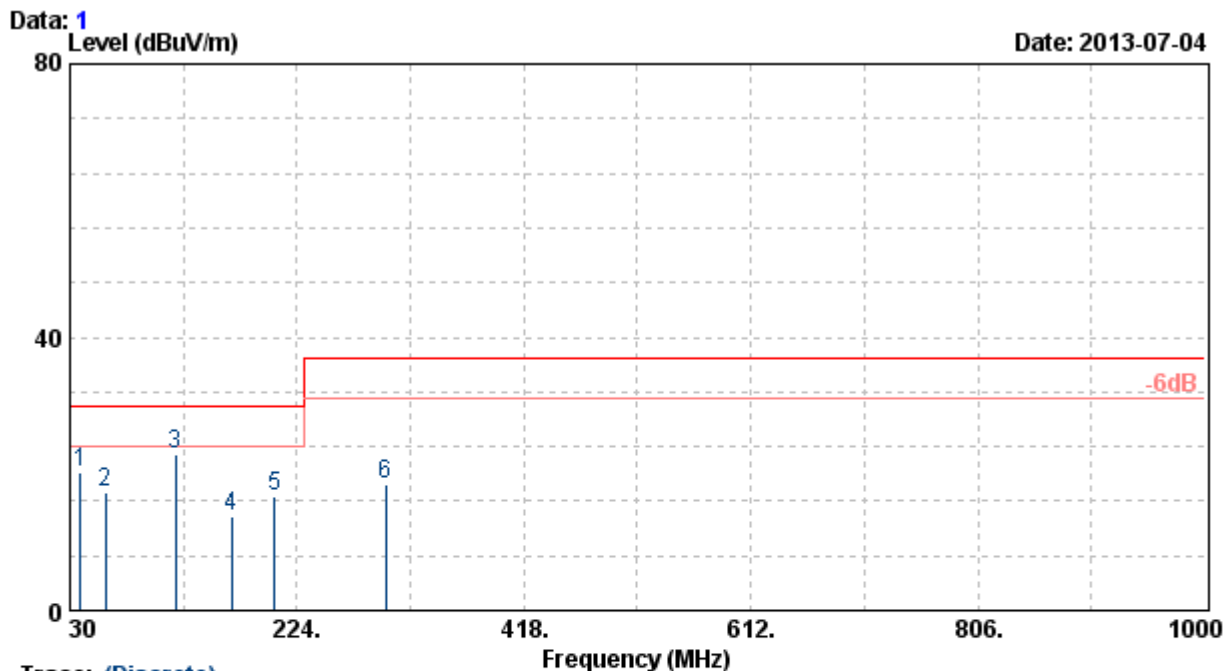
Above 1 GHz





## **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: Peak Level + Duty Factor
7. Repeat above procedures until the measurements for all frequencies are complete.

**Below 1GHz****Operation Mode:** Link Mode**Test Date:** 2013/07/04**Temperature:** 25°C**Tested by:** Ted Huang**Humidity:** 54% RH**Polarity:** Ver. / Hor.**Vertical**

| Freq.  | Reading | Antenna | Cable | Measure | Limit  | Over   | Detector |
|--------|---------|---------|-------|---------|--------|--------|----------|
|        | Level   | Factor  | Loss  | Level   |        | Limit  |          |
| MHz    | dBuV    | dB/m    | dB    | dBuV/m  | dBuV/m | dBuV/m |          |
| 38.93  | 5.01    | 13.73   | 1.34  | 20.08   | 30.00  | -9.92  | QP       |
| 60.01  | 7.84    | 7.77    | 1.69  | 17.30   | 30.00  | -12.70 | QP       |
| 120.05 | 6.48    | 13.82   | 2.56  | 22.86   | 30.00  | -7.14  | QP       |
| 167.95 | -0.85   | 11.79   | 2.94  | 13.88   | 30.00  | -16.12 | QP       |
| 205.00 | 0.97    | 12.34   | 3.36  | 16.67   | 30.00  | -13.33 | QP       |
| 300.00 | 0.62    | 13.55   | 4.21  | 18.38   | 37.00  | -18.62 | QP       |

**Remark:**

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).
6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.
7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 – 1000 MHz scan.



