

# Verykool USA Inc

## Mobile Phone

Main Model: RS76

Serial Model: N/A

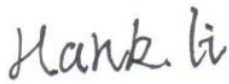
June 25, 2014

Report No.: 14070287-FCC-R2  
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |
| Hank Li<br>Compliance Engineer                                                      | Alex Liu<br>Technical Manager                                                       |                                                                                       |

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Test result presented in this test report is applicable to the representative sample only.

# RF Test Report

To: FCC Part 15.247: 2013, ANSI C63.4: 2009

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# 1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the Verykool USA Inc, Mobile Phone and model: RS76 against the current Stipulated Standards. The Mobile Phone has demonstrated compliance with the FCC 15.247: 2013, ANSI C63.4: 2009.

## EUT Information

|                                                    |                                                                                                                                                                                |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT Description</b>                             | : Mobile Phone                                                                                                                                                                 |
| <b>Main Model</b>                                  | : RS76                                                                                                                                                                         |
| <b>Serial Model</b>                                | : N/A                                                                                                                                                                          |
| <b>Antenna Gain</b>                                | :<br>GSM850: -4.29 dBi<br>PCS1900: -1.51 dBi<br>Bluetooth/BLE: -1.67 dBi<br>WIFI: -1.67 dBi                                                                                    |
| <b>Input Power</b>                                 | :<br>Battery:<br>Model: 524546<br>Spec: 3.7V 1250mAh<br>Limited charger voltage: 4.2V<br>Adapter:<br>Model: S200<br>Input: AC 100-240V; 50/60Hz 0.15A<br>Output: DC 5.0V; 1.0A |
| <b>Classification Per Stipulated Test Standard</b> | : FCC 15.247: 2013, ANSI C63.4: 2009                                                                                                                                           |

## **2 TECHNICAL DETAILS**

|                                        |                                                                                                                                                                                                                                                                                                |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                         | <b>Compliance testing of Mobile Phone with stipulated standards</b>                                                                                                                                                                                                                            |
| <b>Applicant / Client</b>              | <b>Verykool USA Inc<br/>3636 Nobel Drive, Suite 325, San Diego, CA 92122 USA</b>                                                                                                                                                                                                               |
| <b>Manufacturer</b>                    | <b>Verykool Wireless Technology Ltd<br/>Room 802 Fangda Building Nanshan District Science Park Shenzhen P.R<br/>China</b>                                                                                                                                                                      |
| <b>Laboratory performing the tests</b> | <b>SIEMIC (Shenzhen - China) Laboratories<br/>Zone A, Floor 1, Building 2, Wan Ye Long Technology Park, South Side of<br/>Zhoushi Road, Bao'an District, Shenzhen, Guangdong, China<br/>Tel: +86-0755-2601 4629 / 2601 4953<br/>Fax: +86-0755-2601 4953-810<br/>Email: China@siemic.com.cn</b> |
| <b>Test report reference number</b>    | <b>14070287-FCC-R2</b>                                                                                                                                                                                                                                                                         |
| <b>Date EUT received</b>               | <b>June 10, 2014</b>                                                                                                                                                                                                                                                                           |
| <b>Standard applied</b>                | <b>FCC 15.247: 2013, ANSI C63.4: 2009</b>                                                                                                                                                                                                                                                      |
| <b>Dates of test (from – to)</b>       | <b>June 12 to June 20, 2014</b>                                                                                                                                                                                                                                                                |
| <b>No of Units</b>                     | <b>#1</b>                                                                                                                                                                                                                                                                                      |
| <b>Equipment Category</b>              | <b>DSS</b>                                                                                                                                                                                                                                                                                     |
| <b>Trade Name</b>                      | <b>verykool</b>                                                                                                                                                                                                                                                                                |
| <b>RF Operating Frequency (ies)</b>    | <b>GSM850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz<br/>PCS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz<br/>802.11b/g/n: 2412-2462 MHz<br/>Bluetooth&amp; BLE: 2402-2480 MHz</b>                                                                                               |
| <b>Number of Channels</b>              | <b>299CH (PCS1900) and 124CH (GSM850)<br/>Bluetooth: 79CH<br/>802.11b/g/n: 11CH<br/>BLE: 40CH</b>                                                                                                                                                                                              |
| <b>Modulation</b>                      | <b>GSM / GPRS: GMSK<br/>802.11b/g/n: DSSS/OFDM<br/>Bluetooth: GFSK&amp; <math>\pi/4</math>DQPSK&amp;8DPSK<br/>BLE: GFSK<br/>EDGE: 8PSK</b>                                                                                                                                                     |
| <b>EDGE/GPRS Multi-slot class</b>      | <b>8/10/12</b>                                                                                                                                                                                                                                                                                 |
| <b>FCC ID</b>                          | <b>WA6RS76</b>                                                                                                                                                                                                                                                                                 |

### 3 MODIFICATION

NONE

## 4 TEST SUMMARY

The product was tested in accordance with the following specifications.  
All testing has been performed according to below product classification:

### Spread Spectrum System/Device

#### Test Results Summary

| Test Standard                | Description                    | Product Class | Pass / Fail |
|------------------------------|--------------------------------|---------------|-------------|
| §15.247(i), §2.1093          | RF Exposure                    | See Above     | Pass        |
| §15.203                      | Antenna Requirement            | See Above     | Pass        |
| §15.207(a)                   | AC Line Conducted Emissions    | See Above     | Pass        |
| §15.205, §15.209, §15.247(d) | Radiated Emissions             | See Above     | Pass        |
| §15.247(a)(1)                | 20 dB Bandwidth                | See Above     | Pass        |
| §15.247(a)(1)                | Channel Separation             | See Above     | Pass        |
| §15.247(a)(1)(iii)           | Time of Occupancy (Dwell Time) | See Above     | Pass        |
| §15.247(a)(1)(iii)           | Quantity of Hopping Channel    | See Above     | Pass        |
| §15.247(b)(1)                | Peak Output Power              | See Above     | Pass        |
| §15.247(d)                   | Band Edge                      | See Above     | Pass        |

## **5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS**

### **5.1 §15.247 (i) and §2.1093 – RF Exposure**

#### **Standard Requirement:**

According to §15.247 (i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f_{\text{(GHz)}}}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR,<sup>16</sup> where

- $f_{\text{(GHz)}}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation<sup>17</sup>
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

Two antennas are available for the EUT (GSM antenna, Bluetooth/WIFI/BLE antenna).

The maximum average output power(turn-up power) in low channel of Bluetooth is 4.598 dBm= 2.88 mW

The calculation results=  $2.88 / 5 * \sqrt{2.402} = 0.89 < 3$

The maximum average output power(turn-up power) in middle channel of Bluetooth is 5.086 dBm=3.23 mW

The calculation results=  $3.23 / 5 * \sqrt{2.441} = 1.01 < 3$

The maximum average output power(turn-up power) in high channel of Bluetooth is 4.571 dBm= 2.86 mW

The calculation results=  $2.86 / 5 * \sqrt{2.480} = 0.90 < 3$

According to KDB 447498, no stand-alone required for Bluetooth antenna, and no simultaneous SAR measurement is required, please refer to SAR report.

**Test Result: Pass**

## **5.2 §15.203 – Antenna Requirement**

### **Standard Requirement:**

According to § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the 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 6 dBi.

### **Antenna Connector Construction**

The EUT has 2 antennas: a PIFA antenna for WIFI/Bluetooth/BLE, the gain is -1.67 dBi for WIFI/Bluetooth/BLE.  
a PIFA antenna for GSM, the gain is -4.29 dBi for GSM850 and -1.51 dBi PCS1900.

Which in accordance to section 15.203, please refer to the internal photos.

**Test Result: Pass**

### **5.3 §15.207 (a) – AC Line Conducted Emissions**

#### **Standard Requirement:**

| Frequency of emission (MHz) | Conducted limit (dBμV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15–0.5                    | 66 to 56*              | 56 to 46* |
| 0.5–5                       | 56                     | 46        |
| 5–30                        | 60                     | 50        |

\*Decreases with the logarithm of the frequency.

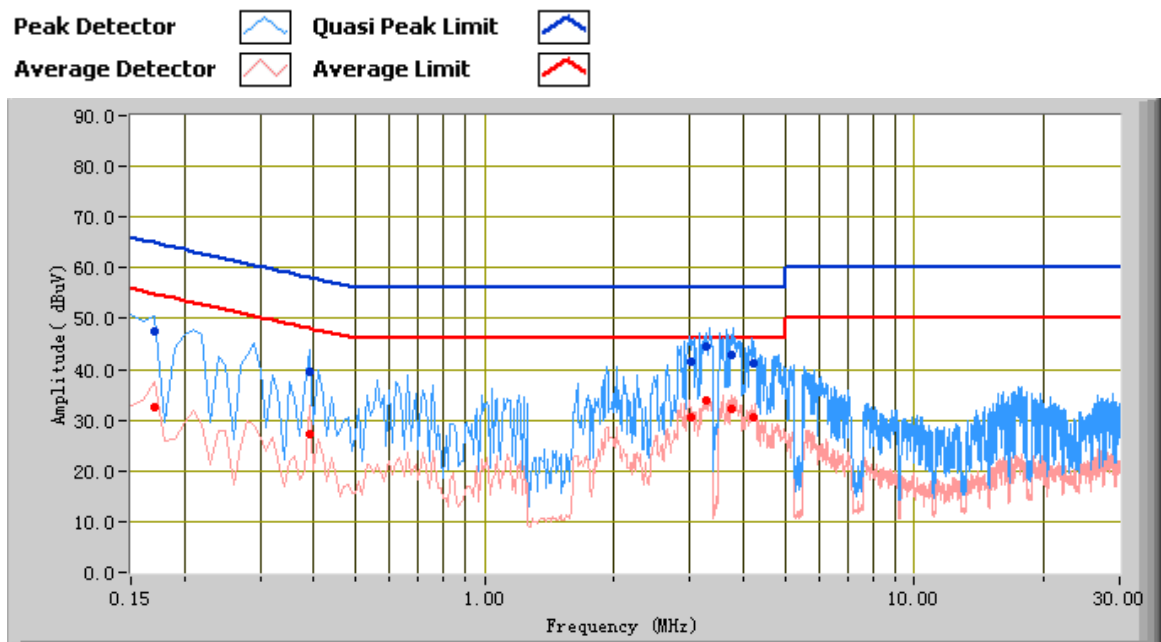
#### **Procedures:**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 24°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1015mbar |
5. Test date : June 19, 2014  
Tested By : Hank Li

**Test Result: Pass**

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| <b>Test Mode:</b> | <b>Charging &amp; GFSK Transmitting(Worse Case)</b> |
|-------------------|-----------------------------------------------------|



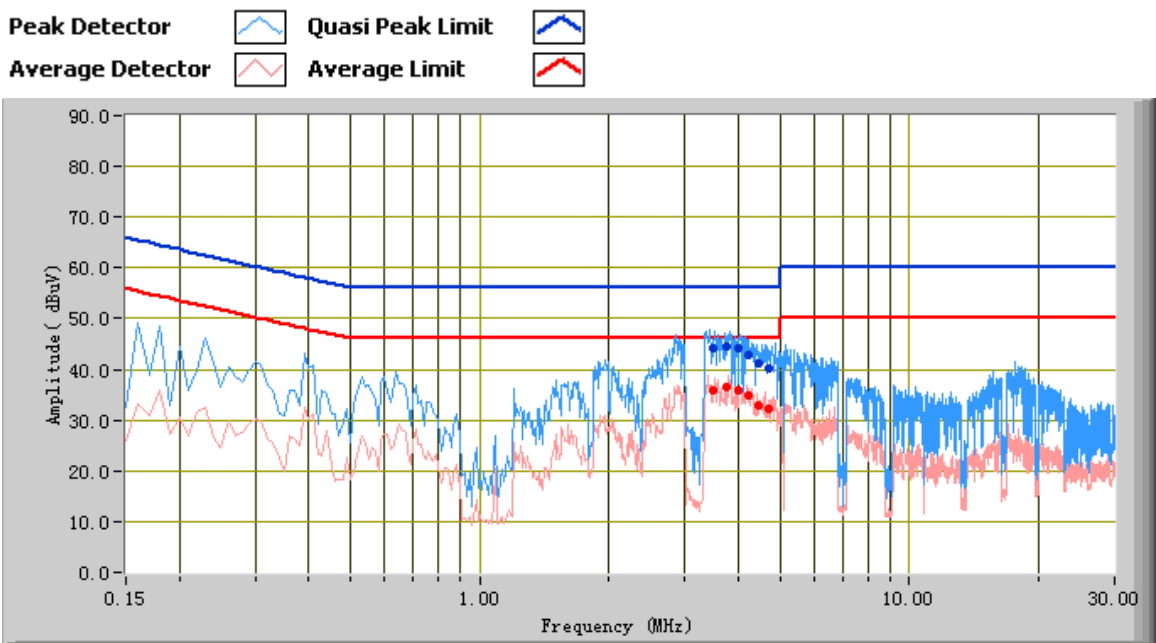
**Test Data**

**Phase Line Plot at 120Vac, 60Hz**

| Frequency (MHz) | Quasi Peak (dBuV) | Limit (dBuV) | Margin (dB) | Average (dBuV) | Limit (dBuV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 3.26            | 44.51             | 56.00        | -11.49      | 34.02          | 46.00        | -11.98      | 10.67        |
| 3.74            | 42.88             | 56.00        | -13.12      | 32.30          | 46.00        | -13.70      | 10.76        |
| 4.22            | 41.32             | 56.00        | -14.68      | 30.62          | 46.00        | -15.38      | 10.85        |
| 3.02            | 41.56             | 56.00        | -14.44      | 30.55          | 46.00        | -15.45      | 10.63        |
| 0.39            | 39.43             | 58.06        | -18.63      | 27.38          | 48.06        | -20.68      | 11.03        |
| 0.17            | 47.45             | 64.96        | -17.51      | 32.68          | 54.96        | -22.28      | 12.35        |

**Test Mode:**

**Charging & GFSK Transmitting (Worse Case)**



**Test Data**

**Phase Neutral Plot at 120Vac, 60Hz**

| Frequency (MHz) | Quasi Peak (dBuV) | Limit (dBuV) | Margin (dB) | Average (dBuV) | Limit (dBuV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 3.50            | 44.05             | 56.00        | -11.95      | 35.80          | 46.00        | -10.20      | 10.71        |
| 3.98            | 44.10             | 56.00        | -11.90      | 35.89          | 46.00        | -10.11      | 10.81        |
| 4.70            | 40.25             | 56.00        | -15.75      | 32.19          | 46.00        | -13.81      | 10.94        |
| 4.22            | 42.79             | 56.00        | -13.21      | 34.74          | 46.00        | -11.26      | 10.85        |
| 3.74            | 44.52             | 56.00        | -11.48      | 36.57          | 46.00        | -9.43       | 10.76        |
| 4.46            | 41.27             | 56.00        | -14.73      | 32.91          | 46.00        | -13.09      | 10.90        |

## **5.4 §15.209, §15.205 & §15.247(d) - Spurious Emissions**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz ( 3m & 10m ) & 1GHz above ( 3m ) is +5.6/-4.5dB.
4. Environmental Conditions
 

|                      |          |
|----------------------|----------|
| Temperature          | 24°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1015mbar |
5. Test date : June 19, 2014  
Tested By : Hank Li

### **Standard Requirement:**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### **Procedures:**

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. A Quasi-peak measurement was then made for that frequency point for below 1GHz test, PK and AV for above 1GHz emission test.
  - a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.
  - b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
  - c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz.

