

# FCC TEST REPORT

**Product** : INNO LUMI LED Remote  
**Trade mark** : N/A  
**Model/Type reference** : LUMI-R2  
**Serial Number** : N/A  
**Report Number** : EED32J00107902  
**FCC ID** : 2AMKD-LUMI-R2  
**Date of Issue** : Jul. 03, 2017  
**Test Standards** : 47 CFR Part 15 Subpart C (2015)  
**Test result** : PASS

Prepared for:

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Date:

Jul. 03, 2017

Check No.: 2447608080



**2 Version**

| Version No. | Date          | Description |
|-------------|---------------|-------------|
| 00          | Jul. 03, 2017 | Original    |
|             |               |             |
|             |               |             |

### 3 Test Summary

| Test Item  | Test Requirement                                   | Test method      | Result |
|--|--|------------------|--------|
| <b>Antenna Requirement</b>   | 47 CFR Part 15 Subpart C Section 15.203            | ANSI C63.10-2013 | PASS   |
| <b>AC Power Line Conducted Emission</b>                                  | 47 CFR Part 15 Subpart C Section 15.207            | ANSI C63.10-2013 | PASS   |
| <b>Field Strength of the Fundamental Signal</b>                          | 47 CFR Part 15 Subpart C Section 15.249 (a)        | ANSI C63.10-2013 | PASS   |
| <b>Spurious Emissions</b>  | 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209 | ANSI C63.10-2013 | PASS   |
| <b>Restricted bands around fundamental frequency (Radiated Emission)</b> | 47 CFR Part 15 Subpart C Section 15.249(a)/15.205  | ANSI C63.10-2013 | PASS   |
| <b>20dB Occupied Bandwidth</b>   | 47 CFR Part 15 Subpart C Section 15.215 (c)        | ANSI C63.10-2013 | PASS   |

## Remark:

The tested samples and the sample information are provided by the client.

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

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## 5 General Information

### 5.1 Client Information

|                          |  |
|--------------------------|--|
| Applicant:               | Shenzhen Dr. Kon Tech. Co., Ltd  |
| Address of Applicant:    | Rm 606 6/F, Yafangting Centre, Majialong Industrial Zone, Nanshan Dist. Shenzhen, Province Guangdong CHINA |
| Manufacturer:            | Shenzhen Dr. Kon Tech. Co., Ltd  |
| Address of Manufacturer: | Rm 606 6/F, Yafangting Centre, Majialong Industrial Zone, Nanshan Dist. Shenzhen, Province Guangdong CHINA |

### 5.2 General Description of EUT

|                                  |                               |
|----------------------------------|-------------------------------|
| Product Name:                    | INNO LUMI LED Remote          |
| Model No.(EUT):                  | LUMI-R2                       |
| Trade Mark:                      | N/A                           |
| EUT Supports Radios application: | 2.401GHz; 2.441GHz; 2.481GHz  |
| Power Supply:                    | 450mAh 3.7V (lithium battery) |

### 5.3 Product Specification subjective to this standard

|                       |                                |
|-----------------------|--------------------------------|
| Frequency Range:      | 2.401GHz; 2.441GHz; 2.481GHz   |
| Modulation Type:      | GFSK                           |
| Number of Channel:    | 3                              |
| Test power grade:     | N/A                            |
| Test software of EUT: | N/A                            |
| Antenna Type:         | FPC antenna                    |
| Antenna Gain:         | 2dBi                           |
| Test voltage:         | AC 120V,60Hz                   |
| Sample Received Date: | Jun. 02, 2017                  |
| Sample tested Date:   | Jun. 02, 2017 to Jul. 03, 2017 |

### 5.4 Test Environment and Mode

|                               |   |
|-------------------------------|---|
| <b>Operating Environment:</b> |   |
| Temperature:                  | 22°C  |
| Humidity:                     | 53% RH  |
| Atmospheric Pressure:         | 1010mbar  |
| <b>Test mode:</b>             |   |
| Transmitting mode:            | Keep the EUT transmitted the continuous modulation test signal at the specific channel(s) |

### 5.5 Description of Support Units

The EUT has been tested with associated equipment below.

| Associated equipment name | Manufacture | model     | Serial number   | Supplied by |
|---------------------------|-------------|-----------|-----------------|-------------|
| AE1                       | aigo        | A6-501000 | ZFCA00753104460 | CTI         |

## 5.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101

Telephone: +86 (0) 755 3368 3668 Fax:+86 (0) 755 3368 3385

No tests were sub-contracted.

## 5.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

### **CNAS-Lab Code: L1910**

Centre Testing International Group Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories..

### **A2LA-Lab Cert. No. 3061.01**

Centre Testing International Group Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

### **FCC-Registration No.: 886427**

Centre Testing International Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 886427.

### **IC-Registration No.: 7408A-2**

The 3m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408A-2 .

### **IC-Registration No.: 7408B-1**

The 10m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408B-1.

### **NEMKO-Aut. No.: ELA503**

Centre Testing International Group Co., Ltd. has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

### **VCCI**

The Radiation 3 &10 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-4096.

Main Ports Conducted Interference Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-4563.

Telecommunication Ports Conducted Disturbance Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-2146.

The Radiation 3 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-758

## 5.8 Deviation from Standards

None.

## 5.9 Abnormalities from Standard Conditions

None.

## 5.10 Other Information Requested by the Customer

None.

## 5.11 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item                            | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1   | Radio Frequency                 | $7.9 \times 10^{-8}$    |
| 2   | RF power, conducted             | 0.31dB (30MHz-1GHz)     |
|     |                                 | 0.57dB (1GHz-18GHz)     |
| 3   | Radiated Spurious emission test | 4.5dB (30MHz-1GHz)      |
|     |                                 | 4.8dB (1GHz-12.75GHz)   |
| 4   | Conduction emission             | 3.6dB (9kHz to 150kHz)  |
|     |                                 | 3.2dB (150kHz to 30MHz) |
| 5   | Temperature test                | 0.64°C                  |
| 6   | Humidity test                   | 2.8%                    |
| 7   | DC power voltages               | 0.025%                  |