Operation Mode: Link Mode

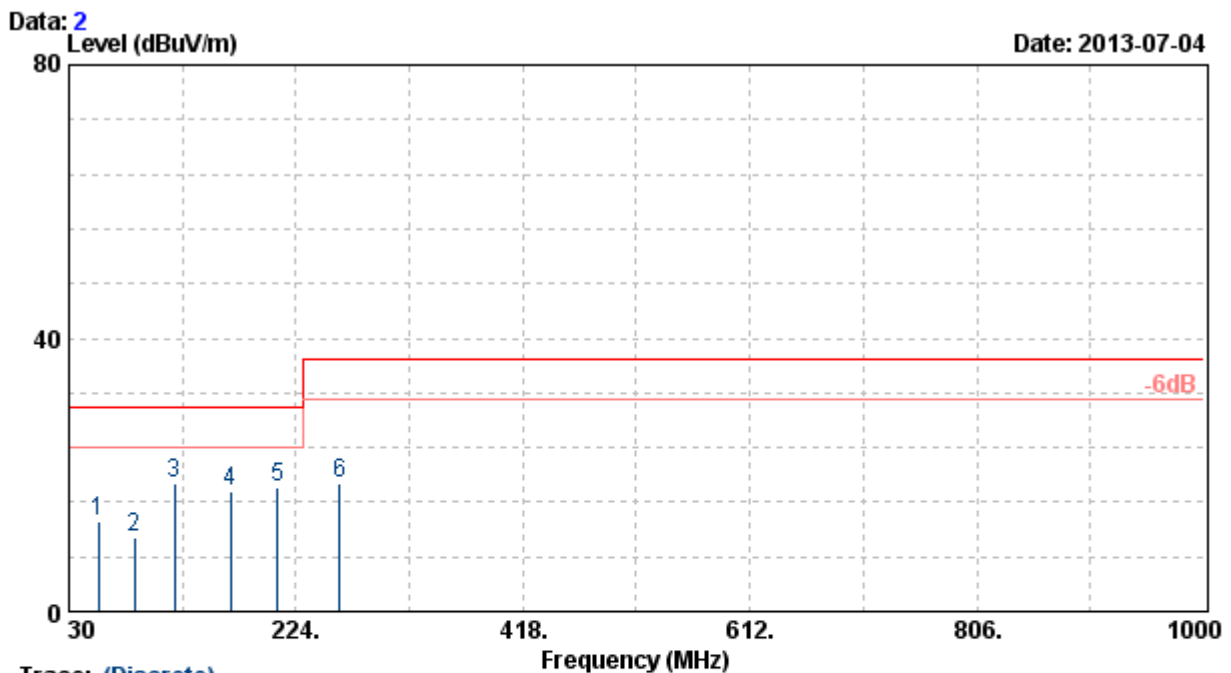
Temperature: 25°C

Humidity: 54% RH

Test Date: 2013/07/04

Tested by: Ted Huang

Polarity: Ver. / Hor.

Horizontal

Trace: (Discrete)

| Freq.  | Reading | Antenna | Cable | Measure | Limit  | Over   | Detector |
|--------|---------|---------|-------|---------|--------|--------|----------|
| MHz    | Level   | Factor  | Loss  | Level   | dBuV/m | Limit  |          |
|        | dBuV    | dB/m    | dB    | dBuV/m  | dBuV/m | dBuV/m |          |
| 55.04  | 3.75    | 7.82    | 1.59  | 13.16   | 30.00  | -16.84 | QP       |
| 86.07  | 1.03    | 7.83    | 2.01  | 10.87   | 30.00  | -19.13 | QP       |
| 120.00 | 2.35    | 13.82   | 2.56  | 18.73   | 30.00  | -11.27 | QP       |
| 168.04 | 2.74    | 11.79   | 2.94  | 17.47   | 30.00  | -12.53 | QP       |
| 208.01 | 2.90    | 11.99   | 3.39  | 18.28   | 30.00  | -11.72 | QP       |
| 261.70 | 2.37    | 12.48   | 3.85  | 18.70   | 37.00  | -18.30 | QP       |

**Remark:**

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, 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.
5. Margin (dB) = Remark result (dBUV/m) – Quasi-peak limit (dBUV/m).
6. That the limit for signals below 1GHz is a QP limit and peak readings are below the QP limit.
7. The fundamental signal is not shown in the test data because measurements at fundamental frequency are shown separately and were ignored during the 30 – 1000 MHz scan.