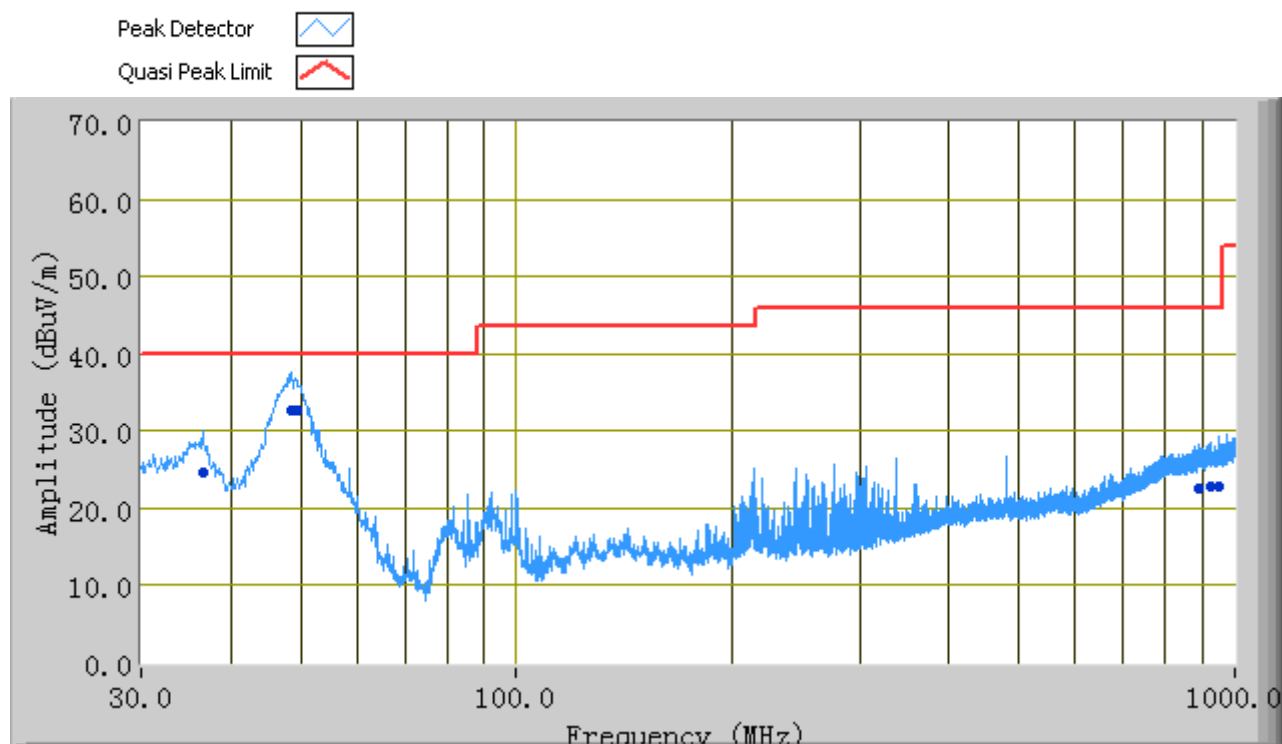
☒ 1 kHz (Duty cycle < 98%)     
 ☐ 10 Hz (Duty cycle > 98%)

4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

**Test Result: Pass**

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| <b>Test Mode:</b> | <b>Charging &amp; GFSK Transmitting(Worse Case)</b> |
|-------------------|-----------------------------------------------------|

*Below 1GHz*



**Test Data**

**Horizontal & Vertical Polarity Plot @3m**

| Frequency (MHz) | Quasi Peak (dBuV/m) | Azimuth | Polarity(H/V) | Height (cm) | Factors (dB) | Limit (dBuV) | Margin (dB) |
|-----------------|---------------------|---------|---------------|-------------|--------------|--------------|-------------|
| 48.75           | 32.75               | 0.00    | V             | 100.00      | -13.31       | 40.00        | -7.25       |
| 49.47           | 32.64               | 271.00  | V             | 108.00      | -13.71       | 40.00        | -7.36       |
| 36.57           | 24.67               | 152.00  | V             | 103.00      | -5.21        | 40.00        | -15.33      |
| 949.15          | 22.83               | 350.00  | H             | 261.00      | 5.54         | 46.00        | -23.17      |
| 923.93          | 22.79               | 254.00  | V             | 284.00      | 5.15         | 46.00        | -23.21      |
| 890.98          | 22.44               | 360.00  | V             | 104.00      | 4.65         | 46.00        | -23.56      |

|                   |                                         |
|-------------------|-----------------------------------------|
| <b>Test Mode:</b> | <b>Charging &amp; GFSK Transmitting</b> |
|-------------------|-----------------------------------------|

*Above 1 GHz*

**Note: Other Bluetooth modes were verified; only the result of worst case DH5 mode was presented.**

**Low Channel (2402 MHz)**

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Duty cycle Factor (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|------------------------|--------------------|---------------------|----------------|-------------|
| 4804            | 39.44               | AV               | V              | 33.83              | 4.87            | -3.55                  | 24                 | 50.59               | 54             | -3.41       |
| 4804            | 39.82               | AV               | H              | 33.83              | 4.87            | -3.55                  | 24                 | 50.97               | 54             | -3.03       |
| 4804            | 42.49               | PK               | V              | 33.83              | 4.87            | —                      | 24                 | 57.19               | 74             | -16.81      |
| 4804            | 43.11               | PK               | H              | 33.83              | 4.87            | —                      | 24                 | 57.81               | 74             | -16.19      |

Duty cycle factor=20log(Dwell time/100ms)=20log(2.89\*23/100)=-3.55

**Middle Channel (2441 MHz)**

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Duty cycle Factor (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|------------------------|--------------------|---------------------|----------------|-------------|
| 4880            | 40.29               | AV               | V              | 33.86              | 4.87            | -3.55                  | 24                 | 51.47               | 54             | -2.53       |
| 4880            | 40.08               | AV               | H              | 33.86              | 4.87            | -3.55                  | 24                 | 51.26               | 54             | -2.74       |
| 4880            | 43.24               | PK               | V              | 33.86              | 4.87            | —                      | 24                 | 57.97               | 74             | -16.03      |
| 4880            | 42.86               | PK               | H              | 33.86              | 4.87            | —                      | 24                 | 57.59               | 74             | -16.41      |

Duty cycle factor=20log(Dwell time/100ms)=20log(2.89\*23/100)=-3.55

**High Channel (2480 MHz)**

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Duty cycle Factor (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|------------------------|--------------------|---------------------|----------------|-------------|
| 4960            | 40.09               | AV               | V              | 33.9               | 4.87            | -3.55                  | 24                 | 51.31               | 54             | -2.69       |
| 4960            | 40.16               | AV               | H              | 33.9               | 4.87            | -3.55                  | 24                 | 51.38               | 54             | -2.62       |
| 4960            | 42.86               | PK               | V              | 33.9               | 4.87            | —                      | 24                 | 57.63               | 74             | -16.37      |
| 4960            | 43.93               | PK               | H              | 33.9               | 4.87            | —                      | 24                 | 58.7                | 74             | -15.3       |

Duty cycle factor=20log(Dwell time/100ms)=20log(2.89\*23/100)=-3.55

## **5.5 §15.247(a) (1)-Channel Separation**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions  

|                      |          |
|----------------------|----------|
| Temperature          | 24°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1008mbar |
3. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
4. Test date : June 13, 2014  
Tested By : Hank Li

### **Standard Requirement:**

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20dB 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.

### **Procedures:**

1. Place the EUT on the table and set it in hopping function transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span, Video (or Average) Bandwidth (VBW)  $\geq \text{RBW}$ , Sweep = auto, Detector function = peak, Trace = max hold.
5. Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

### **Test Result: Pass**

#### **Note:**

0: Low Channel

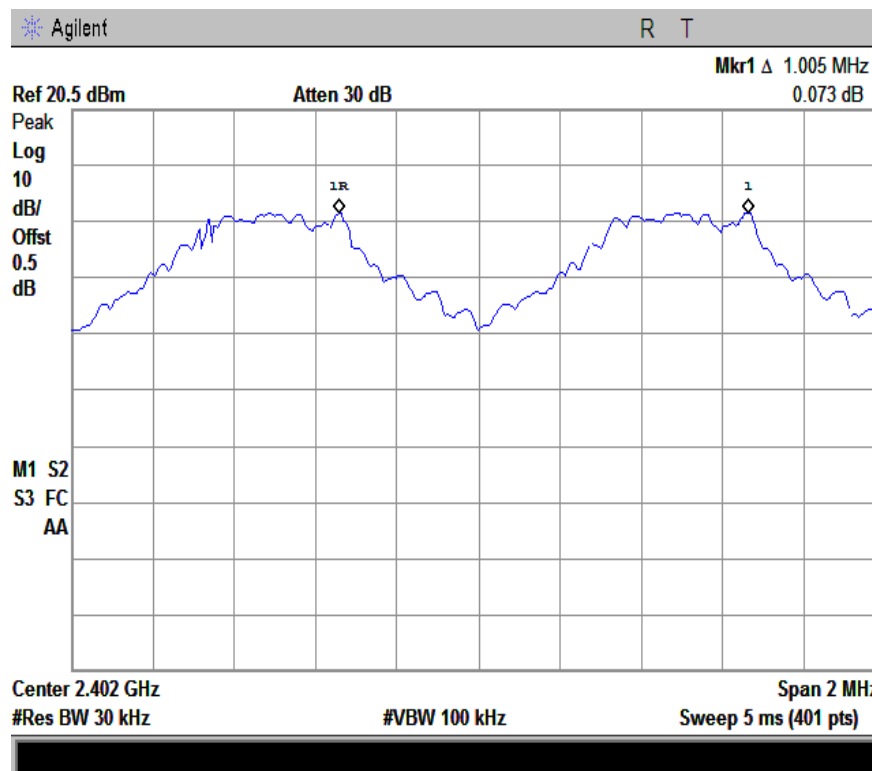
39: Middle Channel

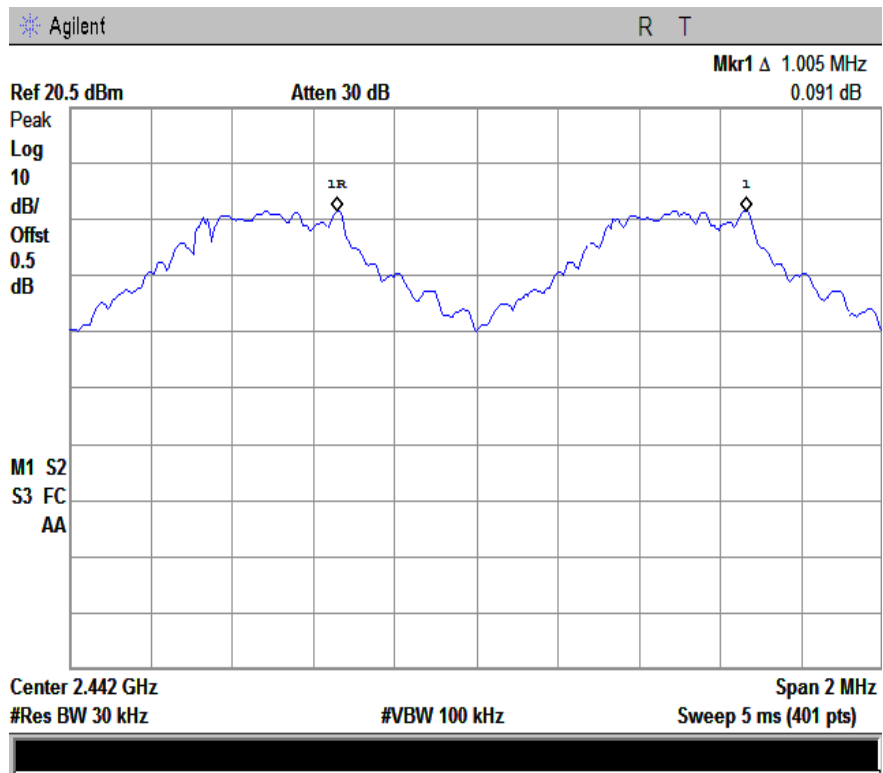
78: High Channel

|                   |                          |
|-------------------|--------------------------|
| <b>Test Mode:</b> | <b>GFSK Transmitting</b> |
|-------------------|--------------------------|

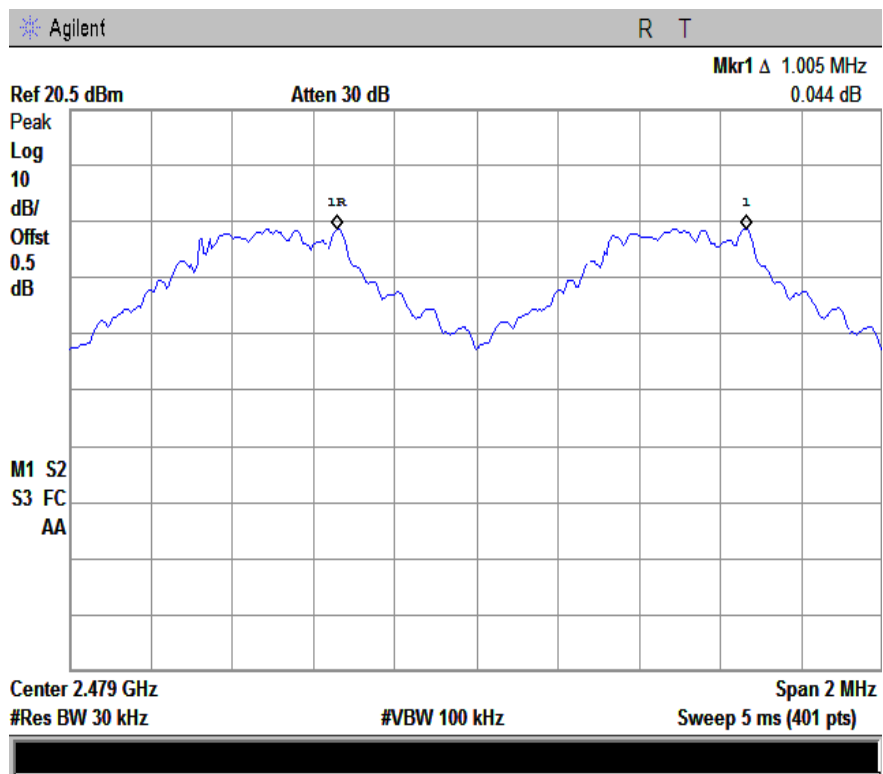
| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz) | Result |
|-------------------|-------------------------|--------------------------|-------------|--------|
| Low Channel       | 2402                    | 1.005                    | 0.965       | Pass   |
| Adjacency Channel | 2403                    |                          |             |        |
| Mid Channel       | 2440                    | 1.005                    | 0.967       | Pass   |
| Adjacency Channel | 2441                    |                          |             |        |
| High Channel      | 2480                    | 1.005                    | 0.964       | Pass   |
| Adjacency Channel | 2479                    |                          |             |        |

Please refer to the following plots.





1M-39

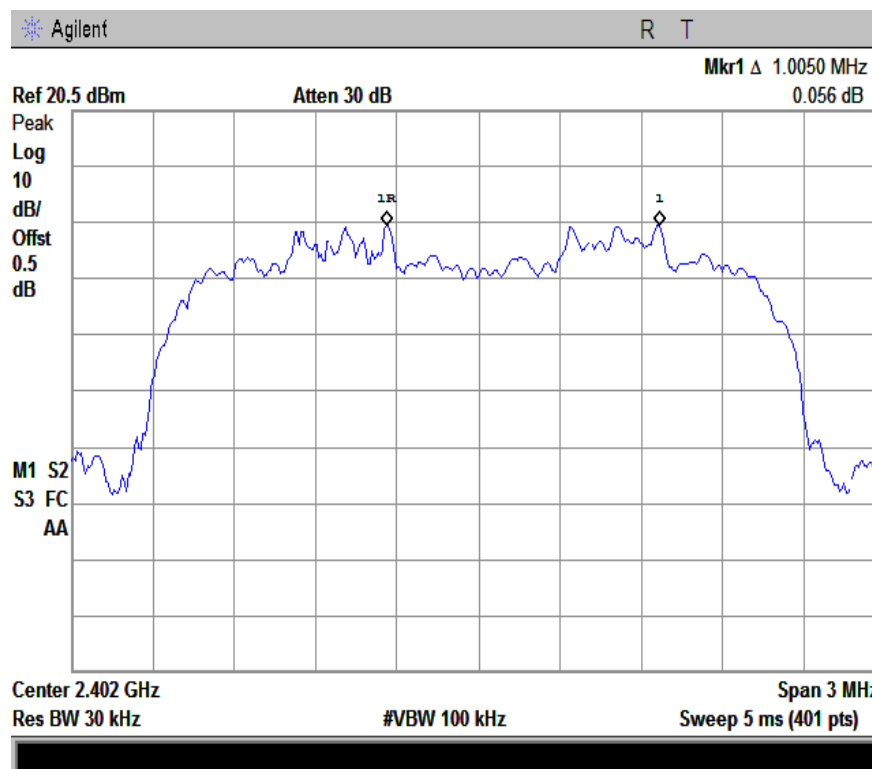


1M-78

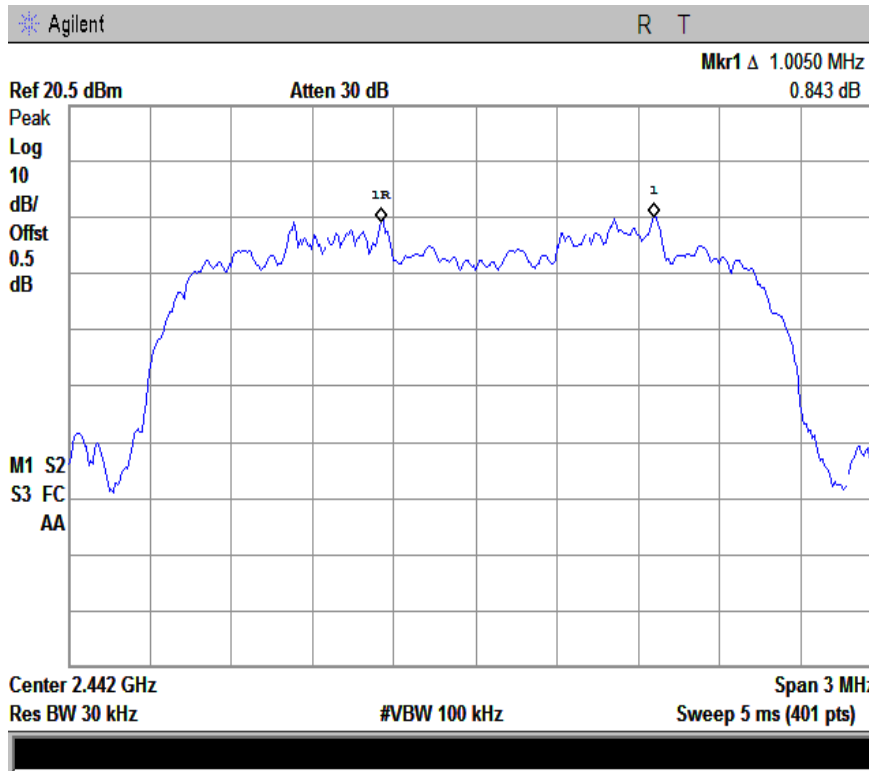
|                   |                                              |
|-------------------|----------------------------------------------|
| <b>Test Mode:</b> | <b><math>\pi/4</math> DQPSK Transmitting</b> |
|-------------------|----------------------------------------------|

| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz) | Result |
|-------------------|-------------------------|--------------------------|-------------|--------|
| Low Channel       | 2402                    | 1.005                    | 0.857       | Pass   |
| Adjacency Channel | 2403                    |                          |             |        |
| Mid Channel       | 2440                    | 1.005                    | 0.861       | Pass   |
| Adjacency Channel | 2441                    |                          |             |        |
| High Channel      | 2480                    | 1.005                    | 0.856       | Pass   |
| Adjacency Channel | 2479                    |                          |             |        |

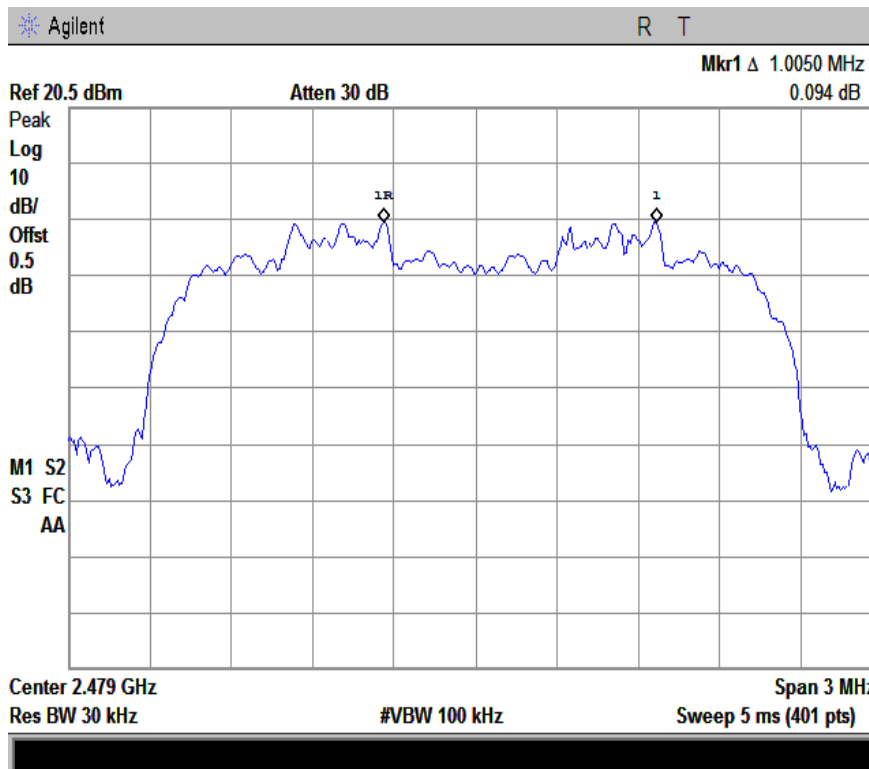
Please refer to the following plots.