## 6 Equipment List

| 3M Semi/full-anechoic Chamber    |               |                           |               |                        |                            |
|----------------------------------|---------------|---------------------------|---------------|------------------------|----------------------------|
| Equipment                        | Manufacturer  | Mode No.                  | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| 3M Chamber & Accessory Equipment | TDK           | SAC-3                     | TTE20130797   | 06-01-2016             | 05-31-2019                 |
| TRILOG Broadband Antenna         | SCHWARZBEC K  | VULB9163                  | 9163-484      | 06-09-2017             | 06-08-2018                 |
| Microwave Preamplifier           | Agilent       | 8449B                     | 3008A02425    | 02-16-2017             | 02-15-2018                 |
| Horn Antenna                     | ETS-LINDGREN  | 3117                      | 00057410      | 06-30-2015             | 06-28-2018                 |
| Horn Antenna                     | A.H.SYSTEMS   | SAS-574                   | 374           | 06-30-2015             | 06-28-2018                 |
| Loop Antenna                     | ETS           | 6502                      | 00071730      | 07-30-2015             | 07-28-2017                 |
| Spectrum Analyzer                | R&S           | FSP40                     | 100416        | 06-13-2017             | 06-12-2018                 |
| Receiver                         | R&S           | ESCI                      | 100435        | 06-14-2017             | 06-13-2018                 |
| LISN                             | schwarzbeck   | NNBM8125                  | 81251547      | 06-13-2017             | 06-12-2018                 |
| LISN                             | schwarzbeck   | NNBM8125                  | 81251548      | 06-13-2017             | 06-12-2018                 |
| Signal Generator                 | Agilent       | E4438C                    | MY45095744    | 03-14-2017             | 03-13-2018                 |
| Signal Generator                 | Keysight      | E8257D                    | MY53401106    | 03-14-2017             | 03-13-2018                 |
| Temperature/ Humidity Indicator  | TAYLOR        | 1451                      | 1905          | 05-08-2017             | 05-07-2018                 |
| Cable line                       | Fulai(7M)     | SF106                     | 5219/6A       | 01-11-2017             | 01-10-2018                 |
| Cable line                       | Fulai(6M)     | SF106                     | 5220/6A       | 01-11-2017             | 01-10-2018                 |
| Cable line                       | Fulai(3M)     | SF106                     | 5216/6A       | 01-11-2017             | 01-10-2018                 |
| Cable line                       | Fulai(3M)     | SF106                     | 5217/6A       | 01-11-2017             | 01-10-2018                 |
| High-pass filter                 | Sinoscite     | FL3CX03WG18 NM12-0398-002 | TTF20120439   | 01-11-2017             | 01-10-2018                 |
| High-pass filter                 | MICRO-TRONICS | SPA-F-63029-4             | 003           | 01-11-2017             | 01-10-2018                 |
| band rejection filter            | Sinoscite     | FL5CX01CA09 CL12-0395-001 | TTF20120434   | 01-11-2017             | 01-10-2018                 |
| band rejection filter            | Sinoscite     | FL5CX01CA08 CL12-0393-001 | TTF20120435   | 01-11-2017             | 01-10-2018                 |
| band rejection filter            | Sinoscite     | FL5CX02CA04 CL12-0396-002 | TTF20120436   | 01-11-2017             | 01-10-2018                 |
| band rejection filter            | Sinoscite     | FL5CX02CA03 CL12-0394-001 | TTF20120437   | 01-11-2017             | 01-10-2018                 |

| Conducted disturbance Test      |              |           |               |                        |                            |
|---------------------------------|--------------|-----------|---------------|------------------------|----------------------------|
| Equipment                       | Manufacturer | Model No. | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Receiver                        | R&S          | ESCI      | 100009        | 06-14-2017             | 06-13-2018                 |
| Temperature/ Humidity Indicator | TAYLOR       | 1451      | 1905          | 05-08-2017             | 05-07-2018                 |
| LISN                            | R&S          | ENV216    | 100098        | 06-13-2017             | 06-12-2018                 |
| LISN                            | schwarzbeck  | NNLK8121  | 8121-529      | 06-13-2017             | 06-12-2018                 |
| Current Probe                   | R&S          | EZ17      | 100106        | 06-13-2017             | 06-12-2018                 |
| ISN                             | TESEQ GmbH   | ISN T800  | 30297         | 02-23-2017             | 02-22-2018                 |

| RF Conducted test     |               |                              |               |                        |                            |
|-----------------------|---------------|------------------------------|---------------|------------------------|----------------------------|
| Equipment             | Manufacturer  | Mode No.                     | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Spectrum Analyzer     | R&S           | FSP40                        | 100416        | 06-13-2017             | 06-12-2018                 |
| Signal Generator      | Agilent       | E4438C                       | MY45095744    | 03-14-2017             | 03-13-2018                 |
| Signal Generator      | Keysight      | E8257D                       | MY53401106    | 03-14-2017             | 03-13-2018                 |
| High-pass filter      | Sinoscite     | FL3CX03WG18<br>NM12-0398-002 | TTF20120439   | 01-11-2017             | 01-10-2018                 |
| High-pass filter      | MICRO-TRONICS | SPA-F-63029-4                | 003           | 01-11-2017             | 01-10-2018                 |
| band rejection filter | Sinoscite     | FL5CX01CA09C<br>L12-0395-001 | TTF20120434   | 01-11-2017             | 01-10-2018                 |
| band rejection filter | Sinoscite     | FL5CX01CA08C<br>L12-0393-001 | TTF20120435   | 01-11-2017             | 01-10-2018                 |
| band rejection filter | Sinoscite     | FL5CX02CA04C<br>L12-0396-002 | TTF20120436   | 01-11-2017             | 01-10-2018                 |

## 7 Test results and Measurement Data

### 7.1 Antenna Requirement

|   |                                |
|---|--------------------------------|
| <b>Standard requirement:</b>  | 47 CFR Part 15C Section 15.203 |
| 15.203 requirement:<br>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. |                                |
| <b>EUT Antenna:</b>   |                                |
| The antenna is FPC antenna and no consideration of replacement. The best case gain of the antenna is 2dBi.  |                                |



## 7.2 AC Power Line Conducted Emission

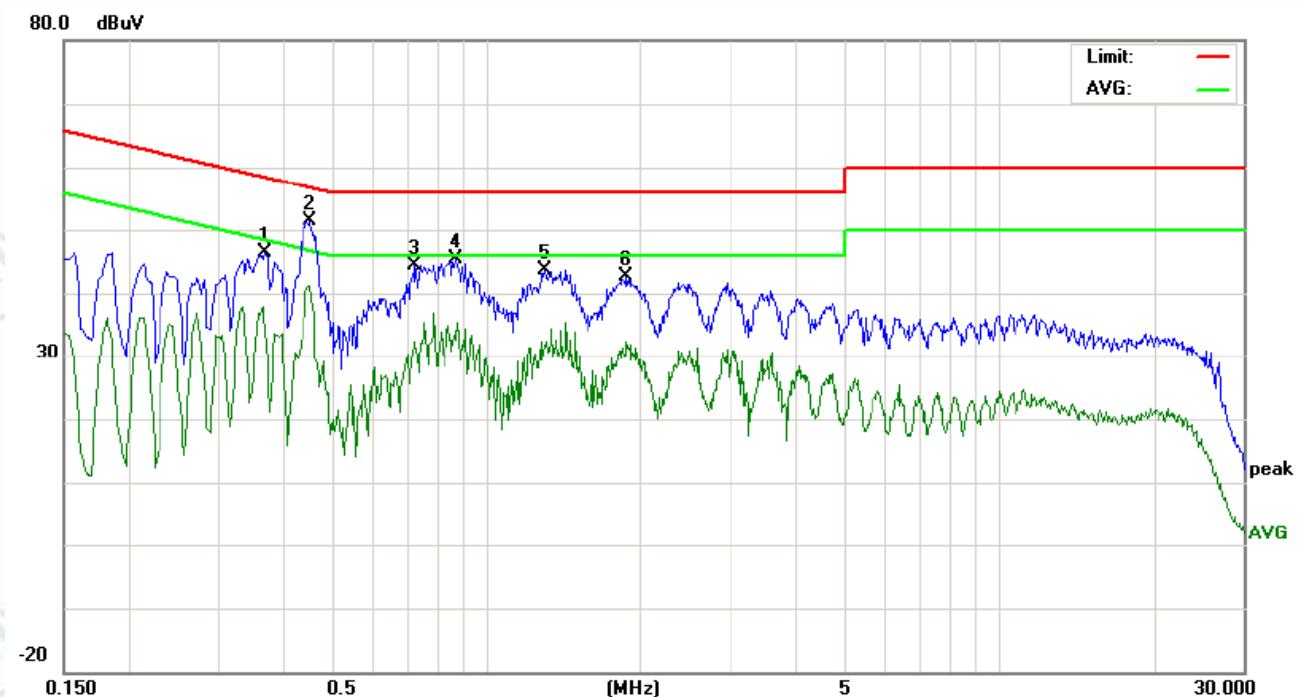
| Test Procedure:       | Test frequency range :150KHz-30MHz<br>1)The mains terminal disturbance voltage test was conducted in a shielded room.<br>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.<br>3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,<br>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.<br>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement. |           |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |
|-----------------------|--|-----------|--|-----------------------|--------------------|--|------------|---------|----------|-----------|-----------|-------|----|----|------|----|----|
| Limit:                | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dB<math>\mu</math>V)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.<br/>         NOTE : The lower limit is applicable at the transition frequency</p>  |           |  | Frequency range (MHz) | Limit (dB $\mu$ V) |  | Quasi-peak | Average | 0.15-0.5 | 66 to 56* | 56 to 46* | 0.5-5 | 56 | 46 | 5-30 | 60 | 50 |
| Frequency range (MHz) | Limit (dB $\mu$ V)   |           |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |
|                       | Quasi-peak   | Average   |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |
| 0.15-0.5              | 66 to 56*  | 56 to 46* |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |
| 0.5-5                 | 56   | 46        |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |
| 5-30                  | 60   | 50        |  |                       |                    |  |            |         |          |           |           |       |    |    |      |    |    |

### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

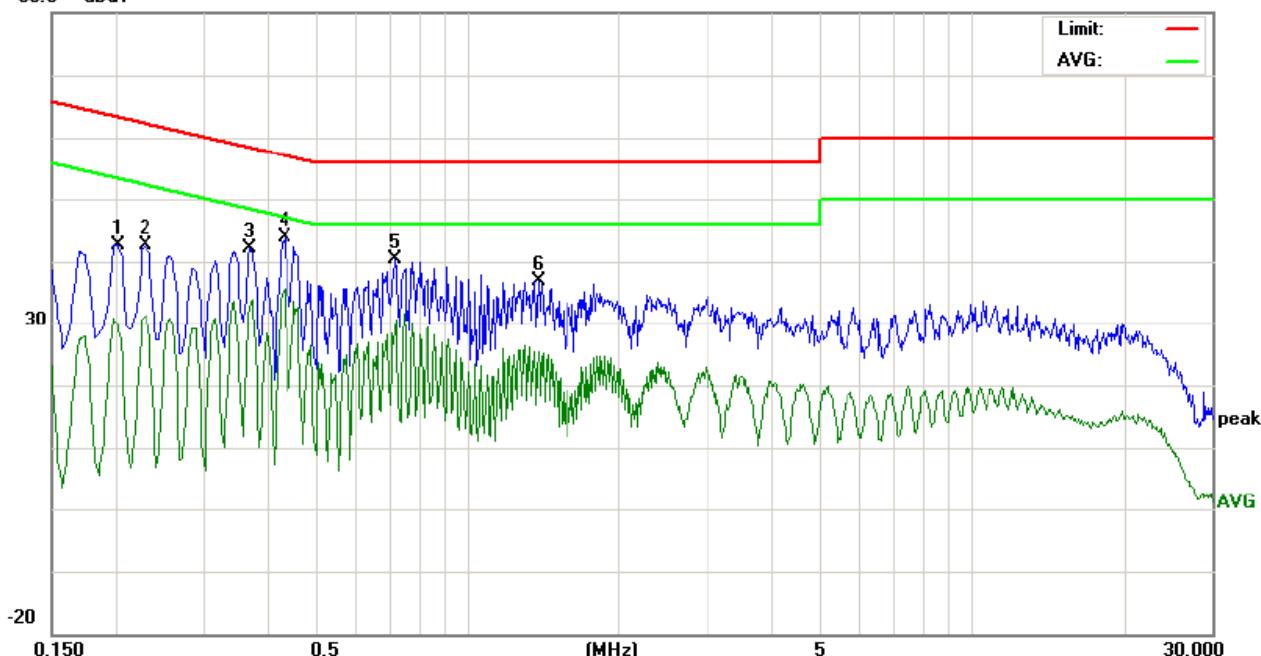
Live line:



| No. | Freq.  | Reading_Level<br>(dBuV) |       |       | Correct<br>Factor |       | Measurement<br>(dBuV) |       |       | Limit<br>(dBuV) |        | Margin<br>(dB) |     |     |
|-----|--------|-------------------------|-------|-------|-------------------|-------|-----------------------|-------|-------|-----------------|--------|----------------|-----|-----|
|     |        | MHz                     | Peak  | QP    | AVG               | dB    | peak                  | QP    | AVG   | QP              | AVG    | QP             | AVG | P/F |
| 1   | 0.3700 | 36.58                   | 22.80 | 12.47 | 9.76              | 46.34 | 32.56                 | 22.23 | 58.50 | 48.50           | -25.94 | -26.27         | P   |     |
| 2   | 0.4540 | 41.70                   | 39.63 | 26.81 | 9.73              | 51.43 | 49.36                 | 36.54 | 56.80 | 46.80           | -7.44  | -10.26         | P   |     |
| 3   | 0.7260 | 34.63                   | 30.32 | 18.09 | 9.75              | 44.38 | 40.07                 | 27.84 | 56.00 | 46.00           | -15.93 | -18.16         | P   |     |
| 4   | 0.8740 | 35.65                   | 30.81 | 20.42 | 9.75              | 45.40 | 40.56                 | 30.17 | 56.00 | 46.00           | -15.44 | -15.83         | P   |     |
| 5   | 1.3020 | 33.98                   | 27.57 | 18.72 | 9.65              | 43.63 | 37.22                 | 28.37 | 56.00 | 46.00           | -18.78 | -17.63         | P   |     |
| 6   | 1.8860 | 32.93                   | 26.10 | 16.86 | 9.71              | 42.64 | 35.81                 | 26.57 | 56.00 | 46.00           | -20.19 | -19.43         | P   |     |

Neutral line:

80.0 dBuV



| No. | Freq.  | Reading_Level<br>(dBuV) |       |       | Correct<br>Factor |       | Measurement<br>(dBuV) |       |       | Limit<br>(dBuV) |        | Margin<br>(dB) |     | P/F | Comment |
|-----|--------|-------------------------|-------|-------|-------------------|-------|-----------------------|-------|-------|-----------------|--------|----------------|-----|-----|---------|
|     |        | MHz                     | Peak  | QP    | Avg               | dB    | peak                  | QP    | Avg   | QP              | Avg    | QP             | Avg |     |         |
| 1   | 0.2020 | 32.89                   | 28.15 | 17.01 | 9.71              | 42.60 | 37.86                 | 26.72 | 63.52 | 53.52           | -25.66 | -26.80         | P   |     |         |
| 2   | 0.2300 | 32.79                   | 28.13 | 18.36 | 9.73              | 42.52 | 37.86                 | 28.09 | 62.45 | 52.45           | -24.59 | -24.36         | P   |     |         |
| 3   | 0.3700 | 32.31                   | 28.45 | 21.37 | 9.76              | 42.07 | 38.21                 | 31.13 | 58.50 | 48.50           | -20.29 | -17.37         | P   |     |         |
| 4   | 0.4340 | 34.13                   | 15.59 | -1.13 | 9.74              | 43.87 | 25.33                 | 8.61  | 57.18 | 47.18           | -31.85 | -38.57         | P   |     |         |
| 5   | 0.7180 | 30.53                   | 16.76 | -2.12 | 9.75              | 40.28 | 26.51                 | 7.63  | 56.00 | 46.00           | -29.49 | -38.37         | P   |     |         |
| 6   | 1.3820 | 27.26                   | 22.06 | 14.47 | 9.66              | 36.92 | 31.72                 | 24.13 | 56.00 | 46.00           | -24.28 | -21.87         | P   |     |         |

