



# FCC TEST REPORT

according to

## FCC Rules and Regulations Part 15 Subpart C

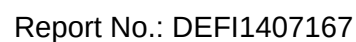
|           |                                                                 |
|-----------|-----------------------------------------------------------------|
| Applicant | : REL ACOUSTICS Ltd.                                            |
| Address   | : North Road, Bridgend Industrial, Estate Bridgend CF313TP U.K. |
| Equipment | : Amplifier                                                     |
| Model No. | : S/3 Wireless Sub Bass System, S/5 Wireless Sub Bass System    |
| Trademark | : REL                                                           |
| FCC ID    | : 2AATQS3-S5SUB                                                 |

- The test result refers exclusively to the test presented test model / sample.
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☐ Additional attachment as following record:

[illegible]



## CERTIFICATE OF COMPLIANCE

according to

### FCC Rules and Regulations Part 15 Subpart C

|              |                                                                            |
|--------------|----------------------------------------------------------------------------|
| Applicant    | : REL ACOUSTICS Ltd.                                                       |
| Address      | : North Road, Bridgend Industrial, Estate Bridgend<br>CF313TP U.K.         |
| Manufacturer | : Dong Guan Lightion Electronics Co., LTD.                                 |
| Address      | : Meilin District, Dalingshan, Dongguan City,<br>Guangdong Province, China |
| Equipment    | : Amplifier                                                                |
| Model No.    | : S/3 Wireless Sub Bass System, S/5 Wireless Sub<br>Bass System            |
| Trademark    | : REL                                                                      |
| FCC ID       | : 2AATQS3-S5SUB                                                            |

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4** The equipment was **passed** the test performed according to **FCC Rules and Regulations Part 15 Subpart C (2010)**.

The test was carried out on Nov.11~24, 2014 at **Cerpess Technology (Suzhou) Co., Ltd.**

Signature

Miro Chueh/ Technical director



## 1. Report of Measurements and Examinations

### 1.1 List of Measurements and Examinations

| FCC Rule | Description of Test         | Result |
|----------|-----------------------------|--------|
| 15.203   | Antenna Requirement         | Pass   |
| 15.207   | Conducted Emission          | Pass   |
| 15.209   | Radiated Emission           | Pass   |
| 15.215   | 20dB Bandwidth Measurement  | Pass   |
| 15.249   | Band Edges Measurement Data | Pass   |



## 2. Test Configuration of Equipment under Test

### 2.1 Feature of Equipment under Test

|                       |                                                                                                                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment             | Amplifier                                                                                                                                                                                               |
| Model No.             | S/3 Wireless Sub Bass System, S/5 Wireless Sub Bass System                                                                                                                                              |
| Power Ratings         | AC 220V~50Hz,FUSE:T5AL 250Vac;<br>AC 120V~60Hz,FUSE:T10AL 250Vac;<br>400W for S/3 Wireless Sub Bass System                                                                                              |
|                       | AC 220V~50Hz,FUSE:T5AL 250Vac;<br>AC 120V~60Hz,FUSE:T10AL 250Vac;<br>550W for S/5 Wireless Sub Bass System                                                                                              |
| Frequency             | 2403MHz -2479MHz                                                                                                                                                                                        |
| Antenna type          | Dipole Antenna with 2.0dBi                                                                                                                                                                              |
| Modulation technology | GFSK                                                                                                                                                                                                    |
| Temperature Range     | 0-60℃                                                                                                                                                                                                   |
| Remark                | <b>S/5 Wireless Sub Bass System</b> was selected as the test model and its data have been recorded in this report. All models are identical to each other except for specifications of some components. |

### 2.2 Test Mode & Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.4
- The complete test system included EUT for RF test.
- The EUT was executed to keep transmitting.
- The following test mode was performed for conduction and radiation test:
  - CH low : 2403MHz, CH Mid: 2441MHz, CH High: 2479MHz.

### 2.3 Description of Test System

| Device             | Manufacturer | Model No.        | Description |
|--------------------|--------------|------------------|-------------|
| Remote workstation |              |                  |             |
| Notebook           | SONY         | PCG-71811P       | R33021      |
| Use Cable          |              |                  |             |
| Audio Cable        | 1            | 1m Non shielding | Audio Cable |



## 2.4 General Information of Test

|                            |                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site:                 | Cerpess Technology (Suzhou) Co., Ltd.                                                                                                                                 |
| Performand Location :      | No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China                                                                                                  |
| NVLAP LAB Code :           | 200814-0                                                                                                                                                              |
| FCC Registration Number :  | 916572, 331395                                                                                                                                                        |
| IC Registration Number :   | 7290A-1, 7290A-2                                                                                                                                                      |
| VCCI Registration Number : | T-343 for Telecommunication Test<br>C-2919 for Conducted emission test<br>R-2670 for Radiated emission test below 1GHz<br>G-227 for Radiated emission test above 1GHz |

## 2.5 Measurement Uncertainty

| Measurement Item          | Measurement Frequency | Polarization | Uncertainty |
|---------------------------|-----------------------|--------------|-------------|
| Conducted Emission        | 9 kHz ~ 30 MHz        | LINE/NEUTRAL | ±2.71 dB    |
| Radiated Emission         | 30 MHz ~ 25GHz        | Vertical     | ±4.11 dB    |
|                           |                       | Horizontal   | ±4.10 dB    |
| Occupied Bandwidth        | ---                   | ---          | ±7500 Hz    |
| Maximum Peak Output Power | ---                   | ---          | ±1.4 dB     |
| Band Edges                | ---                   | ---          | ±2.2 dB     |
| Power Spectral Density    | ---                   | ---          | ±2.2 dB     |