**The fundamental signal****Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Horizontal

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 904.000 | 89.07   | 23.25  | 6.60       | 24.14   | 0.00   | 94.78    | 114.00   | -19.22 | P       |
| 904.000 | 86.92   | 23.25  | 6.60       | 24.14   | 0.00   | 92.63    | 94.00    | -1.37  | Q       |

## Vertical

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 904.000 | 83.73   | 23.25  | 6.60       | 24.14   | 0.00   | 89.44    | 114.00   | -24.56 | P       |
| 904.000 | 81.54   | 23.25  | 6.60       | 24.14   | 0.00   | 87.25    | 94.00    | -6.75  | Q       |

**Remark:***Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**The fundamental signal****Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Horizontal

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 915.019 | 88.62   | 23.37  | 6.65       | 24.15   | 0.00   | 94.49    | 114.00   | -19.51 | P       |
| 915.019 | 86.54   | 23.37  | 6.65       | 24.15   | 0.00   | 92.41    | 94.00    | -1.59  | Q       |

## Vertical

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 915.019 | 79.77   | 23.37  | 6.65       | 24.15   | 0.00   | 85.64    | 114.00   | -28.36 | P       |
| 915.019 | 77.24   | 23.37  | 6.65       | 24.15   | 0.00   | 83.11    | 94.00    | -10.89 | Q       |

**Remark:***Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**The fundamental signal****Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Horizontal

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 926.138 | 89.07   | 23.49  | 6.69       | 24.15   | 0.00   | 95.10    | 114.00   | -18.90 | P       |
| 926.138 | 87.03   | 23.49  | 6.69       | 24.15   | 0.00   | 93.06    | 94.00    | -0.94  | Q       |

## Vertical

| Freq.   | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|---------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)   | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 926.138 | 82.33   | 23.49  | 6.69       | 24.15   | 0.00   | 88.36    | 114.00   | -25.64 | P       |
| 926.138 | 80.11   | 23.49  | 6.69       | 24.15   | 0.00   | 86.14    | 94.00    | -7.86  | Q       |

**Remark:***Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

**Above 1GHz****Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.**Horizontal**

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1808.23   | 60.33   | 28.98  | 2.51       | 44.78   | 0.30   | 47.34    | 74.00    | -26.66 | P       |
| 1808.23   | 50.22   | 28.98  | 2.51       | 44.78   | 0.30   | 37.23    | 54.00    | -16.77 | A       |
| * 2712.14 | 56.95   | 30.28  | 3.02       | 44.84   | 0.30   | 45.72    | 74.00    | -28.28 | P       |
| * 2712.14 | 46.84   | 30.28  | 3.02       | 44.84   | 0.30   | 35.61    | 54.00    | -18.39 | A       |
| * 3616.01 | 67.00   | 30.69  | 3.38       | 44.42   | 0.30   | 56.94    | 74.00    | -17.06 | P       |
| * 3616.01 | 56.89   | 30.69  | 3.38       | 44.42   | 0.30   | 46.83    | 54.00    | -7.17  | A       |
| * 4519.75 | 55.66   | 32.37  | 3.76       | 44.75   | 0.40   | 47.44    | 74.00    | -26.56 | P       |
| * 4519.75 | 45.55   | 32.37  | 3.76       | 44.75   | 0.40   | 37.33    | 54.00    | -16.67 | A       |
| * 5423.94 | 57.08   | 34.27  | 4.03       | 45.01   | 0.40   | 50.78    | 74.00    | -23.22 | P       |
| * 5423.94 | 46.97   | 34.27  | 4.03       | 45.01   | 0.40   | 40.66    | 54.00    | -13.34 | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Low**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Vertical

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1808.13   | 58.71   | 28.98  | 2.51       | 44.78   | 0.30   | 45.72    | 74.00    | -28.28 | P       |
| 1808.13   | 48.60   | 28.98  | 2.51       | 44.78   | 0.30   | 35.61    | 54.00    | -18.39 | A       |
| * 2711.75 | 55.84   | 30.28  | 3.02       | 44.84   | 0.30   | 44.61    | 74.00    | -29.39 | P       |
| * 2711.75 | 45.73   | 30.28  | 3.02       | 44.84   | 0.30   | 34.50    | 54.00    | -19.50 | A       |
| * 3616.01 | 68.62   | 30.69  | 3.38       | 44.42   | 0.30   | 58.56    | 74.00    | -15.44 | P       |
| * 3616.01 | 58.51   | 30.69  | 3.38       | 44.42   | 0.30   | 48.45    | 54.00    | -5.55  | A       |
| * 4519.37 | 55.95   | 32.37  | 3.76       | 44.75   | 0.40   | 47.73    | 74.00    | -26.27 | P       |
| * 4519.37 | 45.84   | 32.37  | 3.76       | 44.75   | 0.40   | 37.62    | 54.00    | -16.38 | A       |
| * 5424.08 | 58.43   | 34.27  | 4.03       | 45.01   | 0.40   | 52.13    | 74.00    | -21.87 | P       |
| * 5424.08 | 48.32   | 34.27  | 4.03       | 45.01   | 0.40   | 42.01    | 54.00    | -11.99 | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Horizontal