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

### 7.3 Radiated Spurious Emission

**Test Requirement:** 47 CFR Part 15C Section 15.249 and 15.209

**Test Method:** ANSI C63.10

**Test Site:** Measurement Distance: 3m (Semi-Anechoic Chamber)

**Receiver Setup:**

| Frequency         | Detector   | RBW    | VBW    | Remark     |
|-------------------|------------|--------|--------|------------|
| 0.009MHz-0.090MHz | Peak       | 10kHz  | 30KHz  | Peak       |
| 0.009MHz-0.090MHz | Average    | 10kHz  | 30KHz  | Average    |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz  | 30KHz  | Quasi-peak |
| 0.110MHz-0.490MHz | Peak       | 10kHz  | 30KHz  | Peak       |
| 0.110MHz-0.490MHz | Average    | 10kHz  | 30KHz  | Average    |
| 0.490MHz-30MHz    | Quasi-peak | 10kHz  | 30kHz  | Quasi-peak |
| 30MHz-1GHz        | Quasi-peak | 120kHz | 300KHz | Quasi-peak |
| Above 1GHz        | Peak       | 1MHz   | 3MHz   | Peak       |
|                   | Peak       | 1MHz   | 10Hz   | Average    |

**Test Setup:**

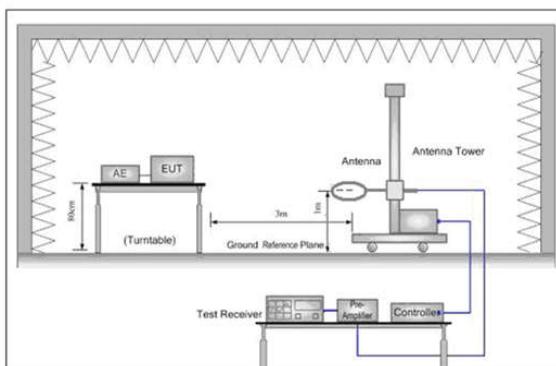


Figure 1. Below 30MHz

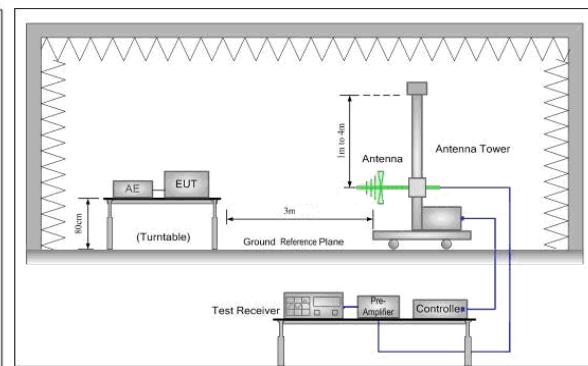


Figure 2. 30MHz to 1GHz

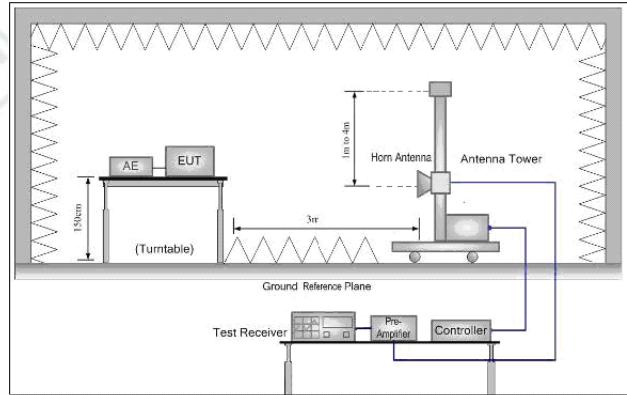


Figure 3. Above 1GHz

**Test Procedure:**

#### Below 1GHz test procedure as below:

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with

**Maximum Hold Mode.**

If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported.

Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

**Above 1GHz test procedure as below:**

Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).

Test the EUT in the lowest channel , the Highest channel

The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.

Repeat above procedures until all frequencies measured was complete.

| Frequency         | Field strength (microvolt/meter) | Limit (dB $\mu$ V/m) | Remark     | Measurement distance (m) |
|-------------------|----------------------------------|----------------------|------------|--------------------------|
| 0.009MHz-0.490MHz | 2400/F(kHz)                      | -                    | -          | 300                      |
| 0.490MHz-1.705MHz | 24000/F(kHz)                     | -                    | -          | 30                       |
| 1.705MHz-30MHz    | 30                               | -                    | -          | 30                       |
| 30MHz-88MHz       | 100                              | 40.0                 | Quasi-peak | 3                        |
| 88MHz-216MHz      | 150                              | 43.5                 | Quasi-peak | 3                        |
| 216MHz-960MHz     | 200                              | 46.0                 | Quasi-peak | 3                        |
| 960MHz-1GHz       | 500                              | 54.0                 | Quasi-peak | 3                        |
| Above 1GHz        | 500                              | 54.0                 | Average    | 3                        |

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

| Frequency         | Limit (dB $\mu$ V/m @3m) | Remark        |
|-------------------|--------------------------|---------------|
| 2400MHz-2483.5MHz | 94.0                     | Average Value |
|                   | 114.0                    | Peak Value    |