### 3. Antenna Requirements

#### 3.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### 3.2 Antenna Construction and Directional Gain

Antenna type: Dipole Antenna

Antenna Gain: 2.0 dBi



## 4. Test of Conducted Emission

### 4.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2009 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

| Frequency<br>(MHz) | Quasi Peak<br>(dB $\mu$ V) | Average<br>(dB $\mu$ V) |
|--------------------|----------------------------|-------------------------|
| 0.15 – 0.5         | 66-56*                     | 56-46*                  |
| 0.5 – 5.0          | 56                         | 46                      |
| 5.0 – 30.0         | 60                         | 50                      |

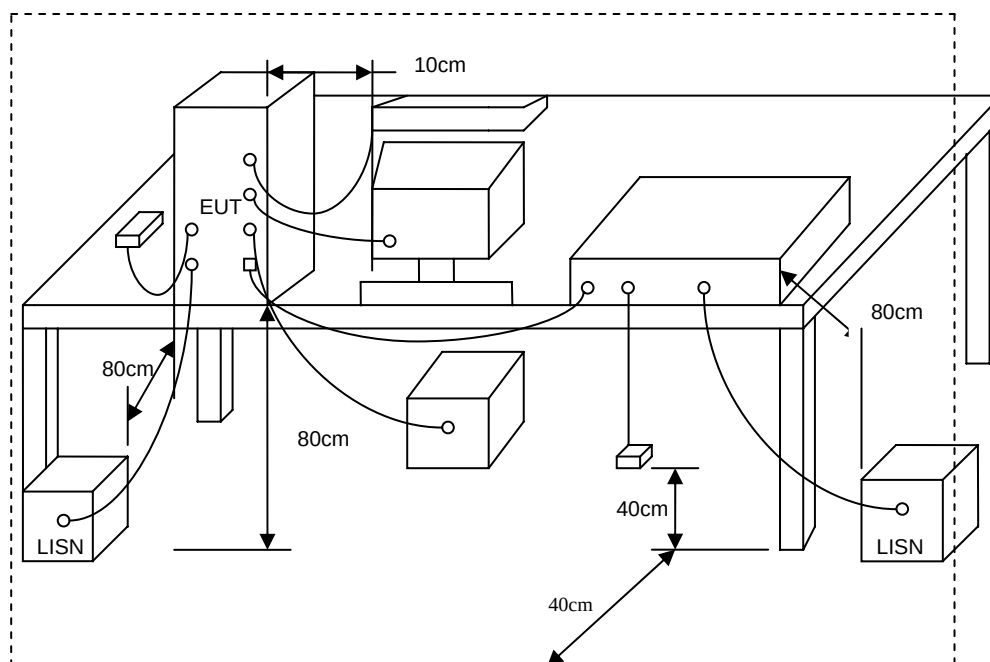
\*Decreases with the logarithm of the frequency.

### 4.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



### 4.3 Typical Test Setup



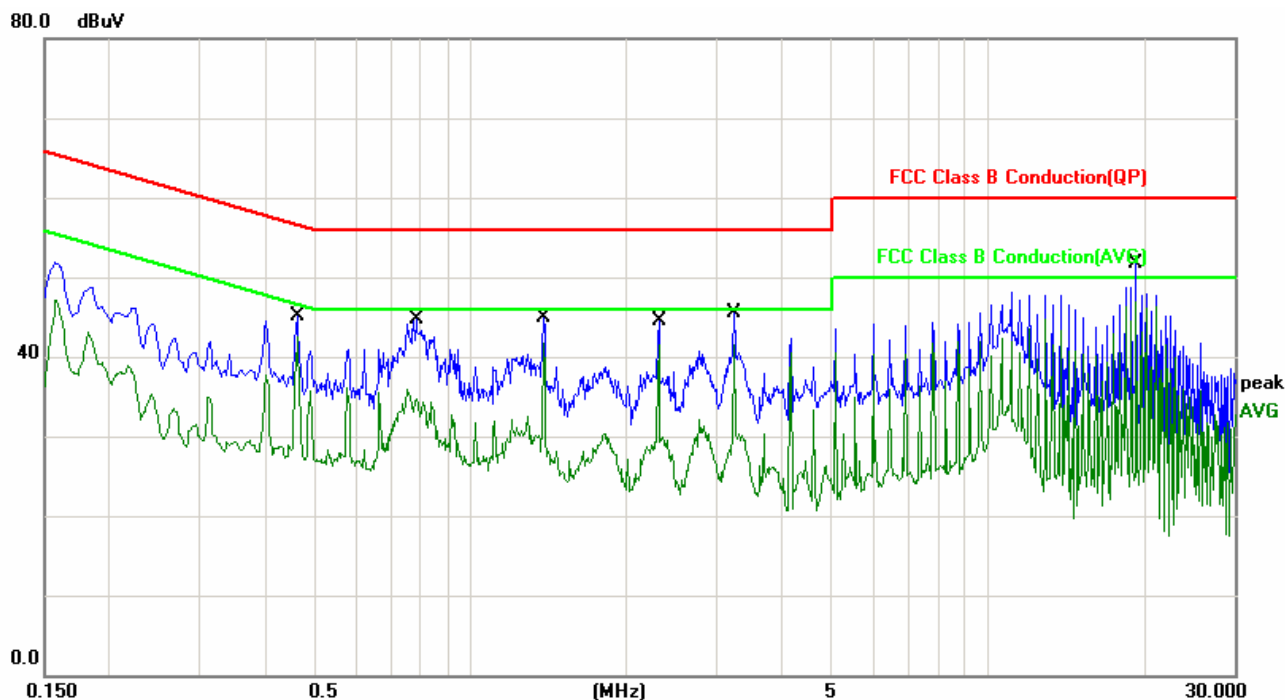
### 4.4 Measurement equipment

| Instrument/Ancillary                | Manufacturer | Model No.   | Serial No. | Calibration Date | Valid Date. |
|-------------------------------------|--------------|-------------|------------|------------------|-------------|
| Test Receiver                       | R&S          | ESCI        | 100564     | 2015.02.25       | 2016.02.24  |
| LISN                                | SCHWARZBECK  | NSLK 8127   | 8127748    | 2014.10.13       | 2015.10.12  |
| LISN                                | SCHWARZBECK  | NSLK 8127   | 8127749    | 2014.10.13       | 2015.10.12  |
| Pulse Limiter with 10dB Attenuation | SCHWARZBECK  | VTSD 9561-F | 9561-F106  | 2014.10.13       | 2015.10.12  |
| Temperature/ Humidity Meter         | mingle       | ETH529      | N/A        | 2015.02.25       | 2016. 02.24 |