2M-0



2M-39

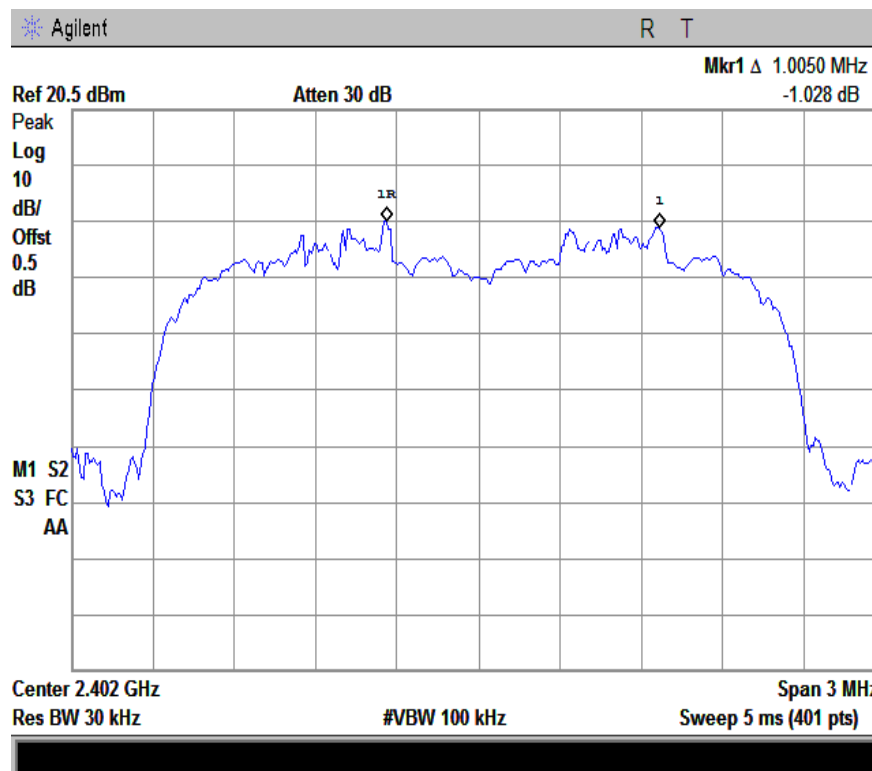


2M-78

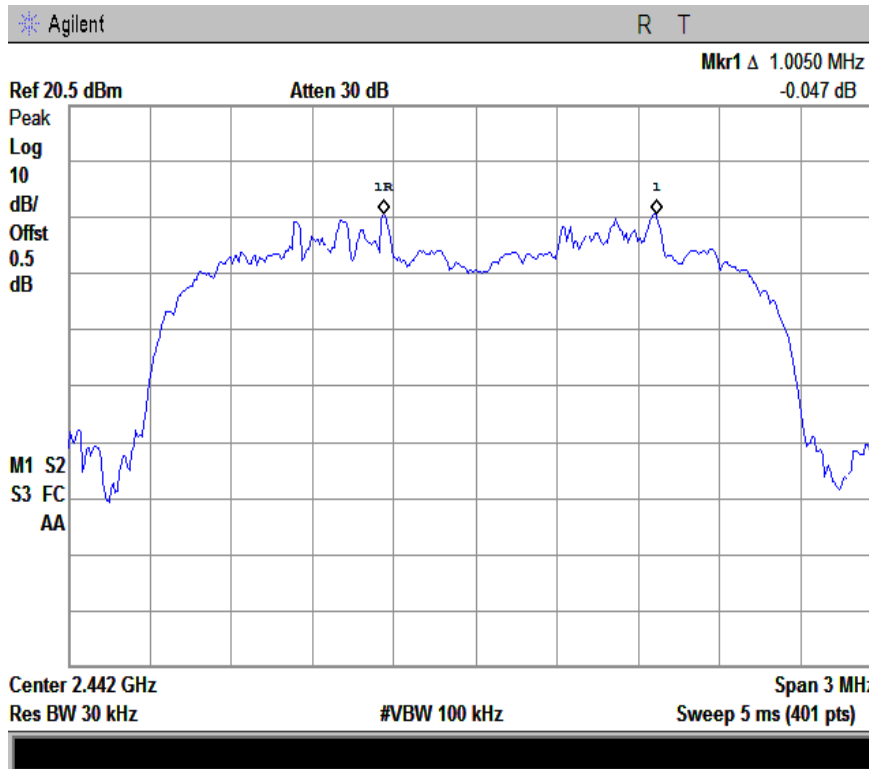
|                   |                           |
|-------------------|---------------------------|
| <b>Test Mode:</b> | <b>8DPSK Transmitting</b> |
|-------------------|---------------------------|

| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz) | Result |
|-------------------|-------------------------|--------------------------|-------------|--------|
| Low Channel       | 2402                    | 1.005                    | 0.867       | Pass   |
| Adjacency Channel | 2403                    |                          |             |        |
| Mid Channel       | 2440                    | 1.005                    | 0.858       | Pass   |
| Adjacency Channel | 2441                    |                          |             |        |
| High Channel      | 2480                    | 1.005                    | 0.860       | Pass   |
| Adjacency Channel | 2479                    |                          |             |        |

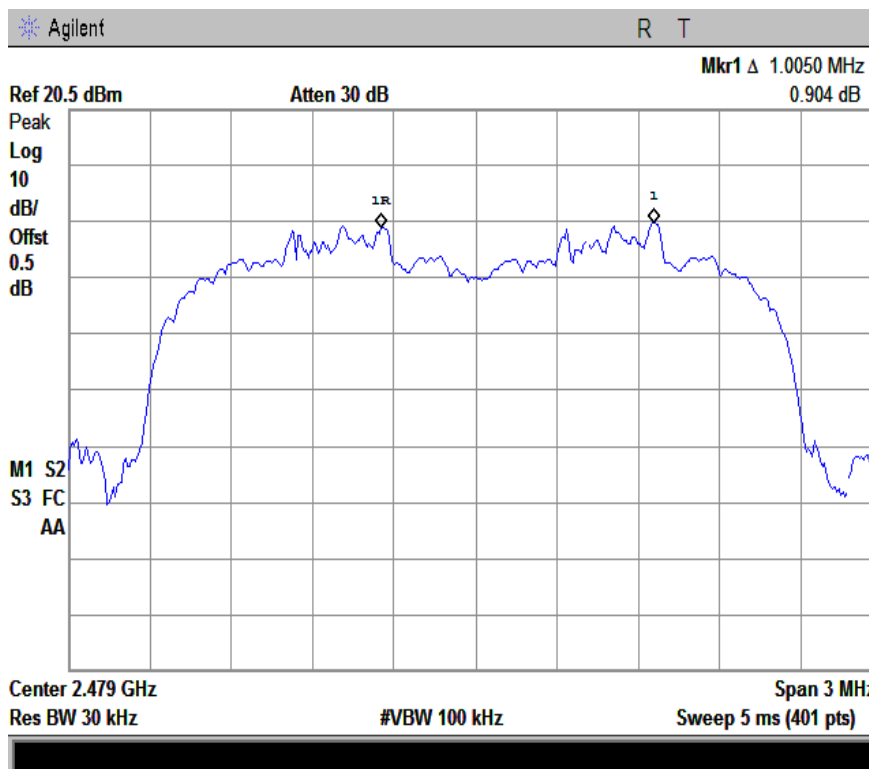
Please refer to the following plots.



3M-0



3M-39



3M-78

## **§15.247(a) (1) – 20dB Bandwidth**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 24°C     |
| Relative Humidity    | 58%      |
| Atmospheric Pressure | 1016mbar |
3. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
4. Test date : June 12, 2014  
Tested By : Hank Li

### **Standard Requirement:**

According to §15.247(a)(1), 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.

### **Procedures:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel,  $\text{RBW} \geq 1\%$  of the 20 dB bandwidth,  $\text{VBW} \geq \text{RBW}$ , Sweep = auto, Detector function = peak, Trace = max hold.
4. Set the measured low, middle and high frequency and test 20dB bandwidth with spectrum analyzer.

### **Test Result: Pass**

#### **Note:**

0: Low Channel

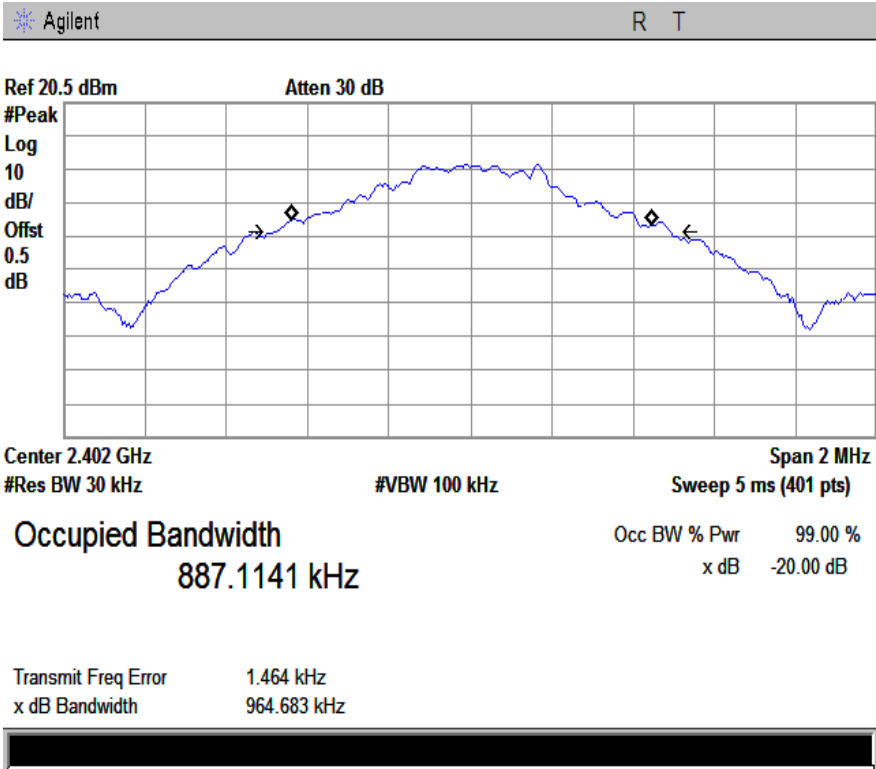
39: Middle Channel

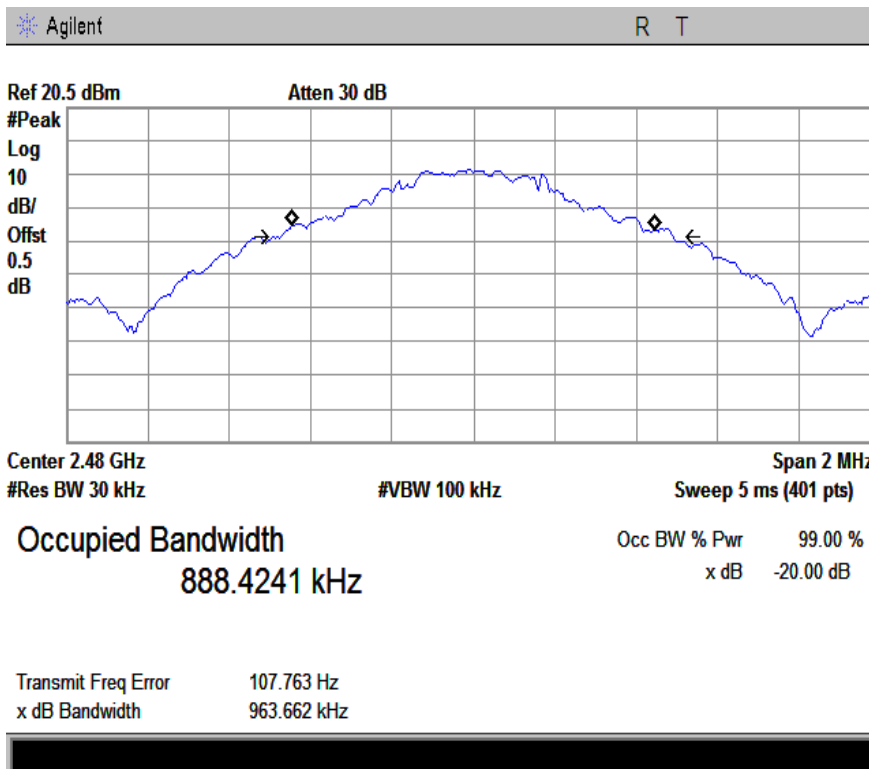
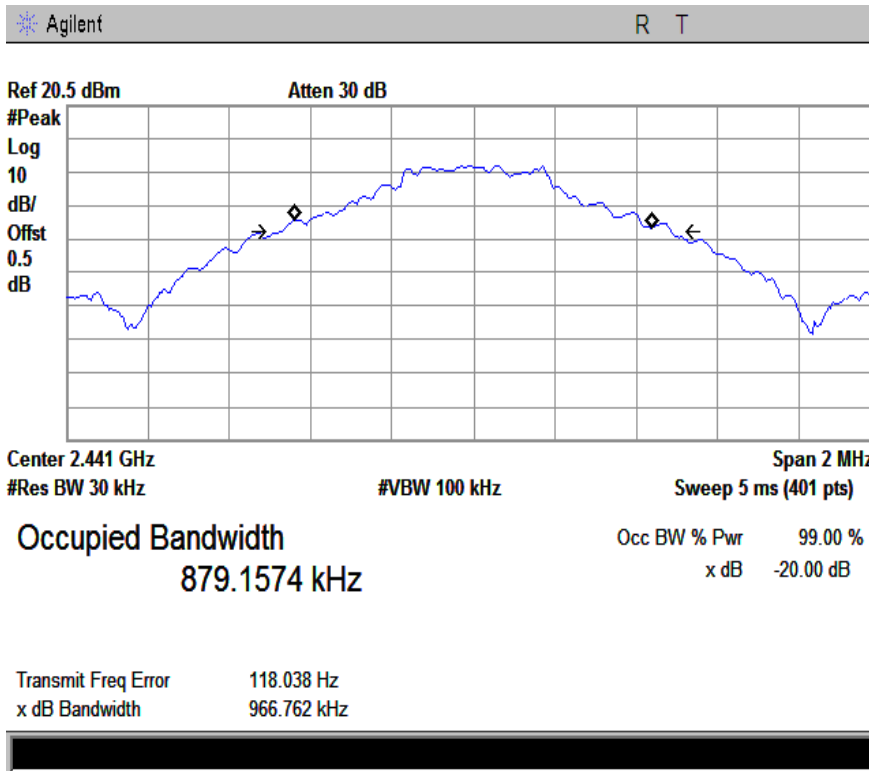
78: High Channel

|            |                   |
|------------|-------------------|
| Test Mode: | GFSK Transmitting |
|------------|-------------------|

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 2402            | 0.965                 |
| Middle  | 2441            | 0.967                 |
| High    | 2480            | 0.964                 |

Please refer to the following plots.