**Limit:**  
(Spurious Emissions)

**Limit:**  
(Field strength of the fundamental signal)

**Test Mode:**

Transmitting mode

**Instruments Used:** Refer to section 6 for details

**Test Results:** Pass

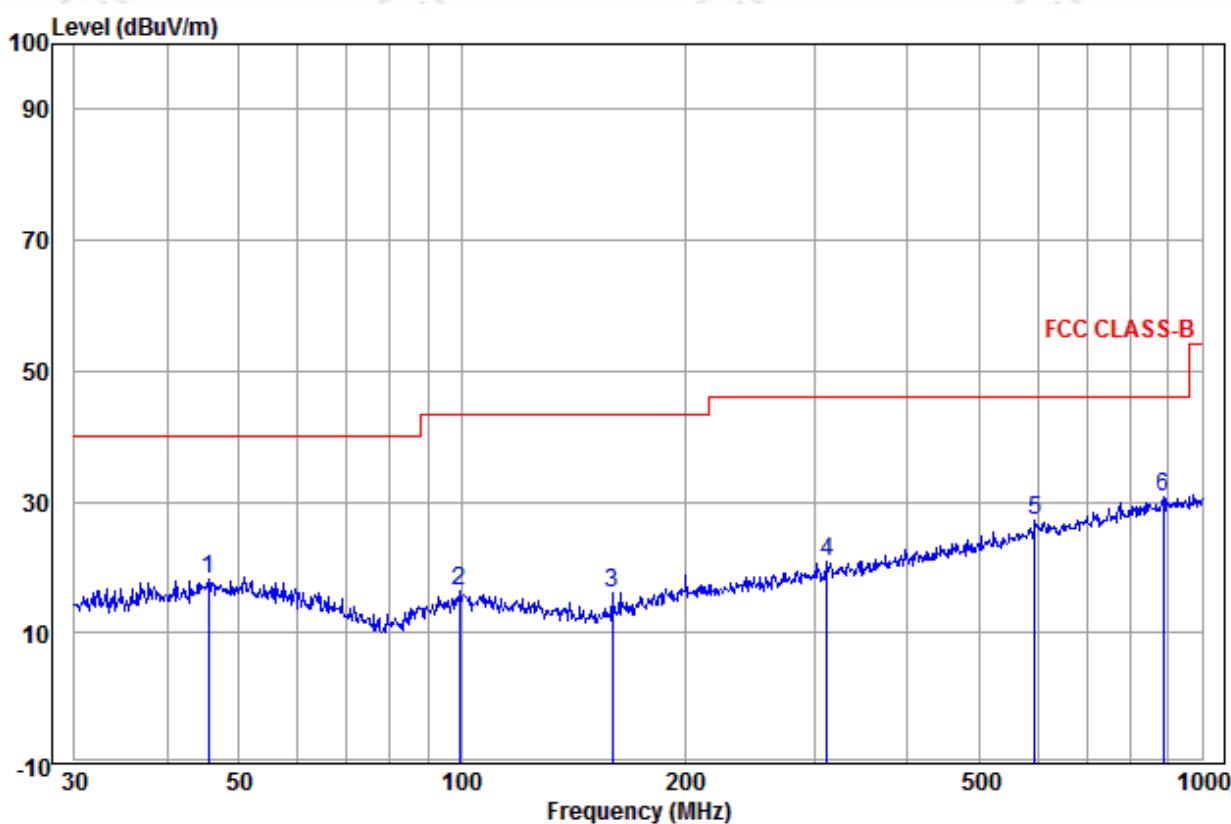
**Measurement Data****Field Strength Of The Fundamental Signal****Peak value:**

| Frequency (MHz) | Antenna Factor (dB/m) | Preamp Gain (dB) | Cable Loss (dB) | Read Level (dB $\mu$ V) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
|-----------------|-----------------------|------------------|-----------------|-------------------------|----------------------|----------------------|-----------------|--------|-----------------|
| 2401            | 32.56                 | 44.04            | 4.31            | 93.87                   | 86.70                | 114.00               | -27.30          | Pass   | H               |
| 2401            | 32.56                 | 44.04            | 4.31            | 88.17                   | 81.00                | 114.00               | -33.00          | Pass   | V               |
| 2441            | 32.63                 | 44.09            | 4.40            | 94.08                   | 87.02                | 114.00               | -26.98          | Pass   | H               |
| 2441            | 32.63                 | 44.09            | 4.40            | 92.92                   | 85.86                | 114.00               | -28.14          | Pass   | V               |
| 2481            | 32.71                 | 44.14            | 4.50            | 93.71                   | 86.78                | 114.00               | -27.22          | Pass   | H               |
| 2481            | 32.71                 | 44.14            | 4.50            | 89.79                   | 82.86                | 114.00               | -31.14          | Pass   | V               |

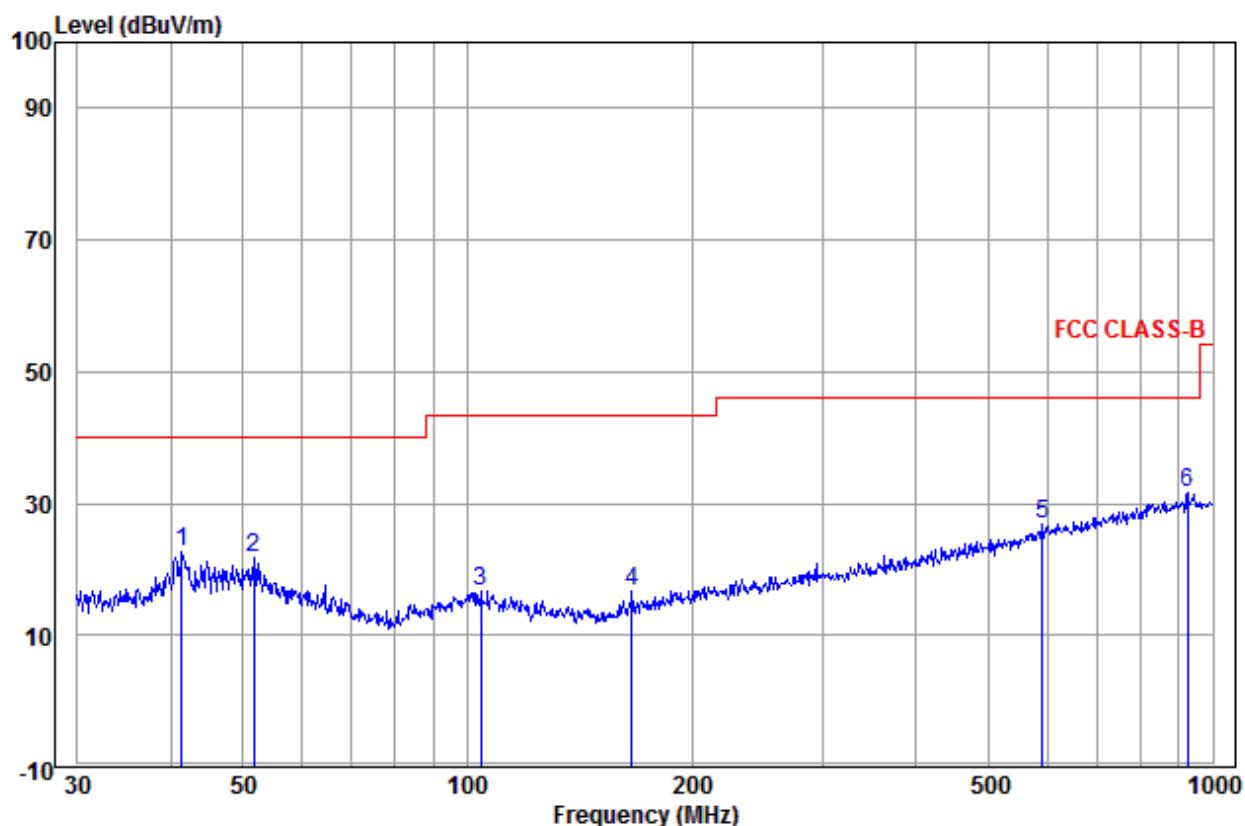
**Remark:** As shown in this section, for field strength of the fundamental signal measurements, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above. So only the peak measurements were shown in the report.