#### 4.5 Test Result and Data

|           |                |             |         |
|-----------|----------------|-------------|---------|
| Power     | : AC 120V/60Hz | Pol/Phase   | : LINE  |
| Test Mode | : Normal link  | Temperature | : 25 °C |
| Memo      | :              | Humidity    | : 60 %  |

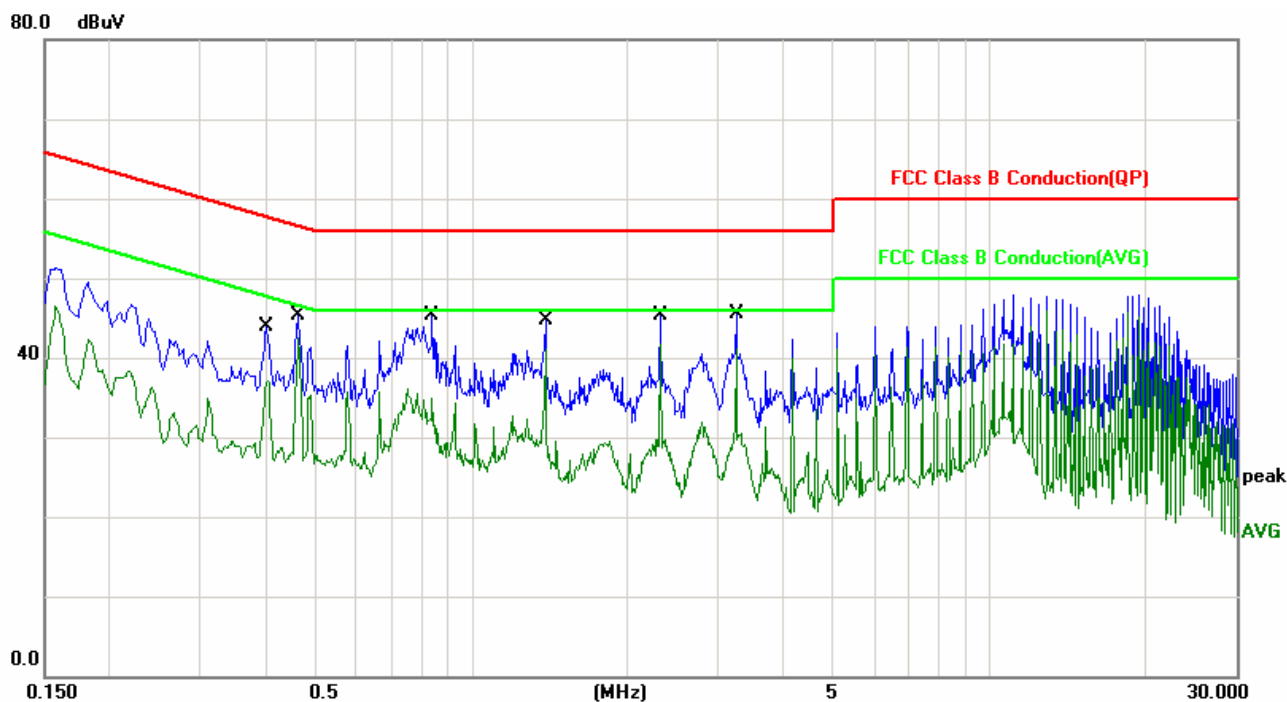


| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.4620          | 9.66        | 33.82          | 43.48        | 56.66        | -13.18      | QP       |
| 2   | 0.4620          | 9.66        | 32.84          | 42.50        | 46.66        | -4.16       | AVG      |
| 3   | 0.7860          | 9.66        | 31.55          | 41.21        | 56.00        | -14.79      | QP       |
| 4   | 0.7860          | 9.66        | 25.67          | 35.33        | 46.00        | -10.67      | AVG      |
| 5   | 1.3860          | 9.66        | 32.96          | 42.62        | 56.00        | -13.38      | QP       |
| 6   | 1.3860          | 9.66        | 31.48          | 41.14        | 46.00        | -4.86       | AVG      |
| 7   | 2.3100          | 9.68        | 31.46          | 41.14        | 56.00        | -14.86      | QP       |
| 8   | 2.3100          | 9.68        | 29.59          | 39.27        | 46.00        | -6.73       | AVG      |
| 9   | 3.2340          | 9.70        | 30.24          | 39.94        | 56.00        | -16.06      | QP       |
| 10  | 3.2340          | 9.70        | 26.77          | 36.47        | 46.00        | -9.53       | AVG      |
| 11  | 19.3900         | 10.14       | 17.64          | 27.78        | 60.00        | -32.22      | QP       |
| 12  | 19.3900         | 10.14       | 12.55          | 22.69        | 50.00        | -27.31      | AVG      |