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1829.74   | 60.14   | 29.14  | 2.52       | 44.79   | 0.30   | 47.32    | 74.00    | -26.68 | P       |
| 1829.74   | 50.03   | 29.14  | 2.52       | 44.79   | 0.30   | 37.21    | 54.00    | -16.79 | A       |
| * 2745.24 | 56.80   | 30.30  | 3.04       | 44.76   | 0.30   | 45.67    | 74.00    | -28.33 | P       |
| * 2745.24 | 46.69   | 30.30  | 3.04       | 44.76   | 0.30   | 35.56    | 54.00    | -18.44 | A       |
| * 3659.99 | 65.68   | 30.76  | 3.40       | 44.42   | 0.30   | 55.71    | 74.00    | -18.29 | P       |
| * 3659.99 | 55.57   | 30.76  | 3.40       | 44.42   | 0.30   | 45.60    | 54.00    | -8.40  | A       |
| * 4575.20 | 55.87   | 32.57  | 3.78       | 44.81   | 0.40   | 47.81    | 74.00    | -26.19 | P       |
| * 4575.20 | 45.76   | 32.57  | 3.78       | 44.81   | 0.40   | 37.70    | 54.00    | -16.30 | A       |
| 5490.15   | 56.88   | 34.30  | 4.06       | 44.97   | 0.40   | 50.67    | 74.00    | -23.33 | P       |
| 5490.15   | 46.77   | 34.30  | 4.06       | 44.97   | 0.40   | 40.55    | 54.00    | -13.45 | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode Mid**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Vertical

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1830.14   | 58.10   | 29.14  | 2.52       | 44.79   | 0.30   | 45.28    | 74.00    | -28.72 | P       |
| 1830.14   | 47.99   | 29.14  | 2.52       | 44.79   | 0.30   | 35.17    | 54.00    | -18.83 | A       |
| * 2745.13 | 56.35   | 30.30  | 3.04       | 44.76   | 0.30   | 45.22    | 74.00    | -28.78 | P       |
| * 2745.13 | 46.24   | 30.30  | 3.04       | 44.76   | 0.30   | 35.11    | 54.00    | -18.89 | A       |
| * 3660.05 | 68.34   | 30.76  | 3.40       | 44.42   | 0.30   | 58.37    | 74.00    | -15.63 | P       |
| * 3660.05 | 58.23   | 30.76  | 3.40       | 44.42   | 0.30   | 48.26    | 54.00    | -5.74  | A       |
| * 4575.22 | 56.61   | 32.57  | 3.78       | 44.81   | 0.40   | 48.55    | 74.00    | -25.45 | P       |
| * 4575.22 | 46.50   | 32.57  | 3.78       | 44.81   | 0.40   | 38.44    | 54.00    | -15.56 | A       |
| 5490.12   | 57.52   | 34.30  | 4.06       | 44.97   | 0.40   | 51.31    | 74.00    | -22.69 | P       |
| 5490.12   | 47.41   | 34.30  | 4.06       | 44.97   | 0.40   | 41.19    | 54.00    | -12.81 | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Horizontal