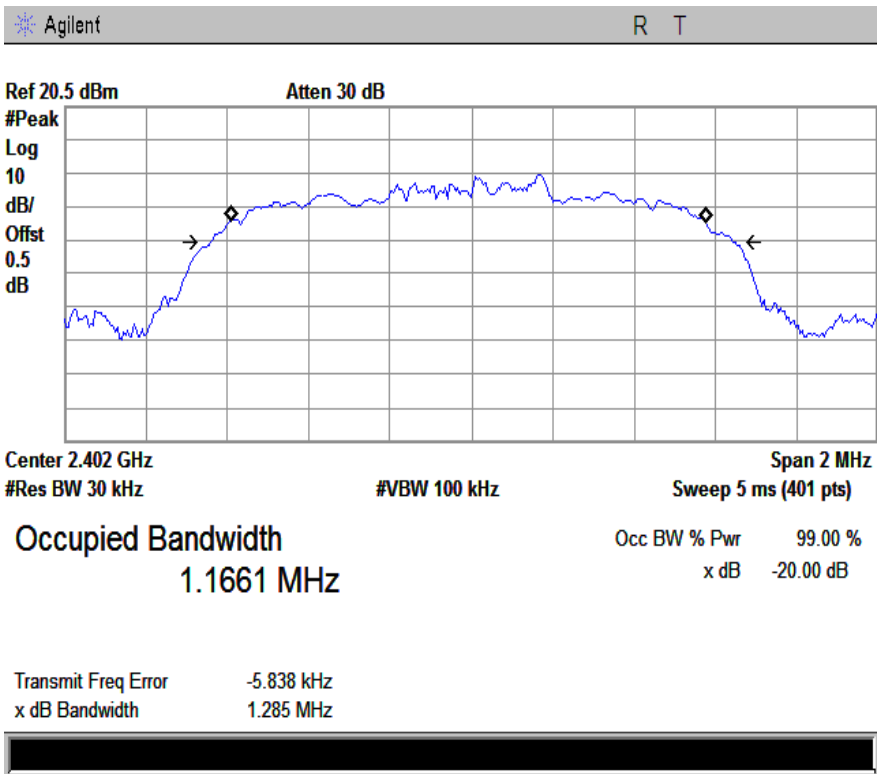




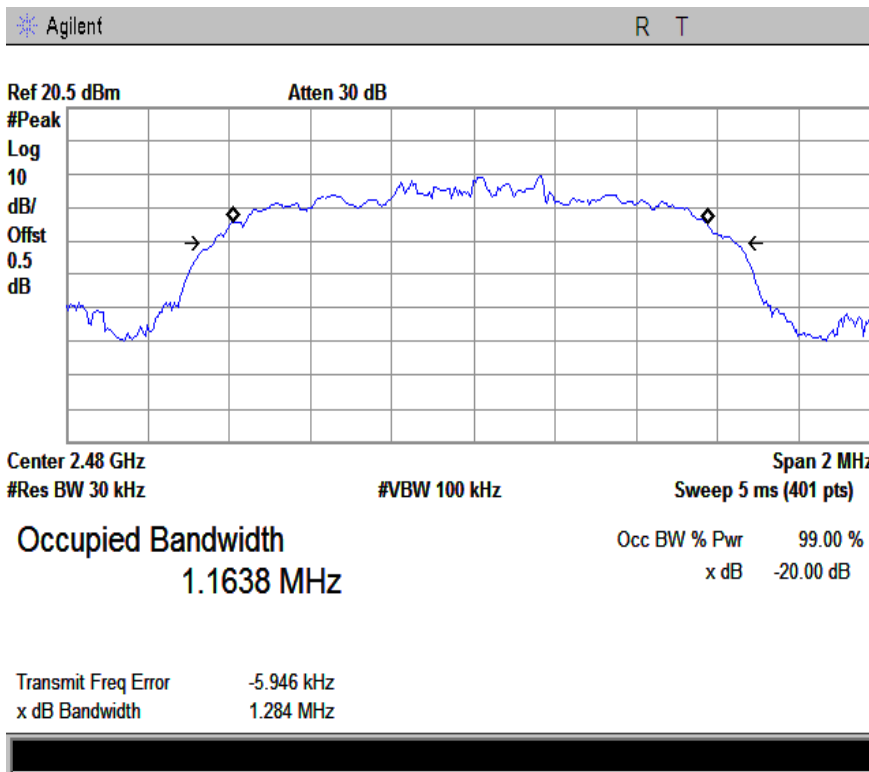
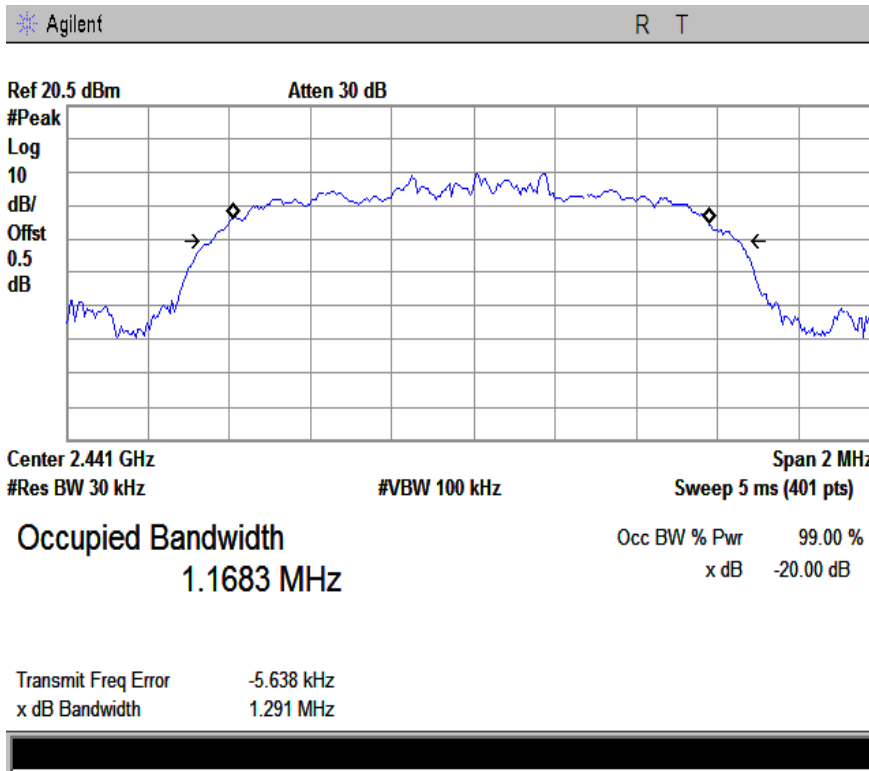
|                   |                                              |
|-------------------|----------------------------------------------|
| <b>Test Mode:</b> | <b><math>\pi</math> /4DQPSK Transmitting</b> |
|-------------------|----------------------------------------------|

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 2402            | 1.285                 |
| Middle  | 2441            | 1.291                 |
| High    | 2480            | 1.284                 |

Please refer to the following plots.



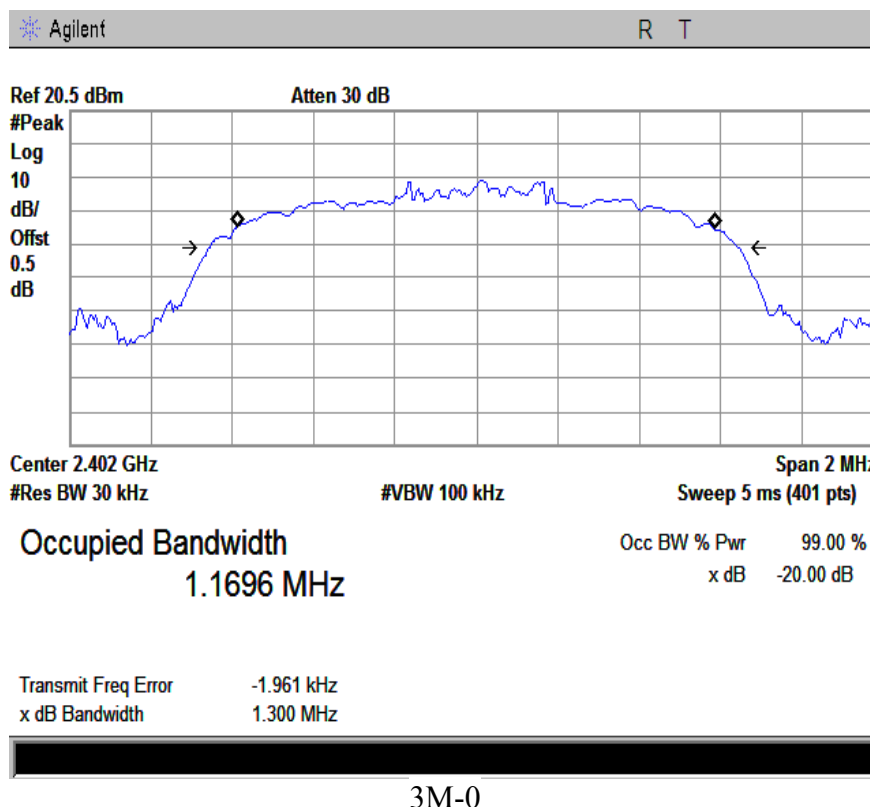
2M-0

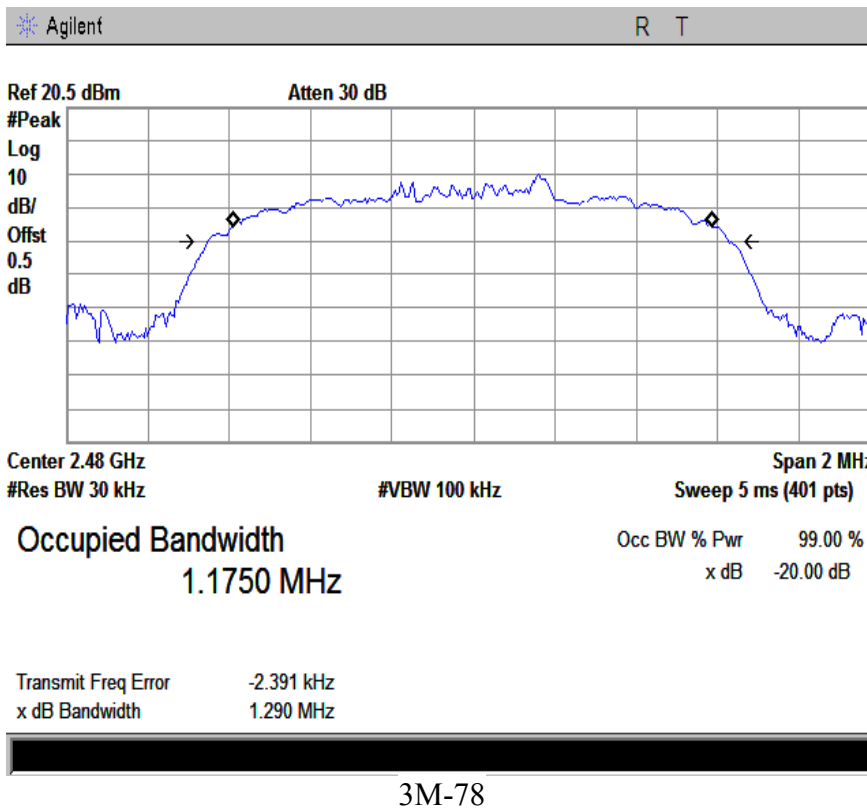
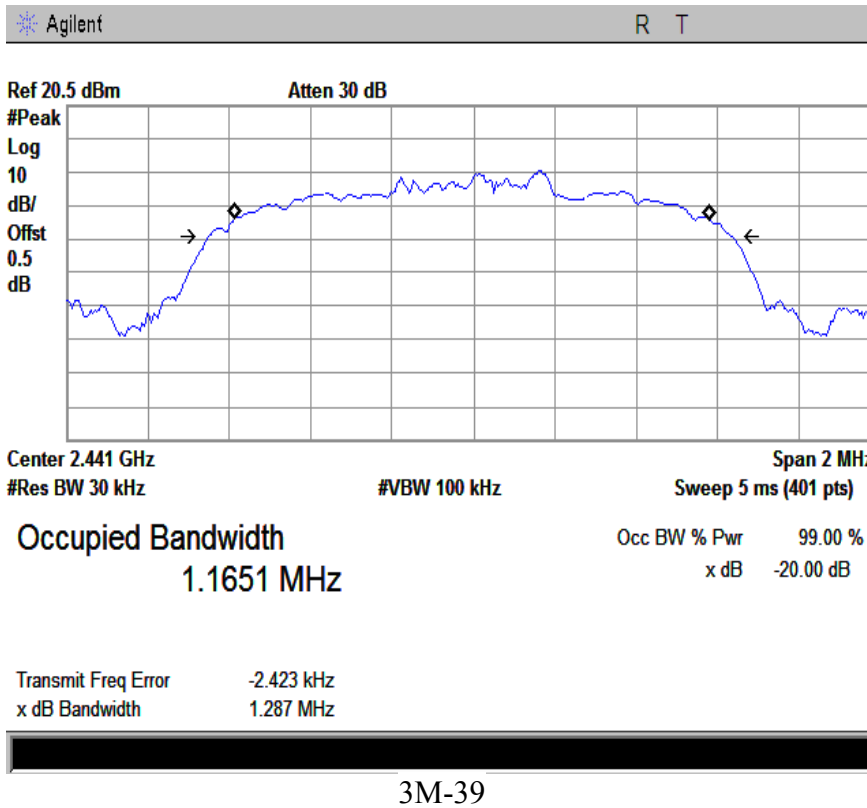


|                   |                           |
|-------------------|---------------------------|
| <b>Test Mode:</b> | <b>8DPSK Transmitting</b> |
|-------------------|---------------------------|

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------|-----------------|-----------------------|
| Low     | 2402            | 1.300                 |
| Middle  | 2441            | 1.287                 |
| High    | 2480            | 1.290                 |

Please refer to the following plots.





## **5.6 §15.247(a) (1) (iii)-Number of Hopping Channels**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 24°C     |
| Relative Humidity    | 57%      |
| Atmospheric Pressure | 1008mbar |
4. Test date : June 13, 2014  
Tested By : Hank Li

### **Standard Requirement:**

According to §15.247(a)(1)(iii), Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

### **Procedures:**

1. Place the EUT on the table and set it in hopping function transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Start=2400MHz, Stop = 2483.5MHz, Span = the frequency band of operation, RBW  $\geq 1\%$  of the span, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold.
4. Count the quantity of peaks to get the number of hopping channels.

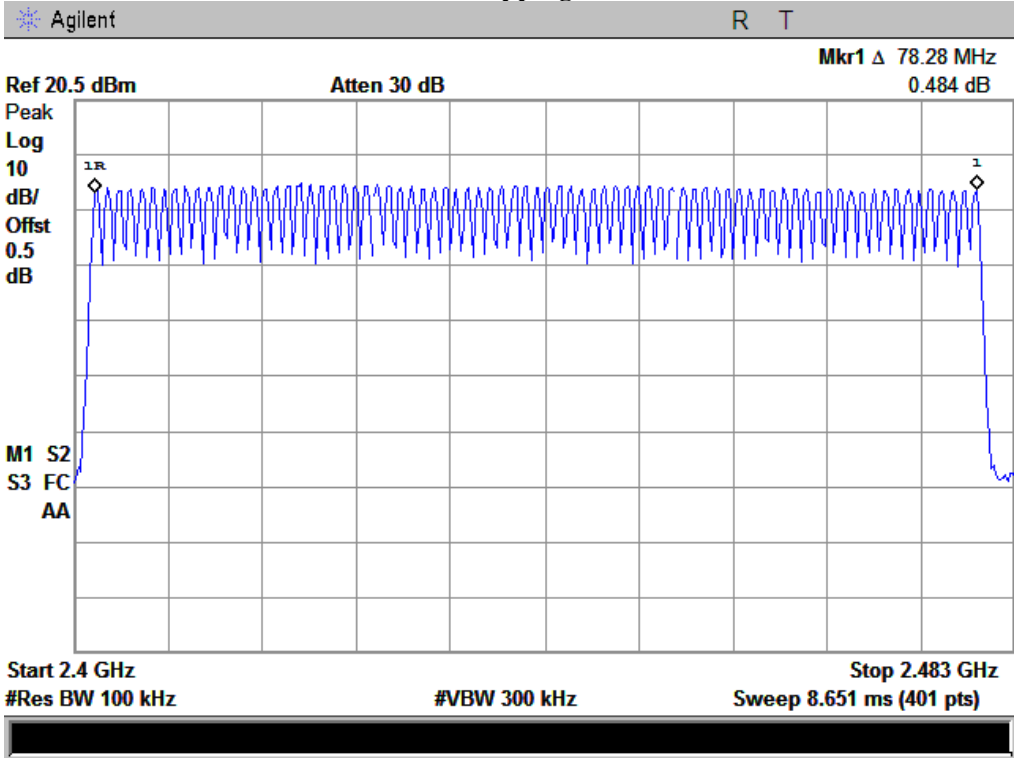
**Test Result: Pass**

|                   |                                          |
|-------------------|------------------------------------------|
| <b>Test Mode:</b> | <b>Hopping Mode With GFSK Modulation</b> |
|-------------------|------------------------------------------|

| Frequency Range<br>(MHz) | Number of<br>Hopping Channels | Limit     |
|--------------------------|-------------------------------|-----------|
| 2400-2483.5              | 79                            | $\geq 15$ |

**Please refer to following tables and plots**

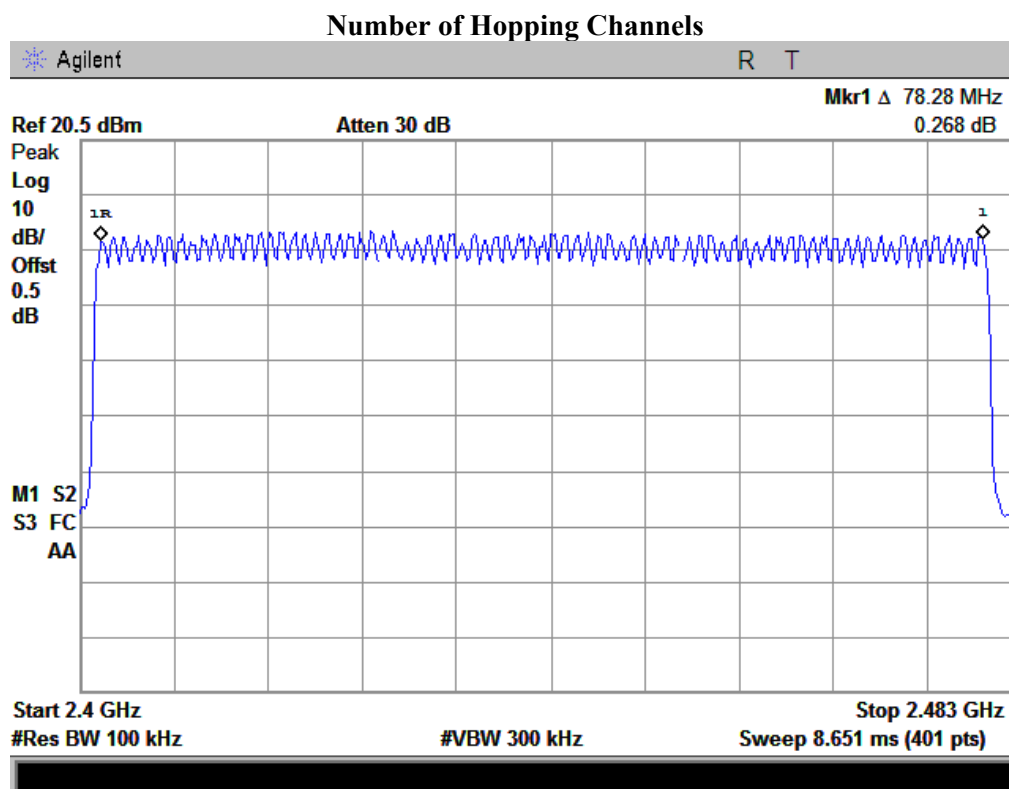
Number of Hopping Channels



|                   |                                                              |
|-------------------|--------------------------------------------------------------|
| <b>Test Mode:</b> | <b>Hopping Mode With <math>\pi</math> /4DQPSK Modulation</b> |
|-------------------|--------------------------------------------------------------|

| Frequency Range<br>(MHz) | Number of<br>Hopping Channels | Limit     |
|--------------------------|-------------------------------|-----------|
| 2400-2483.5              | 79                            | $\geq 15$ |