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator



|           |                |             |           |
|-----------|----------------|-------------|-----------|
| Power     | : AC 120V/60Hz | Pol/Phase   | : NEUTRAL |
| Test Mode | : Normal link  | Temperature | : 25 °C   |
| Memo      | :              | Humidity    | : 60 %    |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.3997          | 9.67        | 30.55          | 40.22        | 57.86        | -17.64      | QP       |
| 2   | 0.3997          | 9.67        | 27.07          | 36.74        | 47.86        | -11.12      | AVG      |
| 3   | 0.4620          | 9.66        | 33.98          | 43.64        | 56.66        | -13.02      | QP       |
| 4   | 0.4620          | 9.66        | 33.06          | 42.72        | 46.66        | -3.94       | AVG      |
| 5   | 0.8420          | 9.66        | 29.97          | 39.63        | 56.00        | -16.37      | QP       |
| 6   | 0.8420          | 9.66        | 24.37          | 34.03        | 46.00        | -11.97      | AVG      |
| 7   | 1.3900          | 9.66        | 30.84          | 40.50        | 56.00        | -15.50      | QP       |
| 8   | 1.3900          | 9.66        | 29.29          | 38.95        | 46.00        | -7.05       | AVG      |
| 9   | 2.3179          | 9.68        | 24.99          | 34.67        | 56.00        | -21.33      | QP       |
| 10  | 2.3179          | 9.68        | 21.63          | 31.31        | 46.00        | -14.69      | AVG      |
| 11  | 3.2460          | 9.70        | 27.45          | 37.15        | 56.00        | -18.85      | QP       |
| 12  | 3.2460          | 9.70        | 20.05          | 29.75        | 46.00        | -16.25      | AVG      |

Note: Measurement Level = Reading Level + Correct Factor+ Attenuator



## 5. Test of Radiated Emission

### 5.1 Test Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

#### A. FCC Part 15 Subpart C Paragraph 15.249(a) Limit

| Frequency (MHz) | Field strength of Fundamental | Field strength of Harmonics    | Distance (m) |
|-----------------|-------------------------------|--------------------------------|--------------|
| 902~928         | 50mV/m (94dB $\mu$ V/m)       | 500 $\mu$ V/m (54dB $\mu$ V/m) | 3            |
| 2400~2483.5     | 50mV/m (94dB $\mu$ V/m)       | 500 $\mu$ V/m (54dB $\mu$ V/m) | 3            |
| 5725~5875       | 50mV/m (94dB $\mu$ V/m)       | 500 $\mu$ V/m (54dB $\mu$ V/m) | 3            |

Note: 1. RF Field Strength (dBuV) = 20 log RF Voltage ( $\mu$ V)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

#### B. Frequencies in restricted band are complied to limit on Paragraph 15.209.

| Frequency range (MHz) | Field Strength |      | Field Strength Limitation at 3m Measurement Dist |                        |
|-----------------------|----------------|------|--------------------------------------------------|------------------------|
|                       | $\mu$ V/m      | Dist | ( $\mu$ V/m)                                     | (dBuV/m)               |
| 0.009 - 0.490         | 2400/F(KHz)    | 300m | 10000* 2400/F(KHz)                               | 20log 2400/F(KHz) + 80 |
| 0.490 - 1.705         | 2400/F(KHz)    | 30m  | 100* 2400/F(KHz)                                 | 20log 2400/F(KHz) + 40 |
| 1.705 - 30.00         | 30             | 30m  | 100*30                                           | 20log 30 + 40          |
| 30.0 - 88.0           | 100            | 3m   | 100                                              | 20log 100              |
| 88.0 - 216.0          | 150            | 3m   | 150                                              | 20log 150              |
| 216.0 - 960.0         | 200            | 3m   | 200                                              | 20log 200              |
| Above 960.0           | 500            | 3m   | 500                                              | 20log 500              |

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage ( $\mu$ V)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. As to 1G-40G, the final emission level got using PK and AV detector.