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1852.37   | 59.27   | 29.31  | 2.54       | 44.79   | 0.30   | 46.63    | 74.00    | -27.37 | P       |
| 1852.37   | 49.16   | 29.31  | 2.54       | 44.79   | 0.30   | 36.51    | 54.00    | -17.49 | A       |
| * 2778.99 | 55.31   | 30.31  | 3.05       | 44.68   | 0.30   | 44.29    | 74.00    | -29.71 | P       |
| * 2778.99 | 45.20   | 30.31  | 3.05       | 44.68   | 0.30   | 34.18    | 54.00    | -19.82 | A       |
| * 3704.47 | 67.62   | 30.83  | 3.41       | 44.42   | 0.30   | 57.74    | 74.00    | -16.26 | P       |
| * 3704.47 | 57.51   | 30.83  | 3.41       | 44.42   | 0.30   | 47.63    | 54.00    | -6.37  | A       |
| * 4631.06 | 55.52   | 32.77  | 3.79       | 44.87   | 0.40   | 47.61    | 74.00    | -26.39 | P       |
| * 4631.06 | 45.41   | 32.77  | 3.79       | 44.87   | 0.40   | 37.50    | 54.00    | -16.50 | A       |
| 5556.83   | 57.91   | 34.36  | 4.08       | 45.00   | 0.40   | 51.75    | 74.00    | -22.25 | P       |
| 5556.83   | 47.80   | 34.36  | 4.08       | 45.00   | 0.40   | 41.64    | 54.00    | -12.36 | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column.

**Operation Mode:** TX / X Mode High**Test Date:** 2013/07/22**Temperature:** 32°C**Tested by:** John Chen**Humidity:** 61% RH**Polarity:** Ver. / Hor.

## Vertical

| Freq.     | Reading | AF     | Cable Loss | Pre-amp | Filter | Level    | Limit    | Margin | Mark    |
|-----------|---------|--------|------------|---------|--------|----------|----------|--------|---------|
| (MHz)     | (dBμV)  | (dB/m) | (dB)       | (dB)    | (dB)   | (dBμV/m) | (dBμV/m) | (dB)   | (P/Q/A) |
| 1852.14   | 58.01   | 29.31  | 2.54       | 44.79   | 0.30   | 45.36    | 74.00    | -28.64 | P       |
| 1852.14   | 47.90   | 29.31  | 2.54       | 44.79   | 0.30   | 35.25    | 54.00    | -18.75 | A       |
| * 2778.79 | 55.62   | 30.31  | 3.05       | 44.68   | 0.30   | 44.60    | 74.00    | -29.40 | P       |
| * 2778.79 | 45.51   | 30.31  | 3.05       | 44.68   | 0.30   | 34.49    | 54.00    | -19.51 | A       |
| * 3704.04 | 67.54   | 30.83  | 3.41       | 44.42   | 0.30   | 57.66    | 74.00    | -16.34 | P       |
| * 3704.04 | 57.43   | 30.83  | 3.41       | 44.42   | 0.30   | 47.55    | 54.00    | -6.45  | A       |
| * 4630.45 | 56.65   | 32.77  | 3.79       | 44.87   | 0.40   | 48.74    | 74.00    | -25.26 | P       |
| * 4630.45 | 46.54   | 32.77  | 3.79       | 44.87   | 0.40   | 38.63    | 54.00    | -15.37 | A       |
| 5556.83   | 61.17   | 34.36  | 4.08       | 45.00   | 0.40   | 55.01    | 74.00    | -18.99 | P       |
| 5556.83   | 51.06   | 34.36  | 4.08       | 45.00   | 0.40   | 44.90    | 54.00    | -9.10  | A       |
| N/A       | ---     | ---    | ---        | ---     | ---    | ---      | ---      | ---    | ---     |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, 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.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m). Peak detector mode and average detector mode of the emission shown in Result column



## 7.5 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range<br>(MHz) | Limits<br>(dB $\mu$ V) |          |
|--------------------------|------------------------|----------|
|                          | 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 #1 |                           |           |               |                 |
|----------------------------|---------------------------|-----------|---------------|-----------------|
| Name of Equipment          | Manufacturer              | Model     | Serial Number | Calibration Due |
| L.I.S.N.                   | SCHWARZBECK               | NNLK 8130 | 8130124       | SEP. 30, 2013   |
|                            | Rohde & Schwarz           | ESH 3-Z5  | 840062/021    | JUL. 31, 2013   |
| TEST RECEIVER              | Rohde & Schwarz           | ESCS 30   | 100348        | JUL. 23, 2014   |
| BNC COAXIAL<br>CABLE       | CCS                       | BNC50     | 11            | OCT. 30, 2013   |
| Test S/W                   | e-3 (5.04211c) R&S (2.27) |           |               |                 |

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

### TEST RESULTS

This EUT is powered by the battery only, so this test item is not applicable.