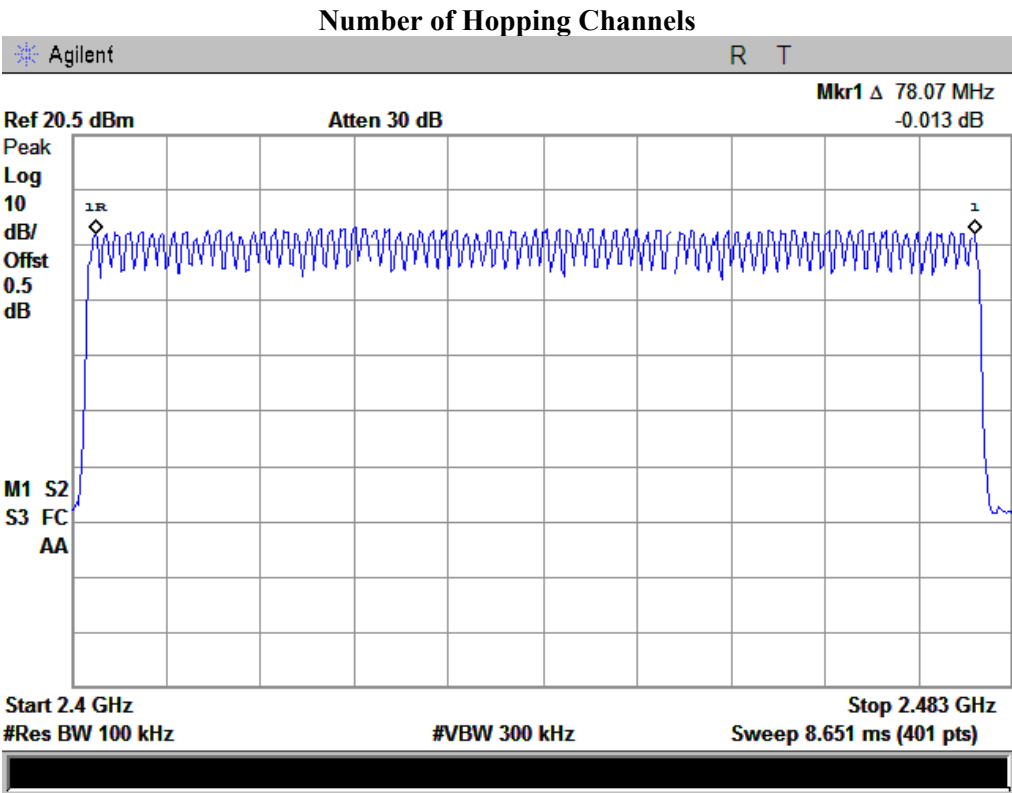
Please refer to following tables and plots



|                   |                                           |
|-------------------|-------------------------------------------|
| <b>Test Mode:</b> | <b>Hopping Mode With 8DPSK Modulation</b> |
|-------------------|-------------------------------------------|

| Frequency Range (MHz) | Number of Hopping Channels | Limit |
|-----------------------|----------------------------|-------|
| 2400-2483.5           | 79                         | ≥15   |

Please refer to following tables and plots



## **5.7 §15.247(a) (1) (iii) -Time of Occupancy (Dwell Time)**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 58%      |
| Atmospheric Pressure | 1020mbar |
4. Test date : June 20, 2014  
Tested By : Hank Li

### **Standard Requirement:**

According to §15.247(a)(1)(iii), The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### **Procedures:**

1. Place the EUT on the table and set it in transmitting mode and switch on frequency hopping function.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = zero span, centered on a hopping channel,  
RBW=1MHz, VBW  $\geq$  RBW, Sweep = as necessary to capture the entire dwell time per hopping channel, Detector function = peak, Trace = max hold.
4. Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts.

### **Test Result: Pass**

#### **Note:**

0: Low Channel

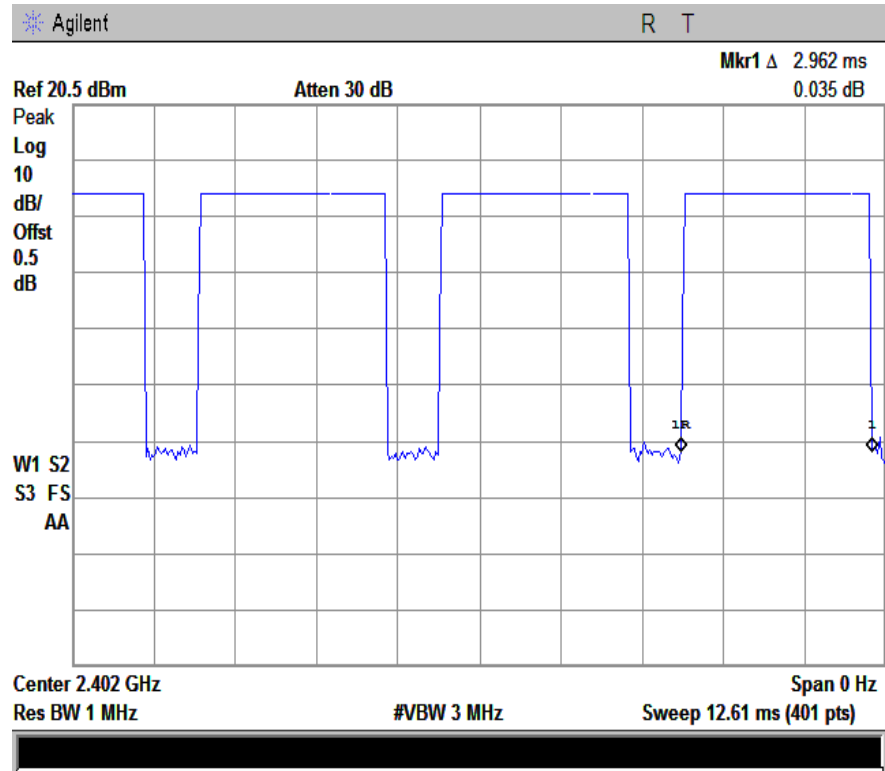
39: Middle Channel

78: High Channel

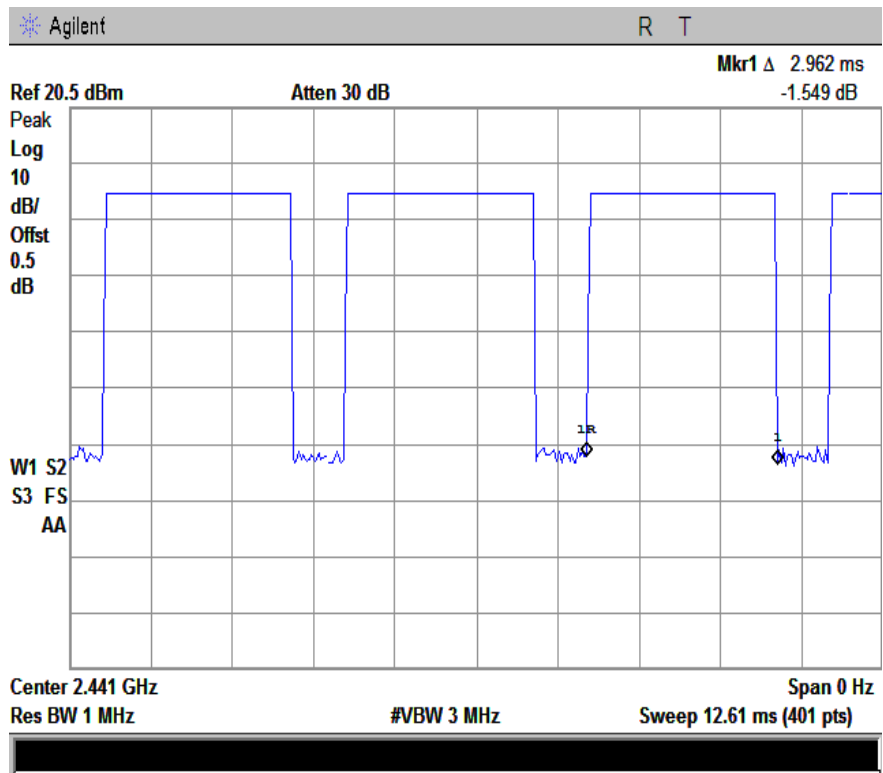
|                   |                                          |
|-------------------|------------------------------------------|
| <b>Test Mode:</b> | <b>Hopping Mode With GFSK Modulation</b> |
|-------------------|------------------------------------------|

| Mode        | Channel                                                                 | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|-------------|-------------------------------------------------------------------------|------------------|----------------|-----------|--------|
| <b>DH 5</b> | Low                                                                     | 2.962            | 0.316          | 0.4       | Pass   |
|             | Middle                                                                  | 2.962            | 0.316          | 0.4       | Pass   |
|             | High                                                                    | 2.962            | 0.316          | 0.4       | Pass   |
|             | <i>Note:</i> Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) × 31.6 Second |                  |                |           |        |

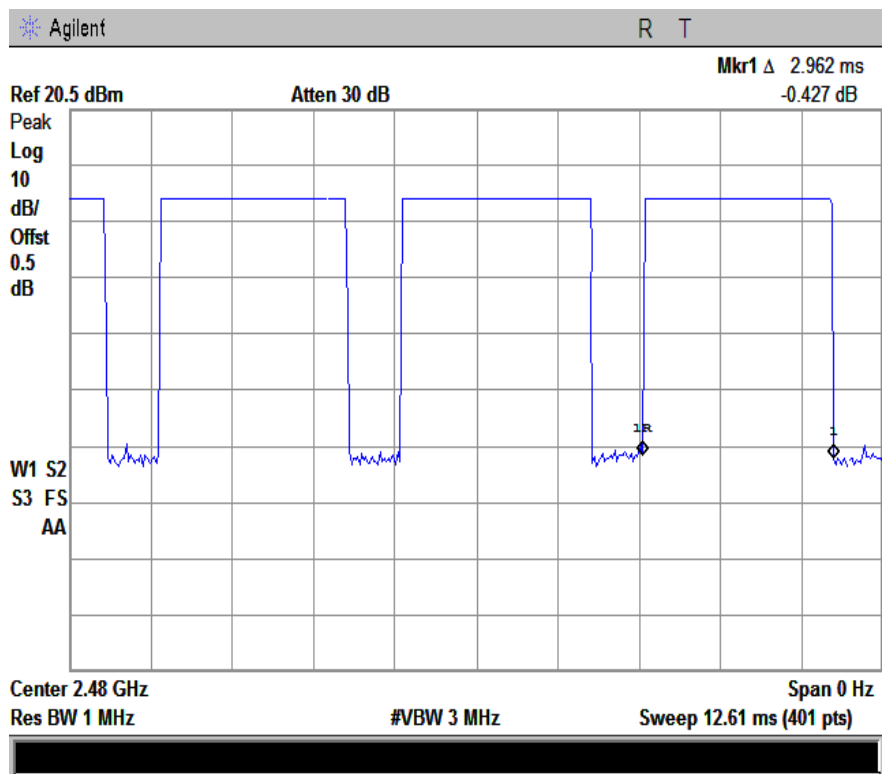
Please refer to the following plots.



1M-0



1M-39

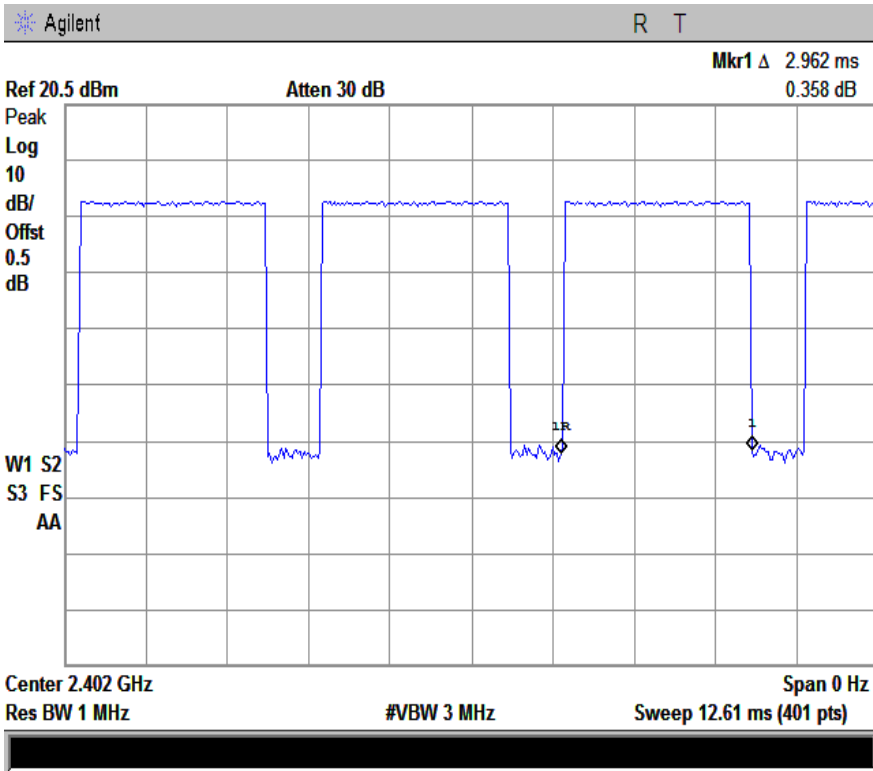


1M-78

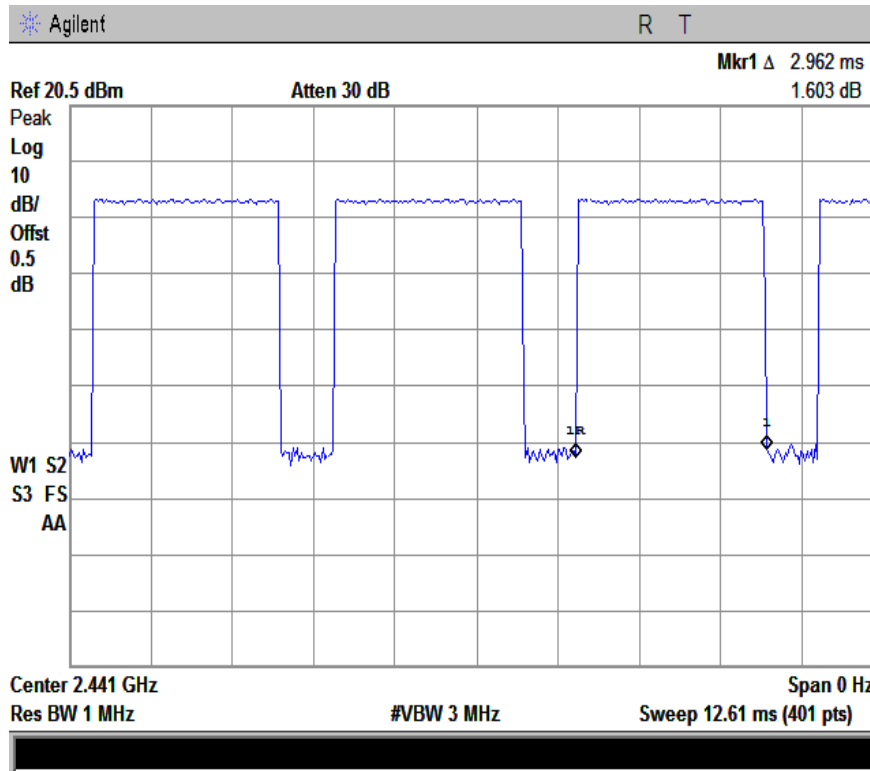
|            |                                            |
|------------|--------------------------------------------|
| Test Mode: | Hopping Mode With $\pi$ /4DQPSK Modulation |
|------------|--------------------------------------------|

| Mode  | Channel                                                         | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|-------|-----------------------------------------------------------------|------------------|----------------|-----------|--------|
| 2DH 5 | Low                                                             | 2.962            | 0.316          | 0.4       | Pass   |
|       | Middle                                                          | 2.962            | 0.316          | 0.4       | Pass   |
|       | High                                                            | 2.962            | 0.316          | 0.4       | Pass   |
|       | Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second |                  |                |           |        |

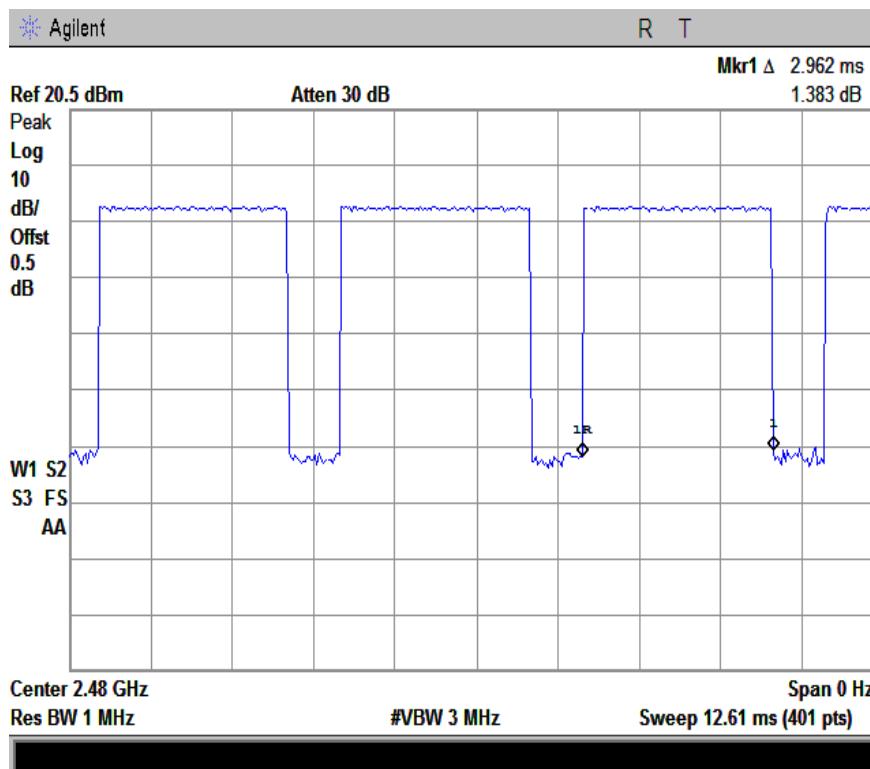
Please refer to the following plots.