5. Alternative switch power supply board provided to the EUT. After pre-scan, the worse case was recorded.

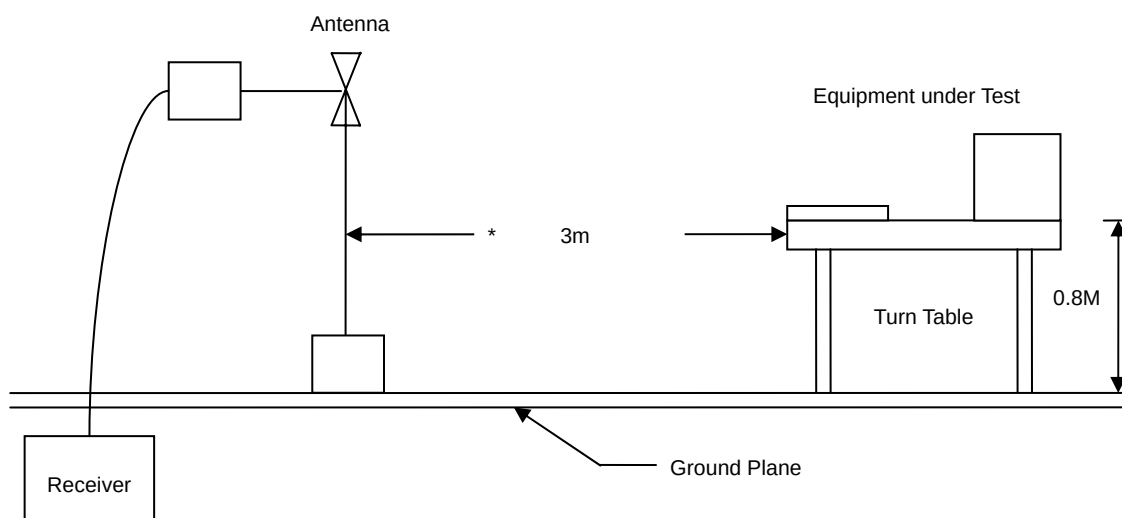


## 5.2 Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

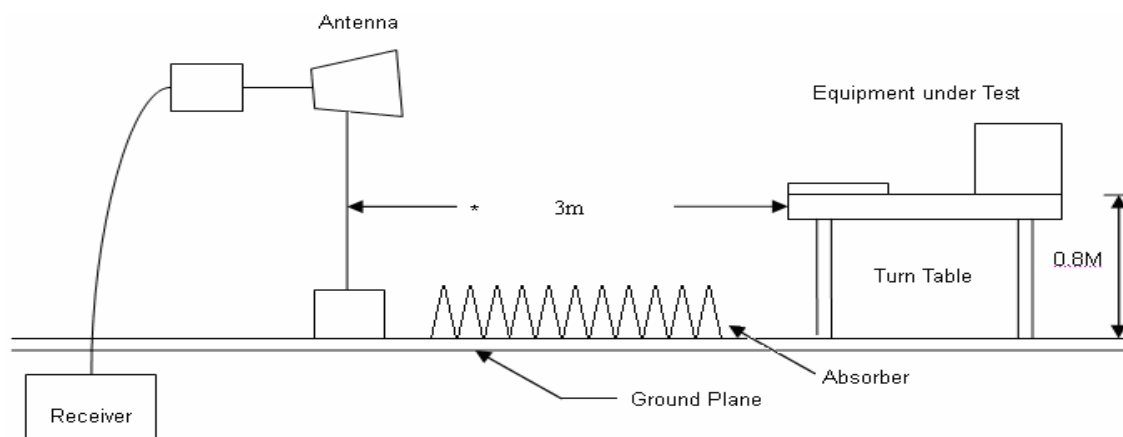
## 5.3 Typical Test Setup

Below 1GHz Test Setup





#### Above 1GHz Test Setup



### 5.4 Measurement equipment

| Instrument/Ancillary        | Manufacturer | Model No.                    | Serial No. | Calibration Date | Valid Date. |
|-----------------------------|--------------|------------------------------|------------|------------------|-------------|
| EMI Test Receiver           | R&S          | ESCI                         | 100853     | 2015.02.25       | 2016. 02.24 |
| Preamplifier                | HP           | 8447F                        | 3113A05915 | 2015.02.25       | 2016. 02.24 |
| Preamplifier                | FIELD        | AFS44-00101800<br>-25-10P-44 | 1579008    | 2014.10.14       | 2015.10.13  |
| Ultra Broadband Antenna     | SCHAFFNER    | CBL6112D                     | 22241      | 2015.02.25       | 2016. 02.24 |
| Broad-Band Horn Antenna     | Sunol        | DRH-118                      | A072913    | 2014.10.14       | 2015.10.13  |
| Spectrum Analyzer           | Agilent      | E4407B                       | MY45118947 | 2014.07.16       | 2015.07.15  |
| Temperature/ Humidity Meter | mingle       | ETH529                       | N/A        | 2015.02.25       | 2016. 02.24 |



## 5.5 Test Result and Data

### 5.5.1 Fundamental & Harmonics Radiated Emission Data

Fundamental Frequency: 2403 MHz

#### VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2403.000        | 2.020               | 95.158               | 97.178                 | -16.822     | 114.000        | PEAK          |
| 2   | 2403.000        | 2.020               | 81.132               | 83.152                 | -10.848     | 94.000         | AVG           |

#### HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2403.000        | 1.811               | 91.251               | 93.062                 | -20.938     | 114.000        | PEAK          |
| 2   | 2403.000        | 1.811               | 76.214               | 78.025                 | -15.975     | 94.000         | AVG           |

Fundamental Frequency: 2441 MHz

#### VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2441.000        | 1.955               | 94.235               | 96.190                 | -17.810     | 114.000        | PEAK          |
| 2   | 2441.000        | 1.955               | 78.535               | 80.490                 | -13.510     | 94.000         | AVG           |

#### HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2441.000        | 1.903               | 88.318               | 90.221                 | -23.779     | 114.000        | PEAK          |
| 2   | 2441.000        | 1.903               | 72.657               | 74.560                 | -19.440     | 94.000         | AVG           |

Fundamental Frequency: 2479 MHz

#### VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2479.000        | 1.884               | 93.258               | 95.142                 | -18.858     | 114.000        | PEAK          |
| 2   | 2479.000        | 1.884               | 76.657               | 78.541                 | -15.459     | 94.000         | AVG           |

#### HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2479.000        | 2.030               | 90.255               | 92.285                 | -21.715     | 114.000        | PEAK          |
| 2   | 2479.000        | 2.030               | 75.958               | 77.988                 | -16.012     | 94.000         | AVG           |



## 5.5.2 General Radiated Emission Data

### Under 1GHz

|                            |                              |
|----------------------------|------------------------------|
| Site : EMC Lab AC 102      | Time : 2014-8-15             |
| Limit : FCC_CLASS_B_03M_QP | Margin : 6                   |
| Test mode: TX              | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz       |                              |

#### VERTICAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Height (cm) | Azimuth (deg) |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|---------------|
| 1   | 98.8700         | -9.77         | 46.35          | 36.58          | 43.50          | -6.92       | QP   | 200         | 79            |
| 2   | 111.4800        | -8.43         | 46.38          | 37.95          | 43.50          | -5.55       | QP   | 200         | 65            |
| 3   | 122.1500        | -8.25         | 44.23          | 35.98          | 43.50          | -7.52       | QP   | 300         | 98            |
| 4   | 187.1399        | -10.59        | 49.86          | 39.27          | 43.50          | -4.23       | QP   | 100         | 41            |
| 5   | 198.7800        | -9.70         | 49.88          | 40.18          | 43.50          | -3.32       | QP   | 200         | 0             |
| 6   | 209.4499        | -9.50         | 48.39          | 38.89          | 43.50          | -4.61       | QP   | 200         | 0             |

#### HORIZONTAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | Height (cm) | Azimuth (deg) |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|---------------|
| 1   | 51.3400         | -14.25        | 48.60          | 34.35          | 40.00          | -5.65       | QP   | 100         | 185           |
| 2   | 68.8000         | -15.48        | 49.80          | 34.32          | 40.00          | -5.68       | QP   | 100         | 49            |
| 3   | 111.4800        | -8.43         | 43.27          | 34.84          | 43.50          | -8.66       | QP   | 100         | 0             |
| 4   | 197.8100        | -9.77         | 45.03          | 35.26          | 43.50          | -8.24       | QP   | 100         | 166           |
| 5   | 371.4400        | -4.76         | 38.96          | 34.20          | 46.00          | -11.80      | QP   | 200         | 168           |
| 6   | 385.0200        | -5.32         | 39.24          | 33.92          | 46.00          | -12.08      | QP   | 100         | 171           |

#### Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor

**Above 1GHz**

|                             |                              |
|-----------------------------|------------------------------|
| Site : EMC Lab AC 102       | Time : 2014-11-16            |
| Limit : FCC_CLASS_B_03M_QP  | Margin : 6                   |
| Test mode: Transmit 2403MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz        |                              |

**VERTICAL**

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 70.29                | 59.67                  | 74.00       | -14.33         | peak          |
| 2   | 1170.000        | -10.62              | 57.50                | 46.88                  | 54.00       | -7.12          | AVG           |
| 3   | 1467.500        | -7.91               | 62.65                | 54.74                  | 74.00       | -19.26         | peak          |
| 4   | 1467.500        | -7.91               | 50.24                | 42.33                  | 54.00       | -11.67         | AVG           |
| 5   | 2912.500        | 0.18                | 52.54                | 52.72                  | 74.00       | -21.28         | peak          |
| 6   | 2912.500        | 0.18                | 40.03                | 40.21                  | 54.00       | -13.79         | AVG           |

**HORIZONTAL**

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 70.21                | 59.59                  | 74.00       | -14.41         | peak          |
| 2   | 1170.000        | -10.62              | 57.50                | 46.88                  | 54.00       | -7.12          | AVG           |
| 3   | 1467.500        | -7.91               | 62.52                | 54.61                  | 74.00       | -19.39         | peak          |
| 4   | 1467.500        | -7.91               | 49.18                | 41.27                  | 54.00       | -12.73         | AVG           |
| 5   | 2062.500        | -4.46               | 56.12                | 51.66                  | 74.00       | -22.34         | peak          |
| 6   | 2062.500        | -4.46               | 43.41                | 38.95                  | 54.00       | -15.05         | AVG           |

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



|                             |                              |
|-----------------------------|------------------------------|
| Site : EMC Lab AC 102       | Time : 2014-11-16            |
| Limit : FCC_CLASS_B_03M_QP  | Margin : 6                   |
| Test mode: Transmit 2441MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz        |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 70.99                | 60.37                  | 74.00       | -13.63         | peak          |
| 2   | 1170.000        | -10.62              | 58.45                | 47.83                  | 54.00       | -6.17          | AVG           |
| 3   | 1467.500        | -7.91               | 62.21                | 54.30                  | 74.00       | -19.70         | peak          |
| 4   | 1467.500        | -7.91               | 50.24                | 42.33                  | 54.00       | -11.67         | AVG           |
| 5   | 2912.500        | 0.18                | 55.26                | 55.44                  | 74.00       | -18.56         | peak          |
| 6   | 2912.500        | 0.18                | 41.80                | 41.98                  | 54.00       | -12.02         | AVG           |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 69.92                | 59.30                  | 74.00       | -14.70         | peak          |
| 2   | 1170.000        | -10.62              | 56.97                | 46.35                  | 54.00       | -7.65          | AVG           |
| 3   | 1467.500        | -7.91               | 62.43                | 54.52                  | 74.00       | -19.48         | peak          |
| 4   | 1467.500        | -7.91               | 49.80                | 41.89                  | 54.00       | -12.11         | AVG           |
| 5   | 2062.500        | -4.46               | 56.34                | 51.88                  | 74.00       | -22.12         | peak          |
| 6   | 2062.500        | -4.46               | 43.97                | 39.51                  | 54.00       | -14.49         | AVG           |

## Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



|                             |                              |
|-----------------------------|------------------------------|
| Site : EMC Lab AC 102       | Time : 2014-11-16            |
| Limit : FCC_CLASS_B_03M_QP  | Margin : 6                   |
| Test mode: Transmit 2479MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz        |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 68.62                | 58.00                  | 74.00       | -16.00         | peak          |
| 2   | 1170.000        | -10.62              | 55.57                | 44.95                  | 54.00       | -9.05          | AVG           |
| 3   | 2062.500        | -4.46               | 55.26                | 50.80                  | 74.00       | -23.20         | peak          |
| 4   | 2062.500        | -4.46               | 41.33                | 36.87                  | 54.00       | -17.13         | AVG           |
| 5   | 2912.500        | 0.18                | 50.86                | 51.04                  | 74.00       | -22.96         | peak          |
| 6   | 2912.500        | 0.18                | 39.44                | 39.62                  | 54.00       | -14.38         | AVG           |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 1170.000        | -10.62              | 69.55                | 58.93                  | 74.00       | -15.07         | peak          |
| 2   | 1170.000        | -10.62              | 55.51                | 44.89                  | 54.00       | -9.11          | AVG           |
| 3   | 1467.500        | -7.91               | 62.95                | 55.04                  | 74.00       | -18.96         | peak          |
| 4   | 1467.500        | -7.91               | 49.59                | 41.68                  | 54.00       | -12.32         | AVG           |
| 5   | 2062.500        | -4.46               | 56.58                | 52.12                  | 74.00       | -21.88         | peak          |
| 6   | 2062.500        | -4.46               | 44.13                | 39.67                  | 54.00       | -14.33         | AVG           |

## Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor



## 6. 20dB Bandwidth Measurement Data

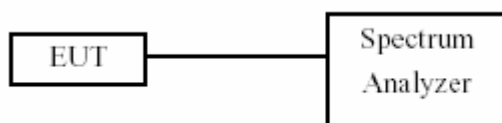
### 6.1 Test Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 6.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 100 KHz and VBW to 300 KHz.
- The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