**Spurious Emissions**

**30MHz~1GHz**



| Freq | Ant Factor | Cable Loss | Read  | Limit | Over   | Remark |                   |
|------|------------|------------|-------|-------|--------|--------|-------------------|
|      |            |            | Level | Level | Line   |        |                   |
|      | MHz        | dB/m       | dB    | dBuV  | dBuV/m | dB     |                   |
| 1    | 45.535     | 12.92      | 0.08  | 5.16  | 18.16  | 40.00  | -21.84 Horizontal |
| 2    | 99.180     | 10.98      | 0.58  | 4.72  | 16.28  | 43.50  | -27.22 Horizontal |
| 3    | 159.784    | 8.50       | 0.72  | 6.81  | 16.03  | 43.50  | -27.47 Horizontal |
| 4    | 311.087    | 13.74      | 1.13  | 6.07  | 20.94  | 46.00  | -25.06 Horizontal |
| 5    | 595.133    | 18.82      | 1.80  | 6.64  | 27.26  | 46.00  | -18.74 Horizontal |
| 6 pp | 887.610    | 21.78      | 2.48  | 6.40  | 30.66  | 46.00  | -15.34 Horizontal |



|      | Ant Freq | Cable Factor | Read Loss | Level Level | Limit Line | Over Limit | Pol/Phase | Remark   |
|------|----------|--------------|-----------|-------------|------------|------------|-----------|----------|
|      | MHz      | dB/m         | dB        | dBuV        | dBuV/m     | dBuV/m     | dB        |          |
| 1    | 41.422   | 12.54        | 0.06      | 9.97        | 22.57      | 40.00      | -17.43    | Vertical |
| 2    | 51.662   | 12.96        | 0.13      | 8.61        | 21.70      | 40.00      | -18.30    | Vertical |
| 3    | 104.170  | 10.77        | 0.59      | 5.22        | 16.58      | 43.50      | -26.92    | Vertical |
| 4    | 166.068  | 8.93         | 0.78      | 6.94        | 16.65      | 43.50      | -26.85    | Vertical |
| 5    | 590.974  | 18.74        | 1.78      | 6.38        | 26.90      | 46.00      | -19.10    | Vertical |
| 6 pp | 925.756  | 22.26        | 2.42      | 7.04        | 31.72      | 46.00      | -14.28    | Vertical |

**Above 1GHz**

| Test mode:      | Transmitting          |                  | Test Frequency : |                         | 2401MHz              |                      |                 |        |                 |
|-----------------|-----------------------|------------------|------------------|-------------------------|----------------------|----------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Preamp Gain (dB) | Cable Loss (dB)  | Read Level (dB $\mu$ V) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1198.095        | 30.22                 | 44.39            | 2.51             | 55.35                   | 43.69                | 74.00                | -30.31          | Pass   | H               |
| 1860.992        | 31.49                 | 43.62            | 3.13             | 48.60                   | 39.60                | 74.00                | -34.40          | Pass   | H               |
| 4802.000        | 34.68                 | 44.60            | 5.11             | 47.37                   | 42.56                | 74.00                | -31.44          | Pass   | H               |
| 7203.000        | 36.42                 | 44.77            | 6.66             | 48.90                   | 47.21                | 74.00                | -26.79          | Pass   | H               |
| 9604.000        | 37.88                 | 45.58            | 7.73             | 44.45                   | 44.48                | 74.00                | -29.52          | Pass   | H               |
| 12005.000       | 39.60                 | 44.90            | 8.52             | 47.71                   | 50.93                | 74.00                | -23.07          | Pass   | H               |
| 1198.095        | 30.22                 | 44.39            | 2.51             | 60.18                   | 48.52                | 74.00                | -25.48          | Pass   | V               |
| 1663.803        | 31.17                 | 43.82            | 2.97             | 51.71                   | 42.03                | 74.00                | -31.97          | Pass   | V               |
| 4802.000        | 34.68                 | 44.60            | 5.11             | 56.27                   | 51.46                | 74.00                | -22.54          | Pass   | V               |
| 7203.000        | 36.42                 | 44.77            | 6.66             | 52.50                   | 50.81                | 74.00                | -23.19          | Pass   | V               |
| 9604.000        | 37.88                 | 45.58            | 7.73             | 42.27                   | 42.30                | 74.00                | -31.70          | Pass   | V               |
| 12005.000       | 39.60                 | 44.90            | 8.52             | 45.70                   | 48.92                | 74.00                | -25.08          | Pass   | V               |

| Test mode:      | Transmitting          |                  | Test Frequency : |                         | 2441MHz              |                      |                 |        |                 |
|-----------------|-----------------------|------------------|------------------|-------------------------|----------------------|----------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Preamp Gain (dB) | Cable Loss (dB)  | Read Level (dB $\mu$ V) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1219.635        | 30.27                 | 44.36            | 2.54             | 56.53                   | 44.98                | 74.00                | -29.02          | Pass   | H               |
| 1923.606        | 31.59                 | 43.57            | 3.18             | 57.19                   | 48.39                | 74.00                | -25.61          | Pass   | H               |
| 4882.000        | 34.85                 | 44.60            | 5.08             | 53.36                   | 48.69                | 74.00                | -25.31          | Pass   | H               |
| 7323.000        | 36.43                 | 44.87            | 6.77             | 43.59                   | 41.92                | 74.00                | -32.08          | Pass   | H               |
| 8637.084        | 36.96                 | 45.60            | 7.94             | 42.12                   | 41.42                | 74.00                | -32.58          | Pass   | H               |
| 9764.000        | 38.05                 | 45.55            | 7.60             | 37.07                   | 37.17                | 74.00                | -36.83          | Pass   | H               |
| 1219.635        | 30.27                 | 44.36            | 2.54             | 56.49                   | 44.94                | 74.00                | -29.06          | Pass   | V               |
| 1663.803        | 31.17                 | 43.82            | 2.97             | 49.88                   | 40.20                | 74.00                | -33.80          | Pass   | V               |
| 4882.000        | 34.85                 | 44.60            | 5.08             | 55.78                   | 51.11                | 74.00                | -22.89          | Pass   | V               |
| 7323.000        | 36.43                 | 44.87            | 6.77             | 50.30                   | 48.63                | 74.00                | -25.37          | Pass   | V               |
| 9764.000        | 38.05                 | 45.55            | 7.60             | 41.28                   | 41.38                | 74.00                | -32.62          | Pass   | V               |
| 12205.000       | 39.54                 | 44.84            | 8.50             | 42.35                   | 45.55                | 74.00                | -28.45          | Pass   | V               |

| Test mode:      |                       | Transmitting     |                 | Test Frequency :        |                      | 2481MHz              |                 |        |                 |
|-----------------|-----------------------|------------------|-----------------|-------------------------|----------------------|----------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Preamp Gain (dB) | Cable Loss (dB) | Read Level (dB $\mu$ V) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1238.405        | 30.32                 | 44.33            | 2.56            | 56.51                   | 45.06                | 74.00                | -28.94          | Pass   | H               |
| 1663.803        | 31.17                 | 43.82            | 2.97            | 51.11                   | 41.43                | 74.00                | -32.57          | Pass   | H               |
| 4962.000        | 35.02                 | 44.60            | 5.05            | 50.28                   | 45.75                | 74.00                | -28.25          | Pass   | H               |
| 7443.000        | 36.45                 | 44.97            | 6.88            | 49.72                   | 48.08                | 74.00                | -25.92          | Pass   | H               |
| 9924.000        | 38.22                 | 45.51            | 7.47            | 43.76                   | 43.94                | 74.00                | -30.06          | Pass   | H               |
| 12405.000       | 39.48                 | 44.78            | 8.47            | 42.66                   | 45.83                | 74.00                | -28.17          | Pass   | H               |
| 1238.405        | 30.32                 | 44.33            | 2.56            | 58.66                   | 47.21                | 74.00                | -26.79          | Pass   | V               |
| 1663.803        | 31.17                 | 43.82            | 2.97            | 50.13                   | 40.45                | 74.00                | -33.55          | Pass   | V               |
| 4962.000        | 35.02                 | 44.60            | 5.05            | 44.94                   | 40.41                | 74.00                | -33.59          | Pass   | V               |
| 7443.000        | 36.45                 | 44.97            | 6.88            | 44.38                   | 42.74                | 74.00                | -31.26          | Pass   | V               |
| 9924.000        | 38.22                 | 45.51            | 7.47            | 39.86                   | 40.04                | 74.00                | -33.96          | Pass   | V               |
| 12405.000       | 39.48                 | 44.78            | 8.47            | 44.32                   | 47.49                | 74.00                | -26.51          | Pass   | V               |

## Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  

$$\text{Final Test Level} = \text{Receiver Reading} - \text{Correct Factor}$$

$$\text{Correct Factor} = \text{Preamplifier Factor} - \text{Antenna Factor} - \text{Cable Factor}$$

Scan from the test data, The average value is lower than limit, and The below the limit need not be reported, so only the peak value had been displayed.
- 2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

## 7.4 Emissions Out of Band-edge

**Test Requirement:** 47 CFR Part 15C Section 15.209 and 15.205

**Test Method:** ANSI C63.10

**Test Site:**

**Limit(Band Edge):**

Measurement Distance: 3m (Semi-Anechoic Chamber)

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

| Frequency     | Limit (dB $\mu$ V/m @3m) | Remark           |
|---------------|--------------------------|------------------|
| 30MHz-88MHz   | 40.0                     | Quasi-peak Value |
| 88MHz-216MHz  | 43.5                     | Quasi-peak Value |
| 216MHz-960MHz | 46.0                     | Quasi-peak Value |
| 960MHz-1GHz   | 54.0                     | Quasi-peak Value |
| Above 1GHz    | 54.0                     | Average Value    |
|               | 74.0                     | Peak Value       |

**Test Setup:**

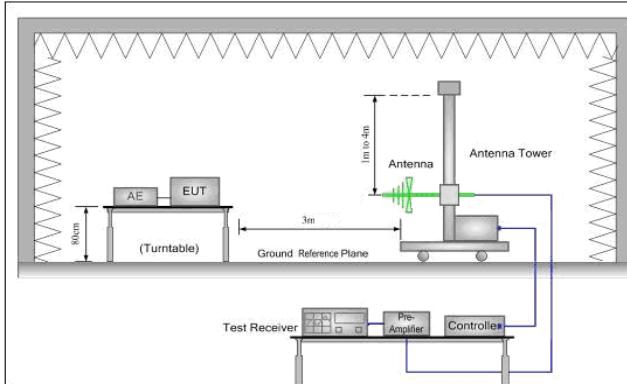


Figure 1. 30MHz to 1GHz

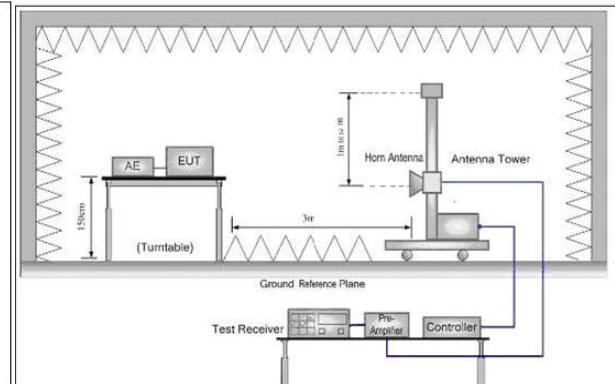


Figure 2. Above 1 GHz

### Below 1GHz test procedure as below:

**Test Procedure:**

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

### Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the lowest channel , the Highest channel
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.

**Instruments Used:**

Refer to section 6 for details

**Test Mode:**

Transmitting mode

**Test Results:**

Pass

**Test plot as follows:**

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Premap Factor (dB) | Read Level (dB $\mu$ V) | Level (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Over Limit (dB) | Antenna Factor (dB/m) | Remark |
|-----------------|-----------------------|-----------------|--------------------|-------------------------|----------------------|----------------------|-----------------|-----------------------|--------|
| 2390.00         | 32.53                 | 3.07            | 44.03              | 49.99                   | 41.56                | 74                   | -32.44          | H                     | PK     |
| 2400.00         | 32.55                 | 3.07            | 44.04              | 60.84                   | 52.42                | 74                   | -21.58          | H                     | PK     |
| 2390.00         | 32.53                 | 3.07            | 44.03              | 52.07                   | 43.64                | 74                   | -30.36          | V                     | PK     |
| 2400.00         | 32.55                 | 3.07            | 44.04              | 61.31                   | 52.89                | 74                   | -21.11          | V                     | PK     |
| 2483.50         | 32.71                 | 3.12            | 44.14              | 63.55                   | 55.24                | 74                   | -18.76          | H                     | PK     |
| 2483.50         | 32.71                 | 3.12            | 44.14              | 57.94                   | 49.63                | 54                   | -4.37           | H                     | AV     |
| 2483.50         | 32.71                 | 3.12            | 44.14              | 65.32                   | 57.01                | 74                   | -16.99          | V                     | PK     |
| 2483.50         | 32.71                 | 3.12            | 44.14              | 58.73                   | 50.42                | 54                   | -3.58           | V                     | AV     |

**Remark:**

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading - Correct Factor

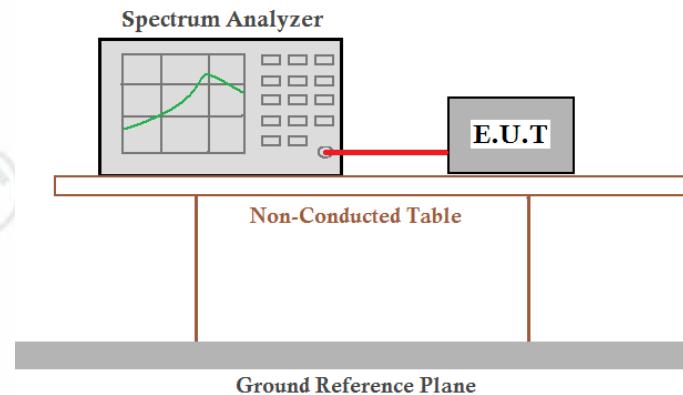
Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