2M-0



2M-39

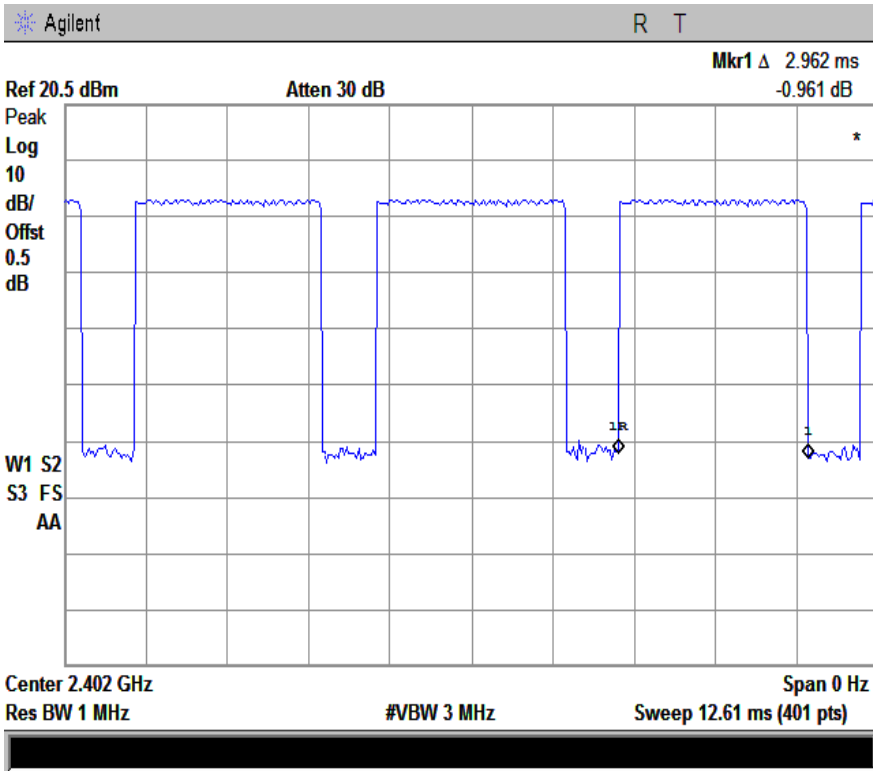


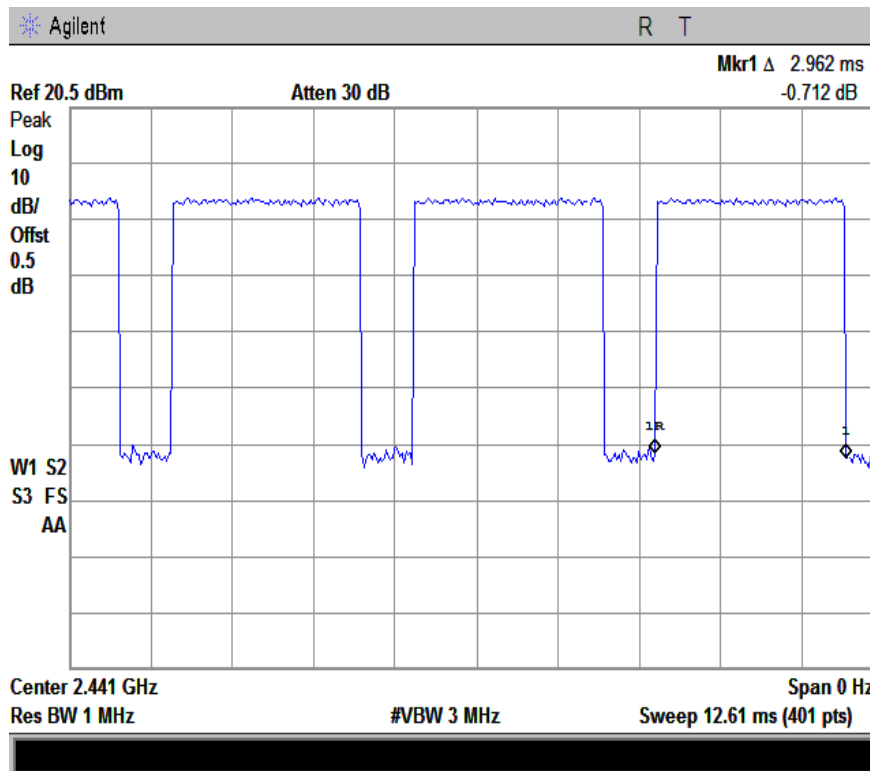
2M-78

|                   |                                           |
|-------------------|-------------------------------------------|
| <b>Test Mode:</b> | <b>Hopping Mode With 8DPSK Modulation</b> |
|-------------------|-------------------------------------------|

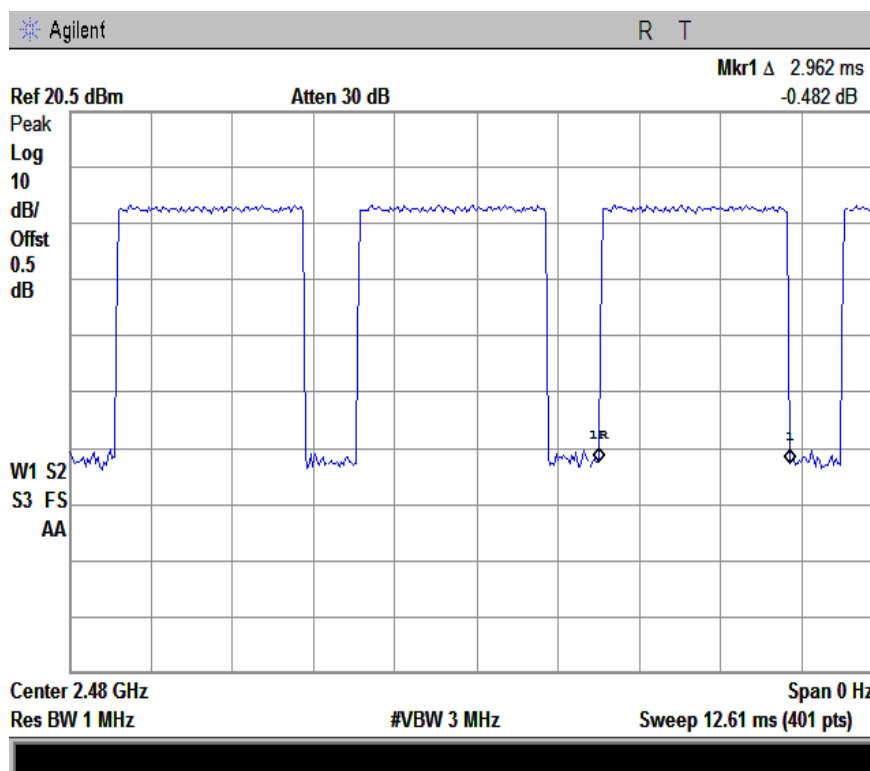
| Mode  | Channel                                                                | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|-------|------------------------------------------------------------------------|------------------|----------------|-----------|--------|
| 3DH 5 | Low                                                                    | 2.962            | 0.316          | 0.4       | Pass   |
|       | Middle                                                                 | 2.962            | 0.316          | 0.4       | Pass   |
|       | High                                                                   | 2.962            | 0.316          | 0.4       | Pass   |
|       | <i>Note:</i> Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second |                  |                |           |        |

Please refer to the following plots.





3M-39



3M-78

## **5.8 §15.247(b) (1) - Peak Output Power**

1. Conducted Measurement  
EUT was set for low, mid, high channel with modulated mode and highest RF output power.  
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is  $\pm 1.5\text{dB}$ .
3. Environmental Conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23°C     |
| Relative Humidity    | 56%      |
| Atmospheric Pressure | 1015mbar |
4. Test date : June 16, 2014  
Tested By : Hank Li

### **Standard Requirement:**

According to §15.247(b)(2), For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125watts.

### **Procedures:**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel, RBW > the 20 dB bandwidth of the emission being measured, VBW  $\geq$  RBW, Sweep=auto, Detector function=peak, Trace = max hold.
4. Then set the EUT to transmit at low, middle and high channel and measure the conducted output power separately.

### **Test Result: Pass**

#### **Note:**

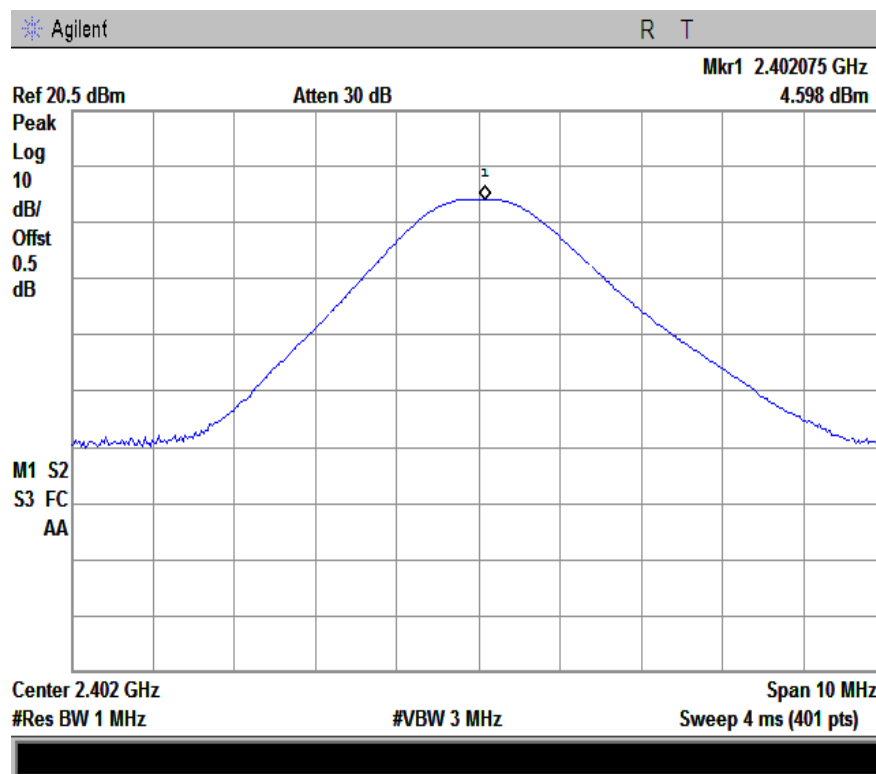
0: Low Channel  
39: Middle Channel  
78: High Channel

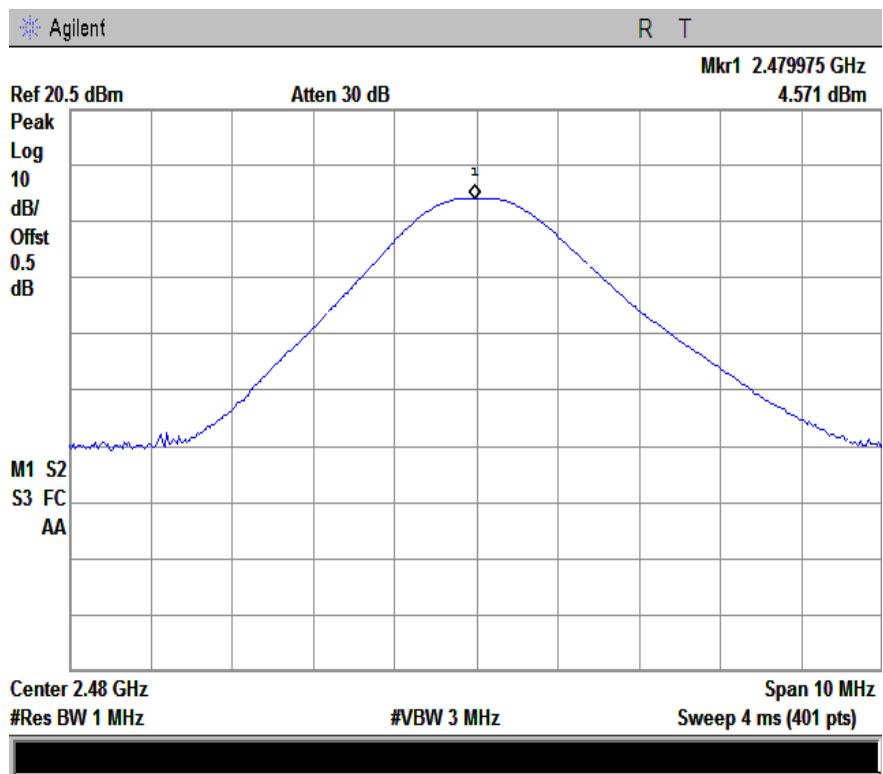
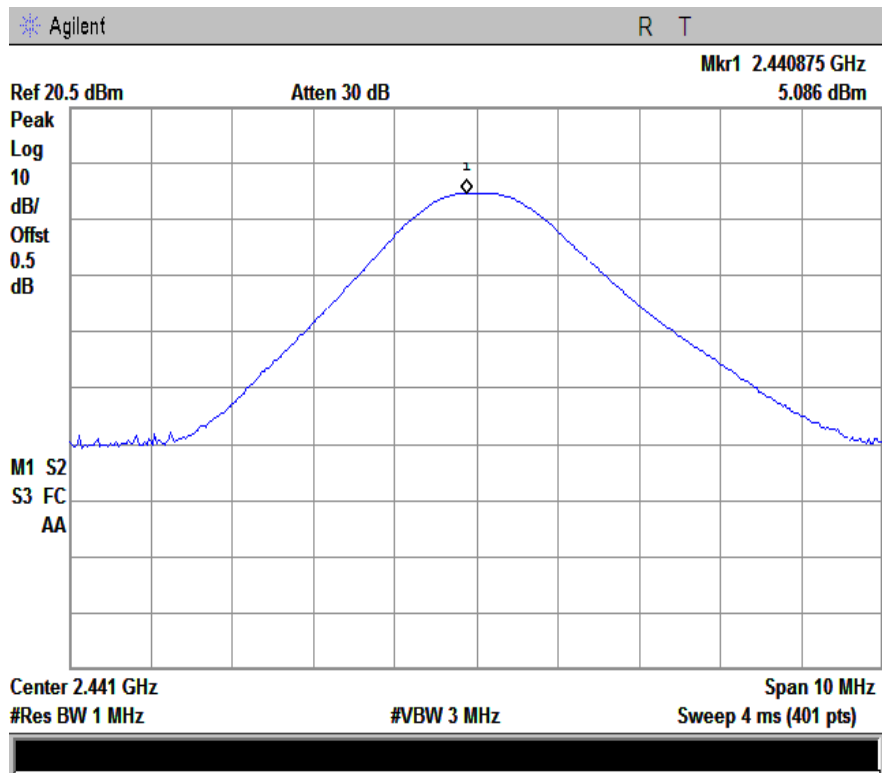
|                   |                          |
|-------------------|--------------------------|
| <b>Test Mode:</b> | <b>GFSK Transmitting</b> |
|-------------------|--------------------------|

| Channel        | Channel frequency (MHz) | Peak output power (dBm) | Power output (mW) | Limit (mW) |
|----------------|-------------------------|-------------------------|-------------------|------------|
| Low channel    | 2402                    | 4.598                   | 2.883             | 1000       |
| Middle channel | 2441                    | 5.086                   | 3.226             | 1000       |
| High channel   | 2480                    | 4.571                   | 2.845             | 1000       |

Please refer to the following plots.