### 6.3 Test Setup Layout



### 6.4 Measurement equipment

| Instrument/Ancillary | Model No. | Manufacturer | Serial No. | Calibration Date | Valid Date |
|----------------------|-----------|--------------|------------|------------------|------------|
| Spectrum Analyzer    | Agilent   | E4407B       | MY45118947 | 2014.07.16       | 2015.07.15 |

### 6.5 Test Result and Data

Test Date: 2014-11-16

Temperature: 25°C

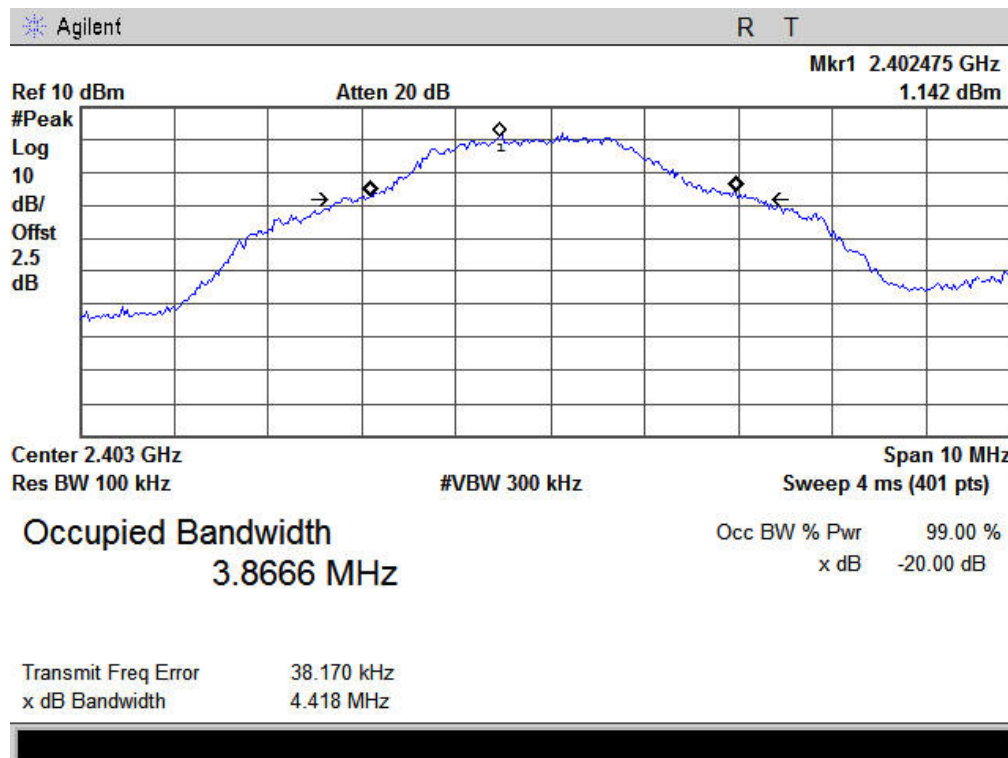
Atmospheric pressure: 1020 hPa

Humidity: 55%

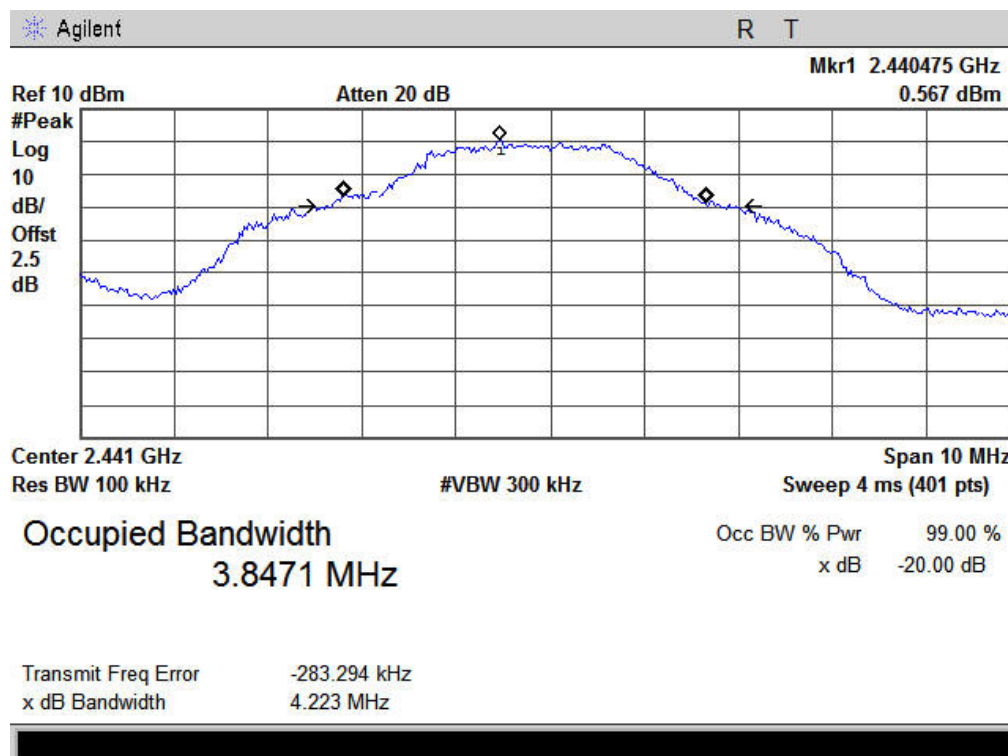
| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) |
|---------|-----------------|----------------------|
| Low     | 2403            | 4418.00              |
| Mid     | 2441            | 4223.00              |
| High    | 2479            | 4311.00              |