## 7.5 20dB Bandwidth

**Test Requirement:** 47 CFR Part 15C Section 15.215

**Test Method:** ANSI C63.10

**Test Setup:**



**Test Mode:** Transmitter mode

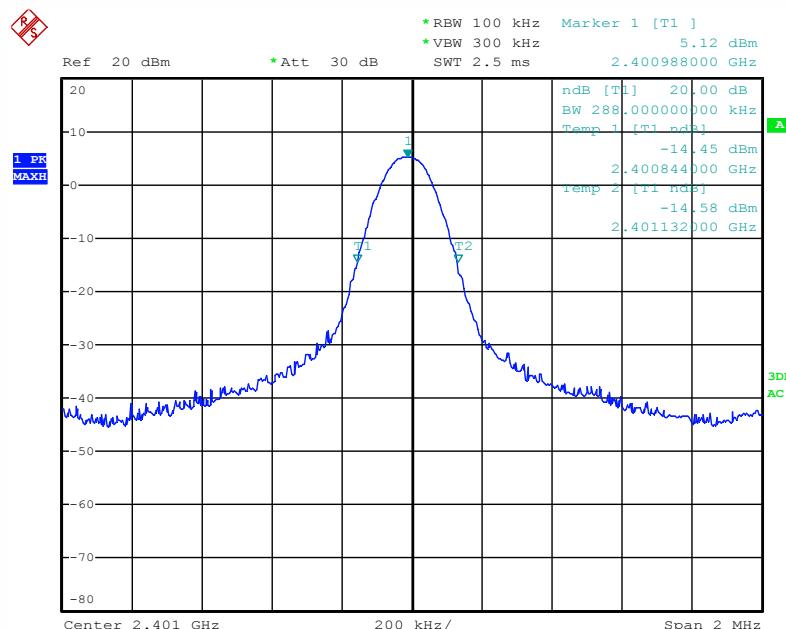
**Limit:** N/A

**Instruments Used:** Refer to section 6 for details

| Test Channel/Frequency | 20dB bandwidth (kHz) |
|------------------------|----------------------|
| 2401MHz                | 288                  |
| 2441MHz                | 292                  |
| 2481MHz                | 284                  |

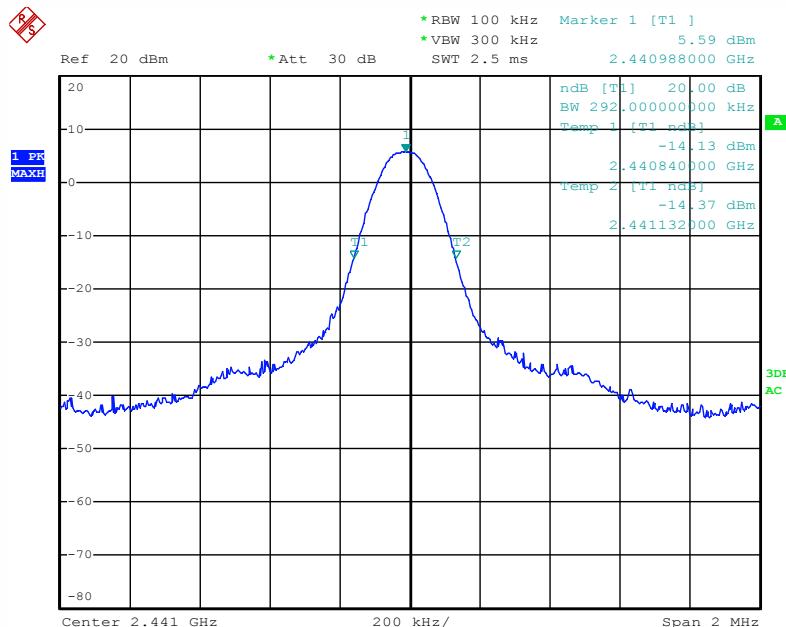
### Test plot as follows:

2401MHz



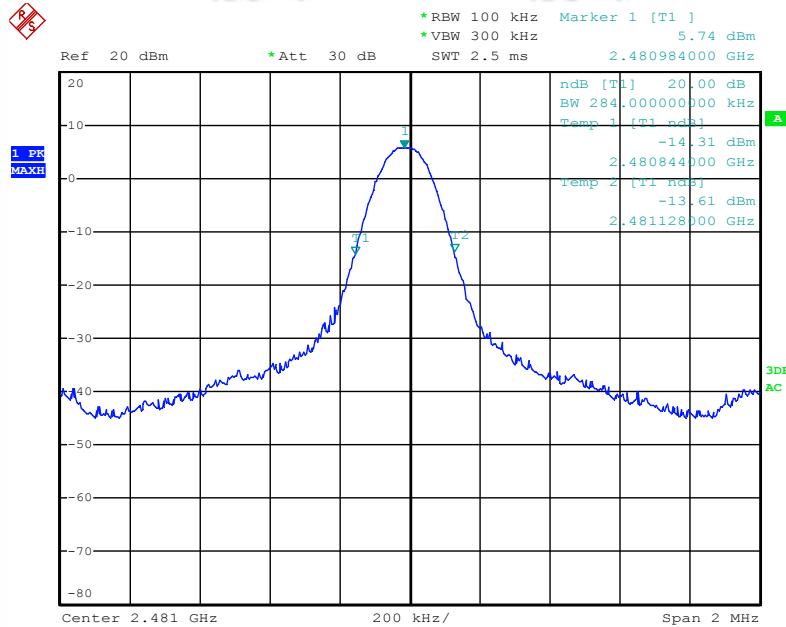
Date: 20.JUN.2017 17:09:31

2441MHz



Date: 20.JUN.2017 17:11:01

2481MHz



Date: 20.JUN.2017 17:11:48

## APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

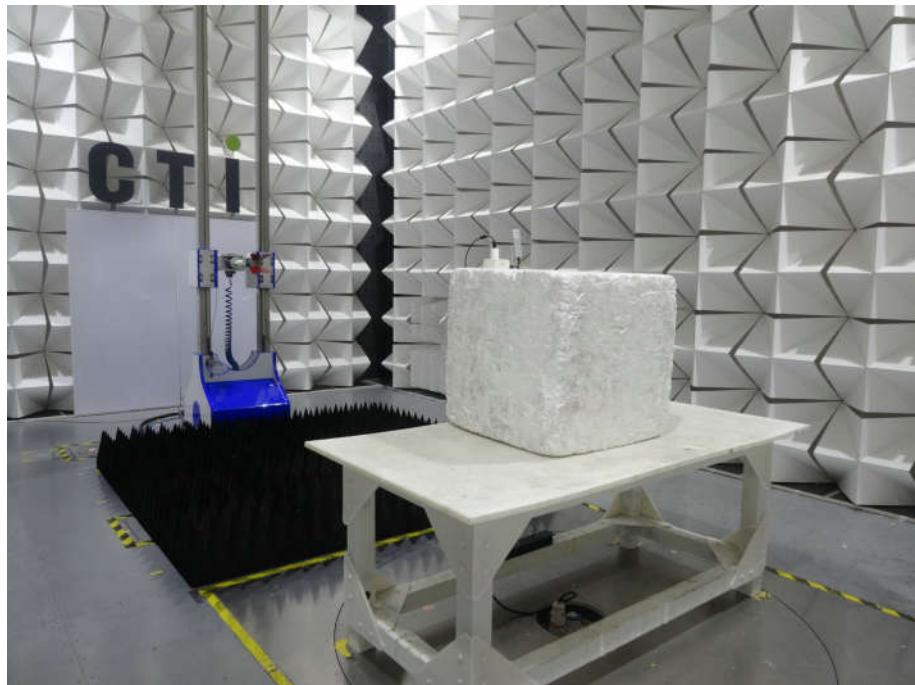
Test Model No.: LUMI-R2



**Radiated spurious emission Test Setup-1(Below 30MHz)**



**Radiated spurious emission Test Setup-2(30MHz-1GHz)**



**Radiated spurious emission Test Setup-3(Above 1GHz)**



**Conducted Emissions Test Setup**

Report No. : EED32J00107902

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## APPENDIX 2 PHOTOGRAPHS OF EUT

Refer to Report No. EED32J00107901 for EUT external and internal photos.

\*\*\* End of Report \*\*\*

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.