**Note:** The data above was tested in conducted mode.

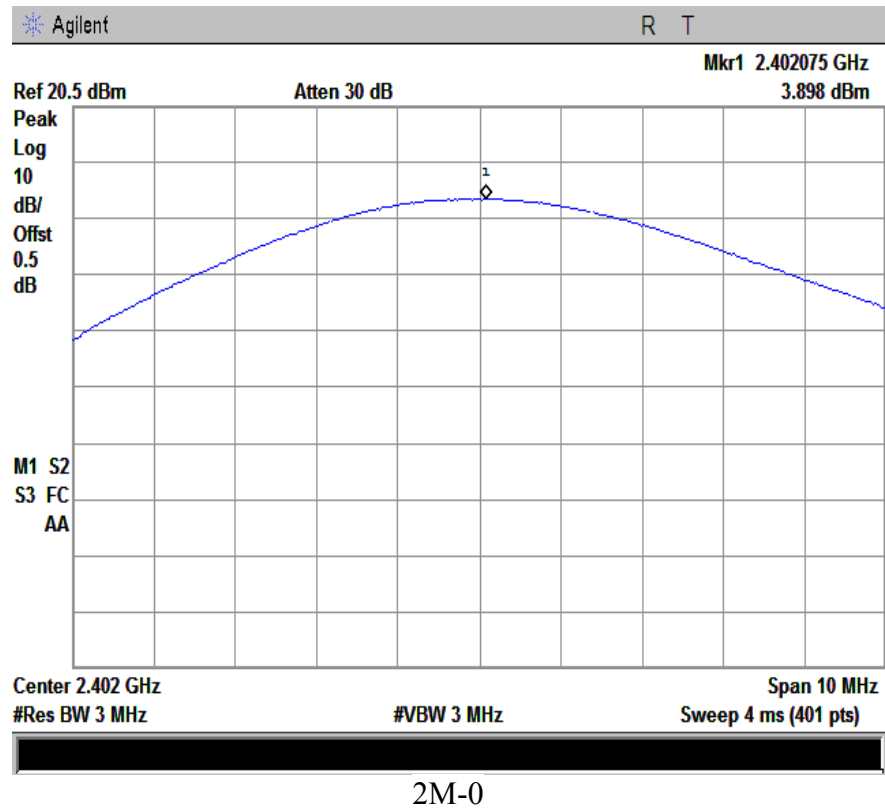


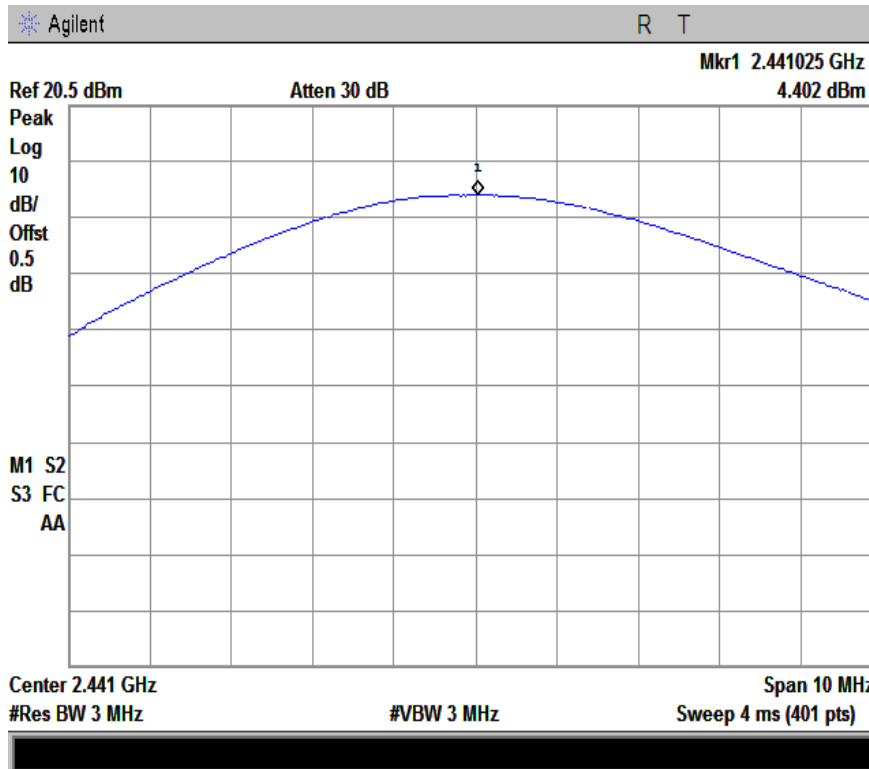


|            |                            |
|------------|----------------------------|
| Test Mode: | $\pi$ /4DQPSK Transmitting |
|------------|----------------------------|

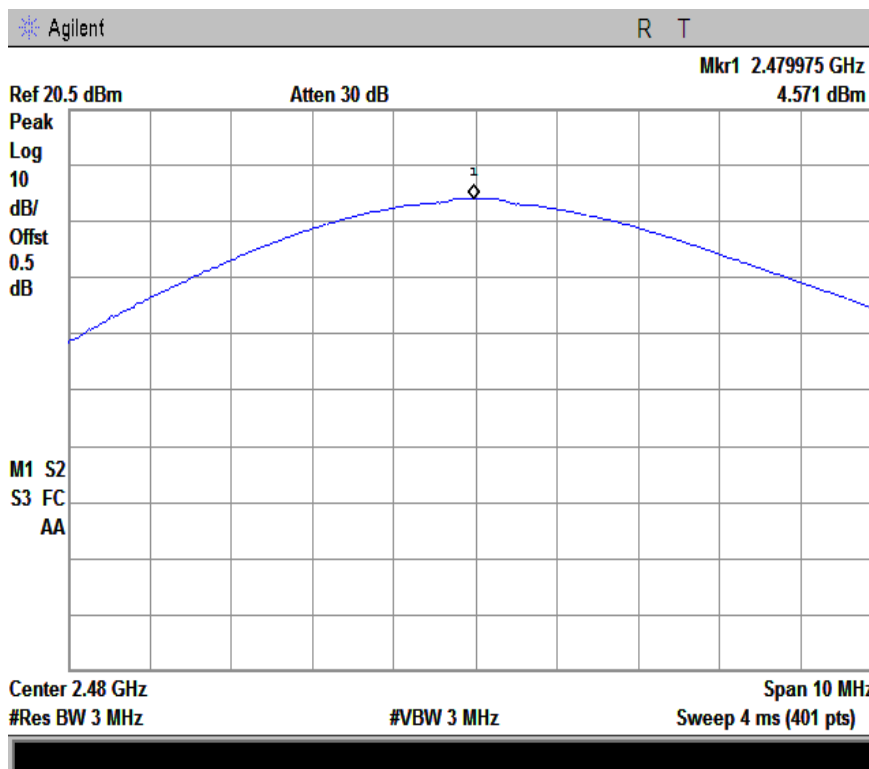
| Channel        | Channel frequency (MHz) | Peak output power (dBm) | Power output (mW) | Limit (mW) |
|----------------|-------------------------|-------------------------|-------------------|------------|
| Low channel    | 2402                    | 3.898                   | 2.454             | 125        |
| Middle channel | 2441                    | 4.402                   | 2.755             | 125        |
| High channel   | 2480                    | 4.571                   | 2.865             | 125        |

Please refer to the following plots.  
**Note:** The data above was tested in conducted mode.





2M-39



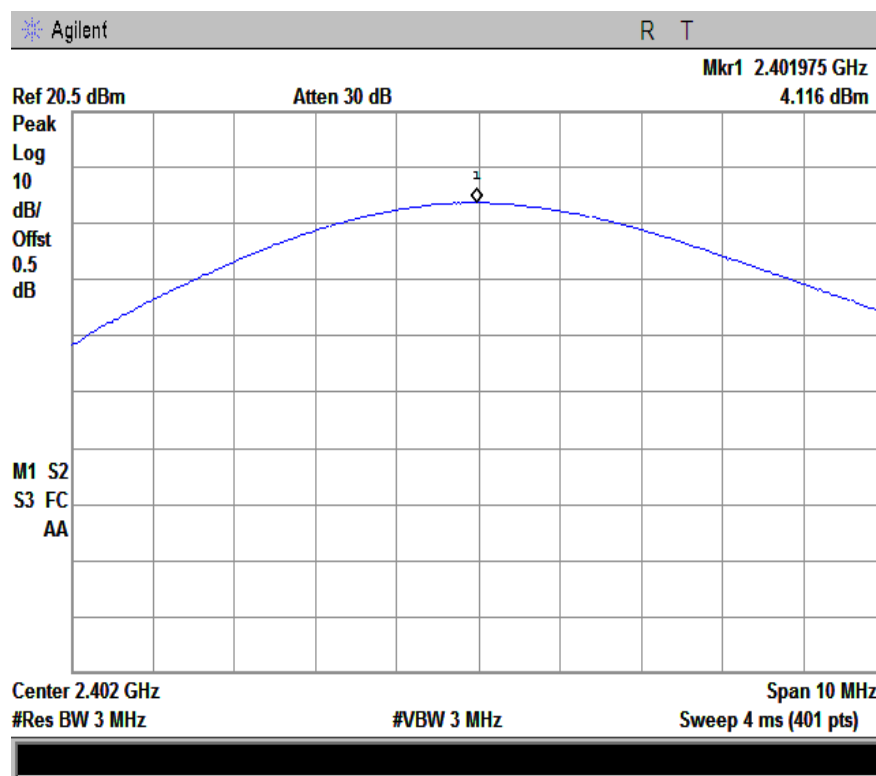
2M-78

|                   |                           |
|-------------------|---------------------------|
| <b>Test Mode:</b> | <b>8DPSK Transmitting</b> |
|-------------------|---------------------------|

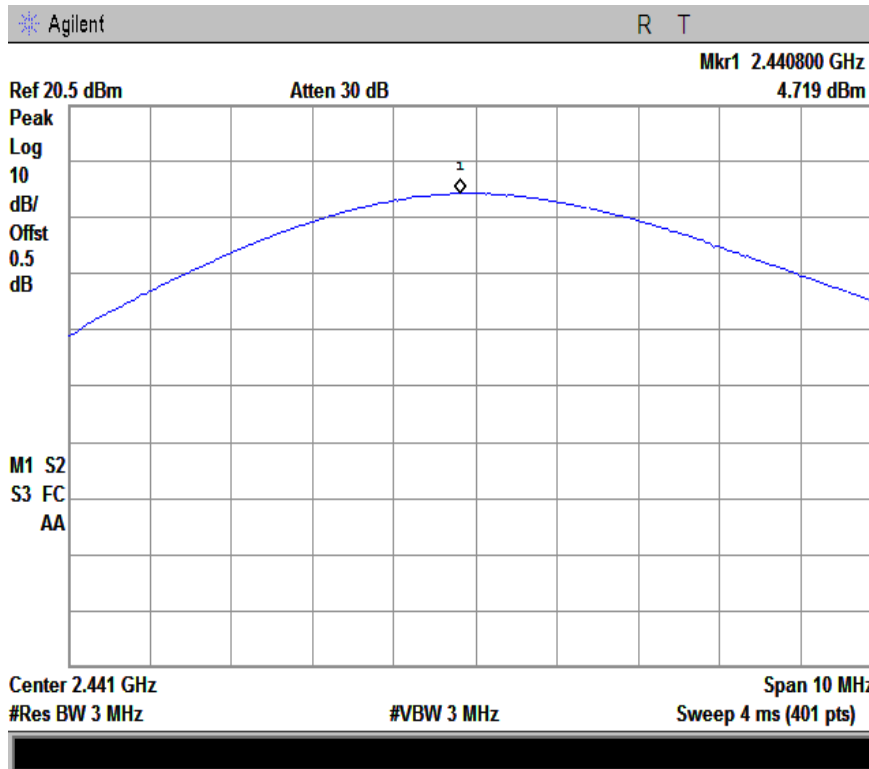
| Channel        | Channel frequency (MHz) | Peak output power (dBm) | Power output (mW) | Limit (mW) |
|----------------|-------------------------|-------------------------|-------------------|------------|
| Low channel    | 2402                    | 4.116                   | 2.580             | 125        |
| Middle channel | 2441                    | 4.719                   | 2.964             | 125        |
| High channel   | 2480                    | 4.196                   | 2.628             | 125        |

Please refer to the following plots.

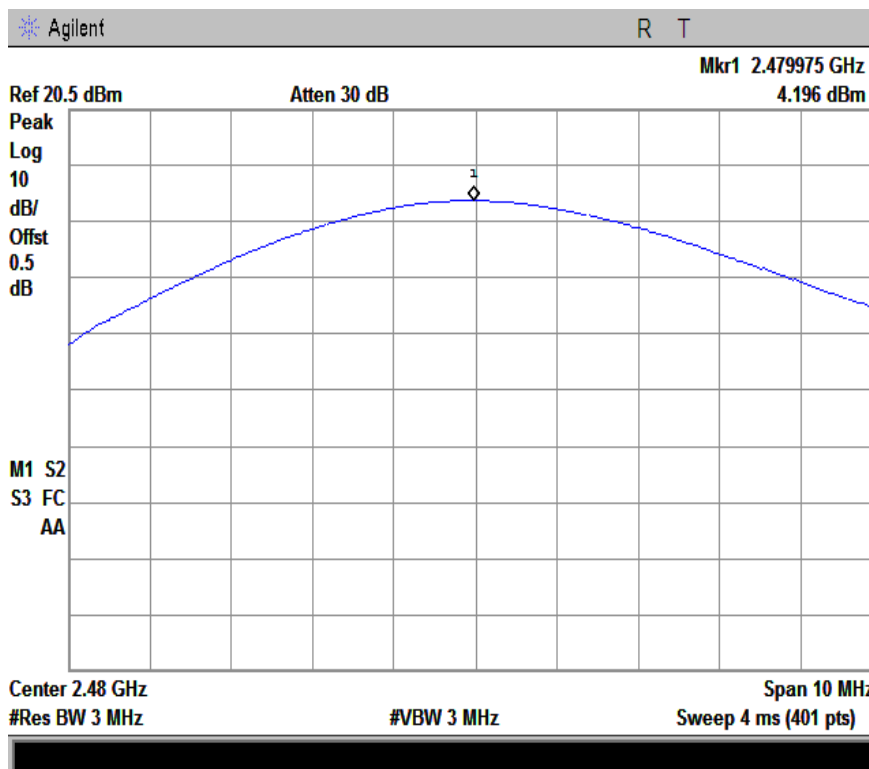
**Note:** The data above was tested in conducted mode.



3M-0



3M-39



3M-78

## **5.9 §15.247(d) - Band Edge**

### **Standard Requirement:**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### **Procedures: (Radiated Method Only)**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:
  - a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.
  - b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
  - c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz.

☒ 1 kHz (Duty cycle < 98%)      ☐ 10 Hz (Duty cycle > 98%)
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

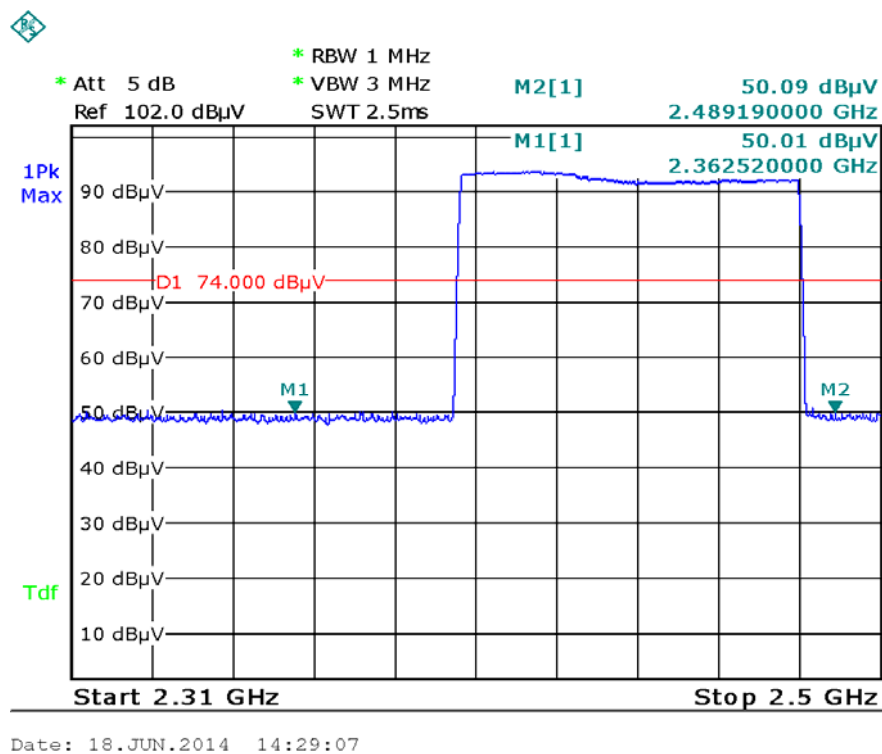
### **Note:**

For Hopping device, should test hopping mode and CW Tx mode separately. For hopping mode, find out the worst points outside the frequency band firstly, then set the worst points as the center frequency, use above average 3 (c) spectrum analyzer set, find out the final worst average value separately.

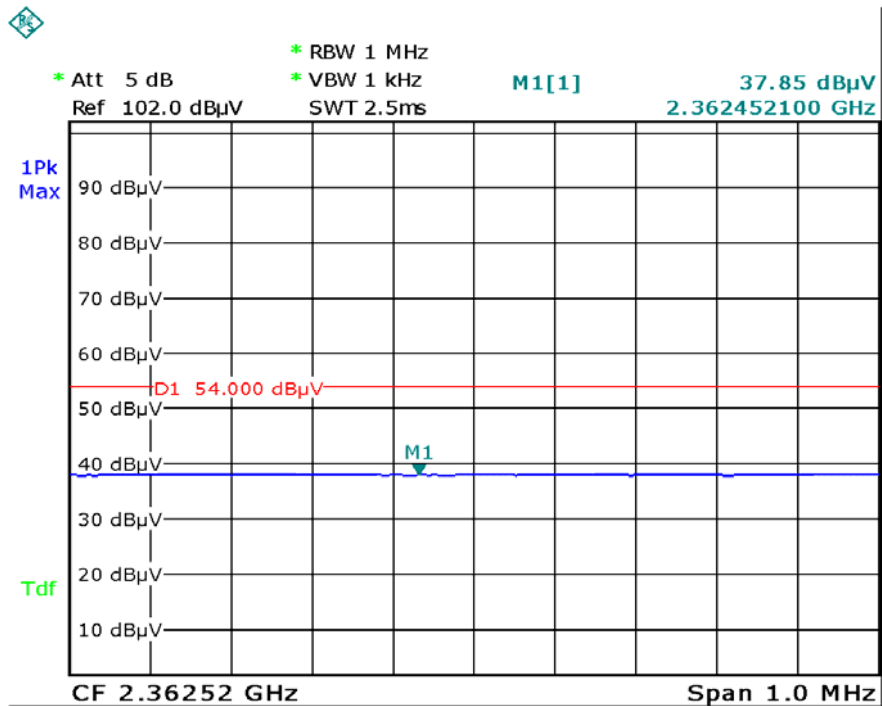
**Test Result: Pass**

|                   |                                       |
|-------------------|---------------------------------------|
| <b>Test Mode:</b> | <b>GFSK Hopping&amp; Transmitting</b> |
|-------------------|---------------------------------------|

Please refer to the following plots.