Channel: Low

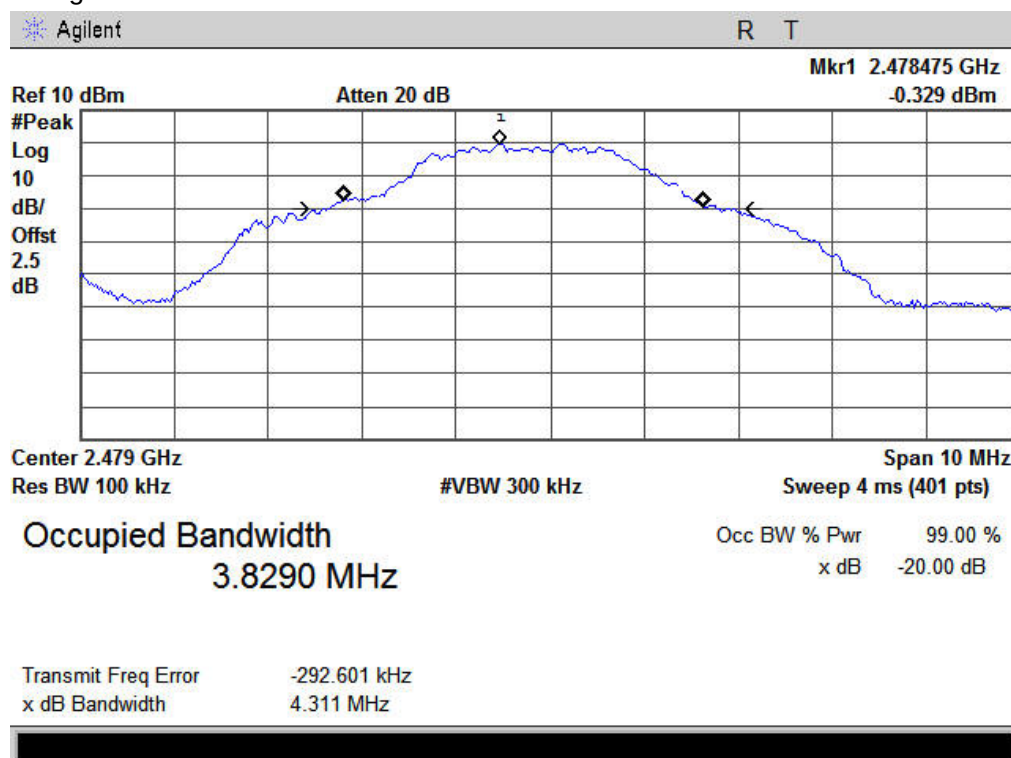


Channel: Mid





Channel: High





## 7. Band Edges Measurement

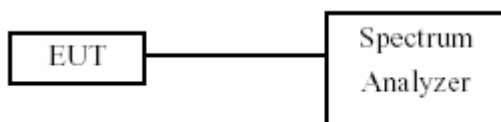
### 7.1 Test Limit

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 7.2 Test Procedure

- The transmitter output was connected to the spectrum analyzer via a low lose cable.
- Set both RBW and VBW of spectrum analyzer to 100 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- The band edges was measured and recorded.

### 7.3 Test Setup Layout



### 7.4 List of Measuring Equipment Used

| Instrument/Ancillary | Model No. | Manufacturer | Serial No. | Calibration Date | Valid Date |
|----------------------|-----------|--------------|------------|------------------|------------|
| Spectrum Analyzer    | Agilent   | E4407B       | MY45118947 | 2014.07.16       | 2015.07.15 |



## 7.5 Restrict band emission Measurement Data

Test Date : 2013-9-29  
Temperature : 23°C  
Humidity : 65%  
Atmospheric Pressure : 1020 hPa

Channel Low

Fundamental Frequency: 2403 MHz

### VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2390.000        | -3.05               | 50.94                | 47.89                  | 74.00       | -26.11         | peak          |
| 2   | 2390.000        | -3.05               | 41.66                | 38.61                  | 54.00       | -15.39         | AVG           |

### HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2390.000        | -3.05               | 54.46                | 51.41                  | 74.00       | -22.59         | peak          |
| 2   | 2390.000        | -3.05               | 44.64                | 41.59                  | 54.00       | -12.41         | AVG           |

Channel High

Fundamental Frequency: 2479 MHz

### VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2483.500        | -2.65               | 64.31                | 61.66                  | 74.00       | -12.34         | peak          |
| 2   | 2483.500        | -2.65               | 54.02                | 51.37                  | 54.00       | -2.63          | AVG           |

### HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Margin (dB) | Limit (dBuV/m) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|-------------|----------------|---------------|
| 1   | 2483.500        | -2.65               | 56.57                | 53.92                  | 74.00       | -20.08         | peak          |
| 2   | 2483.500        | -2.65               | 46.51                | 43.86                  | 54.00       | -10.14         | AVG           |

Notes:

1. Result = Meter Reading + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz



## 8. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz             |
|---------------------|-----------------------|-----------------|-----------------|
| 0.09000 – 0.11000   | 16.42000 – 16.42300   | 399.9 – 410.0   | 4.500 – 5.250   |
| 0.49500 – 0.505**   | 16.69475 – 16.69525   | 608.0 – 614.0   | 5.350 – 5.460   |
| 2.17350 – 2.19050   | 16.80425 – 16.80475   | 960.0 – 1240.0  | 7.250 – 7.750   |
| 4.12500 – 4.12800   | 25.50000 – 25.67000   | 1300.0 – 1427.0 | 8.025 – 8.500   |
| 4.17725 – 4.17775   | 37.50000 – 38.25000   | 1435.0 – 1626.5 | 9.000 – 9.200   |
| 4.20725 – 4.20775   | 73.00000 – 74.60000   | 1645.5 – 1646.5 | 9.300 – 9.500   |
| 6.21500 – 6.21800   | 74.80000 – 75.20000   | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825   | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225   | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400   | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600   | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675   | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475   | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6      |
| 13.36000 – 13.41000 |                       |                 |                 |

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

### 8.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.