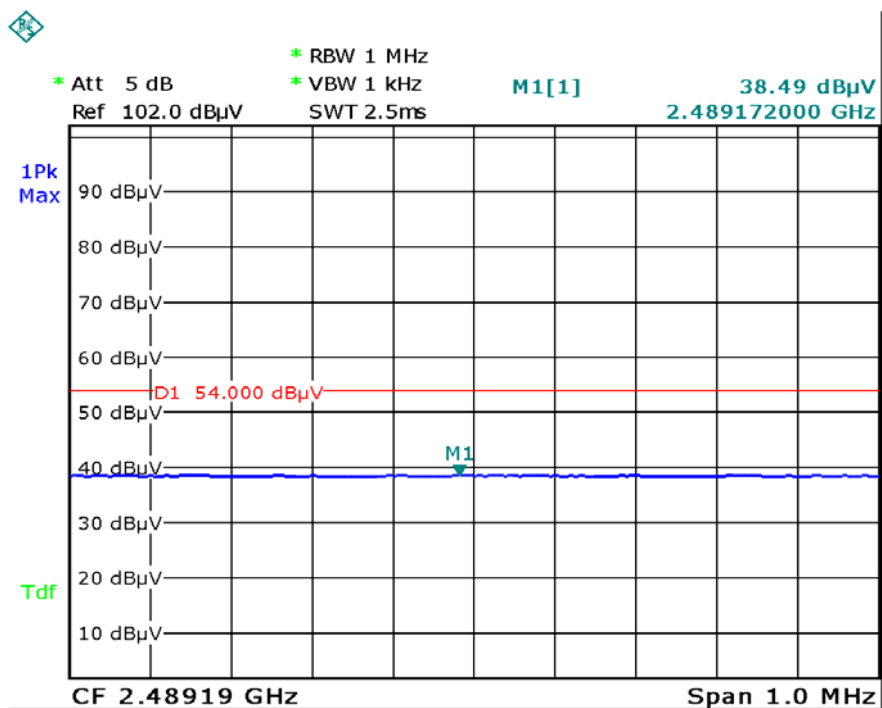


1M-HOPPING-PK



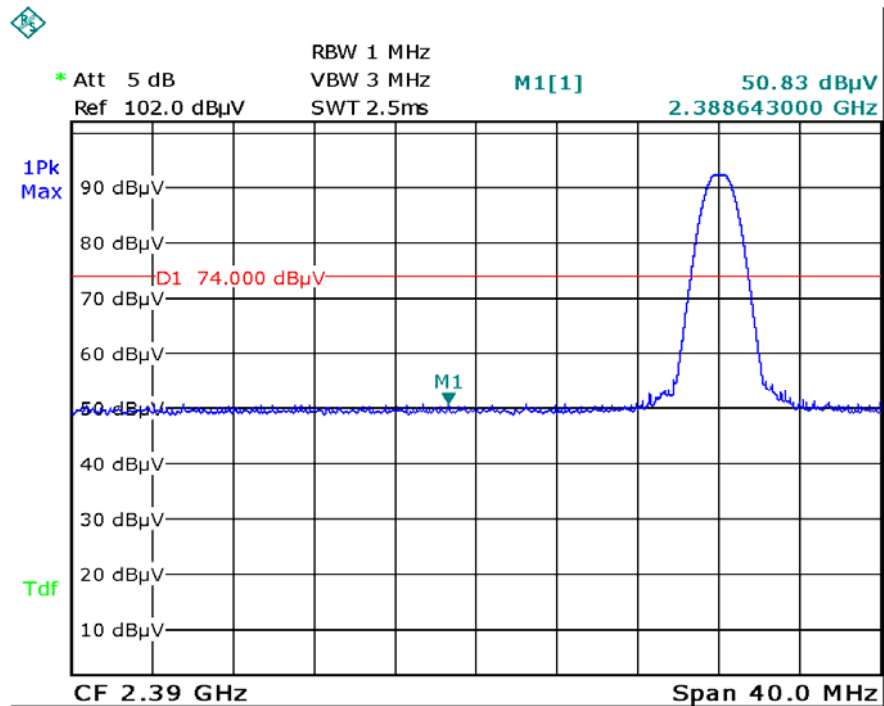
Date: 18.JUN.2014 14:34:00

## 1M-HOPPING-Left Side-AV



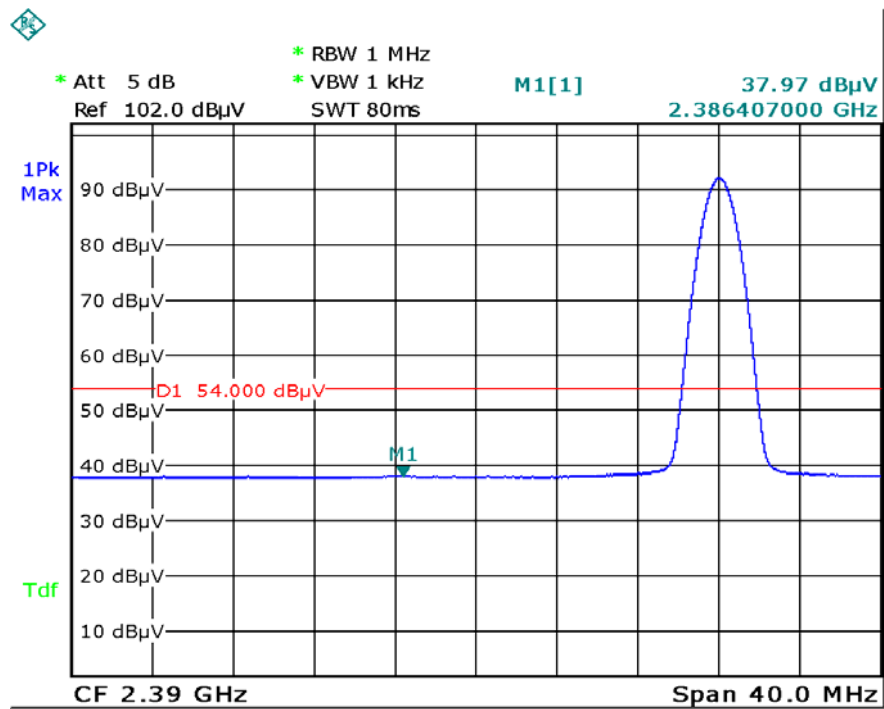
Date: 18.JUN.2014 14:31:21

## 1M-HOPPING-Right Side-AV



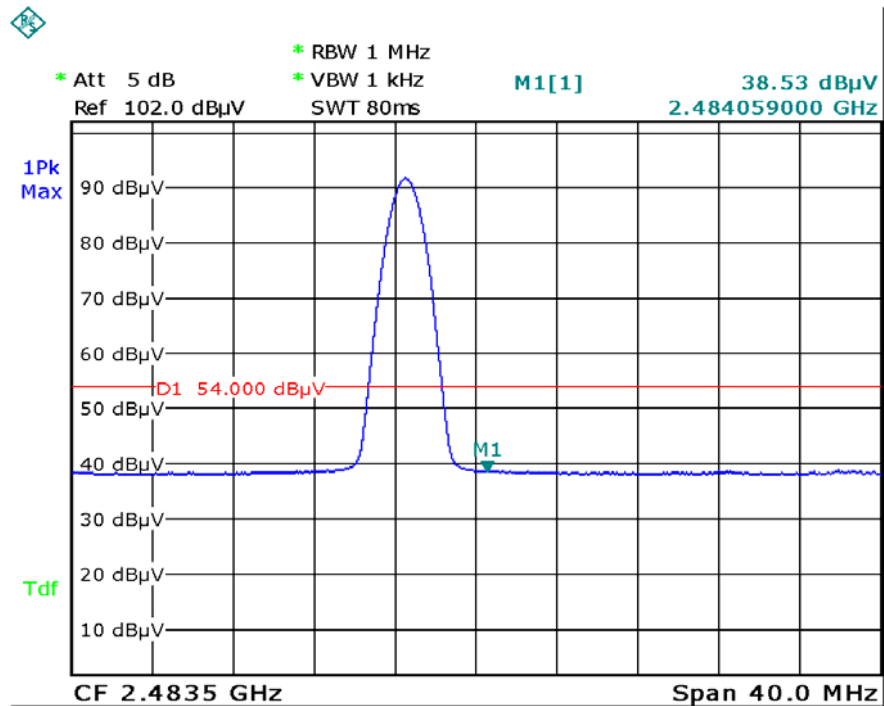
Date: 18.JUN.2014 11:31:30

1M-Left Side-AV



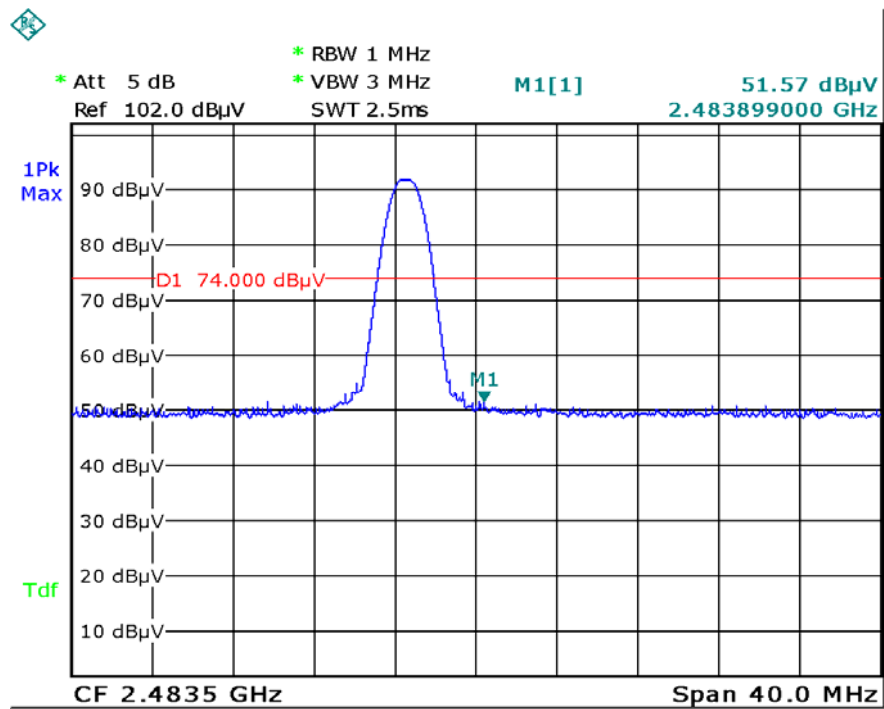
Date: 18.JUN.2014 11:33:50

1M-Left Side-PK



Date: 18.JUN.2014 11:50:32

1M-Right Side-AV

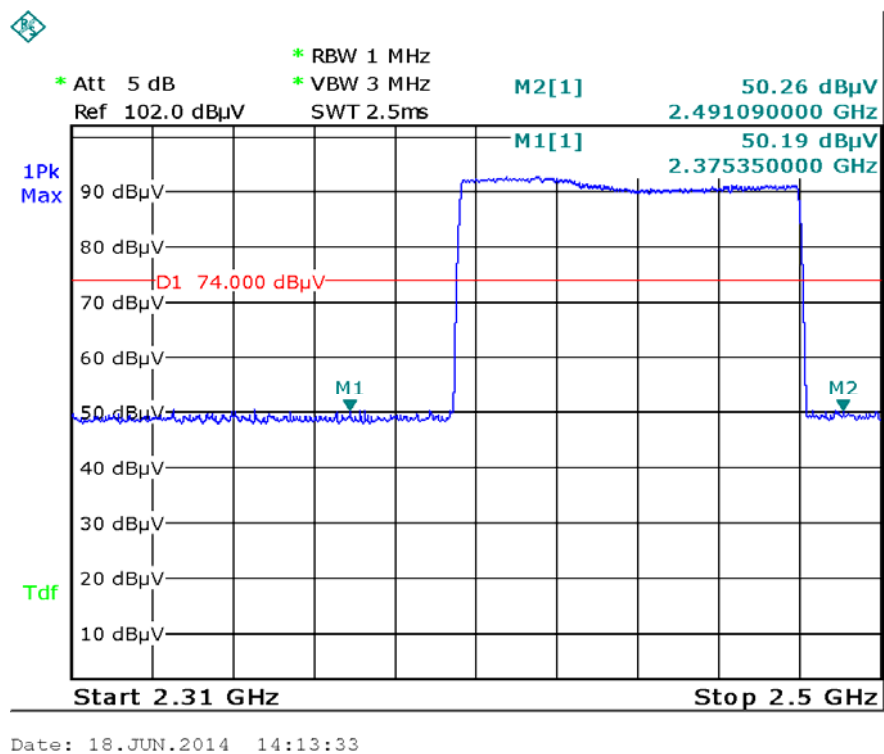


Date: 18.JUN.2014 11:51:55

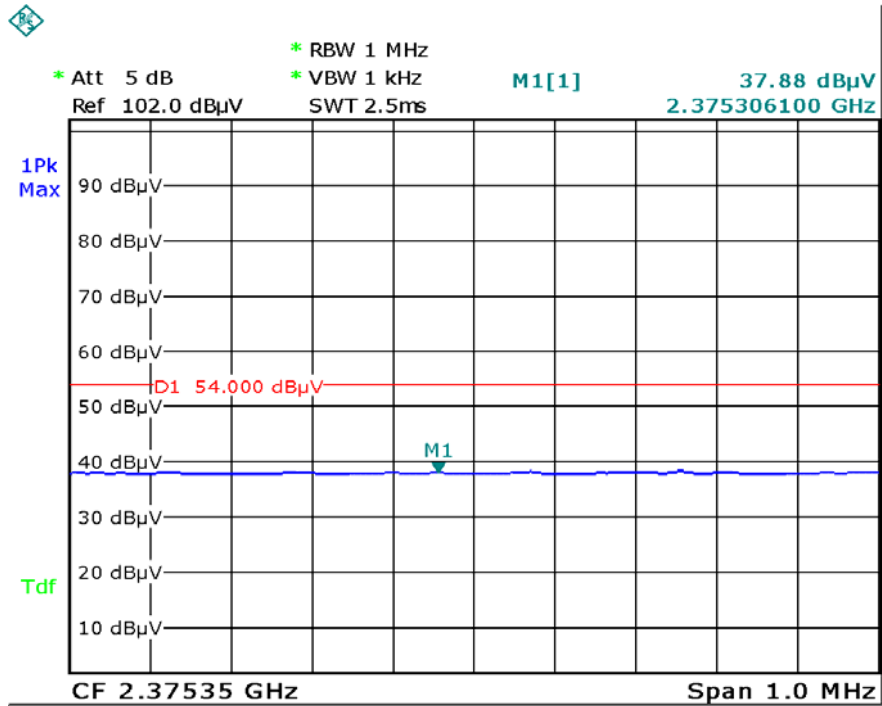
1M-Right Side-PK

|                   |                                                           |
|-------------------|-----------------------------------------------------------|
| <b>Test Mode:</b> | <b><math>\pi</math> /4DQPSK Hopping&amp; Transmitting</b> |
|-------------------|-----------------------------------------------------------|

Please refer to the following plots.

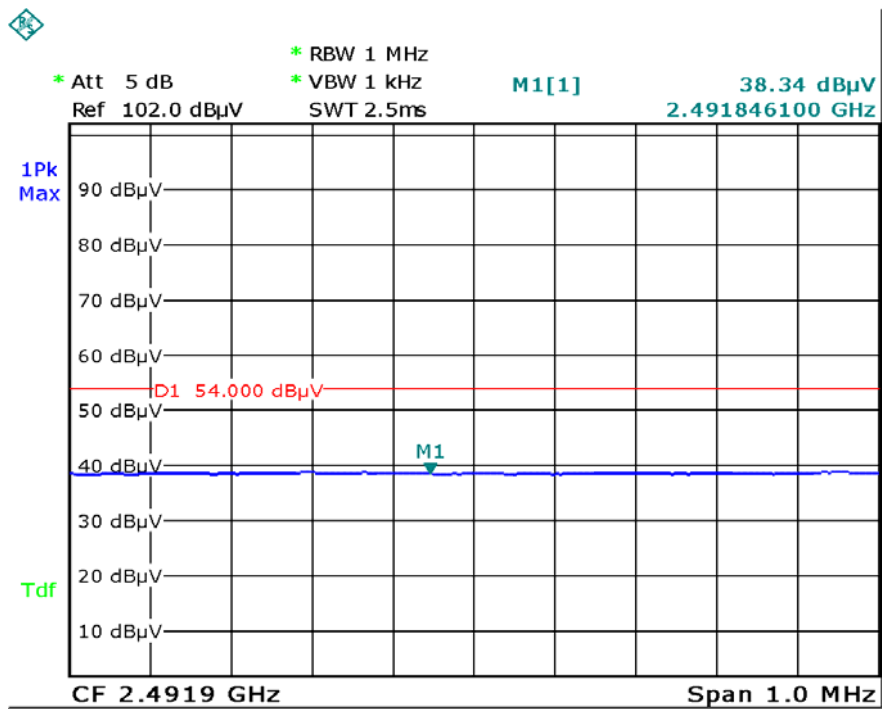


2M-HOPPING-PK



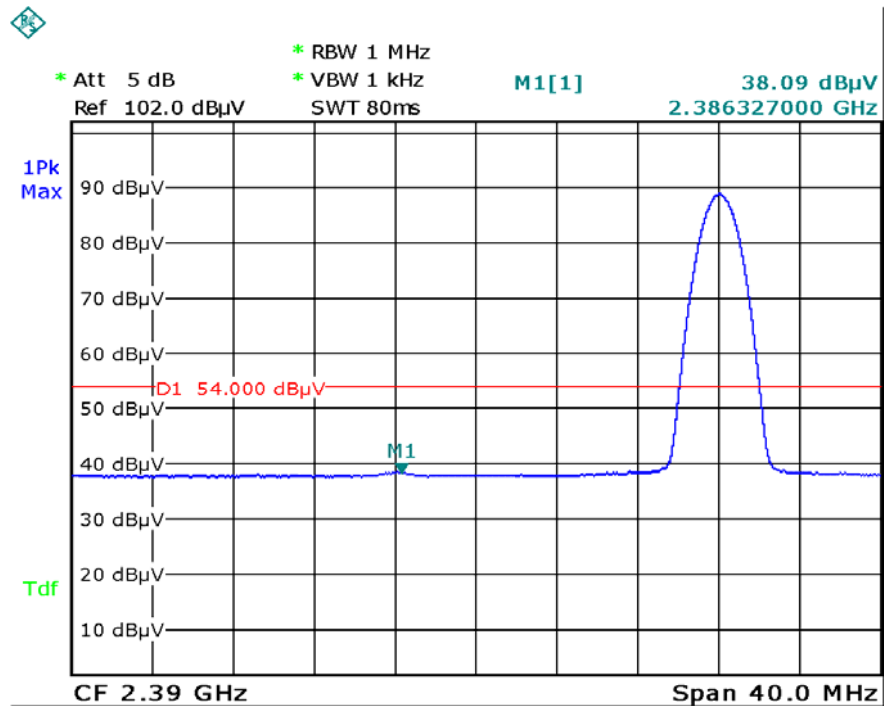
Date: 18.JUN.2014 14:18:05

## 2M-HOPPING-Left Side-AV



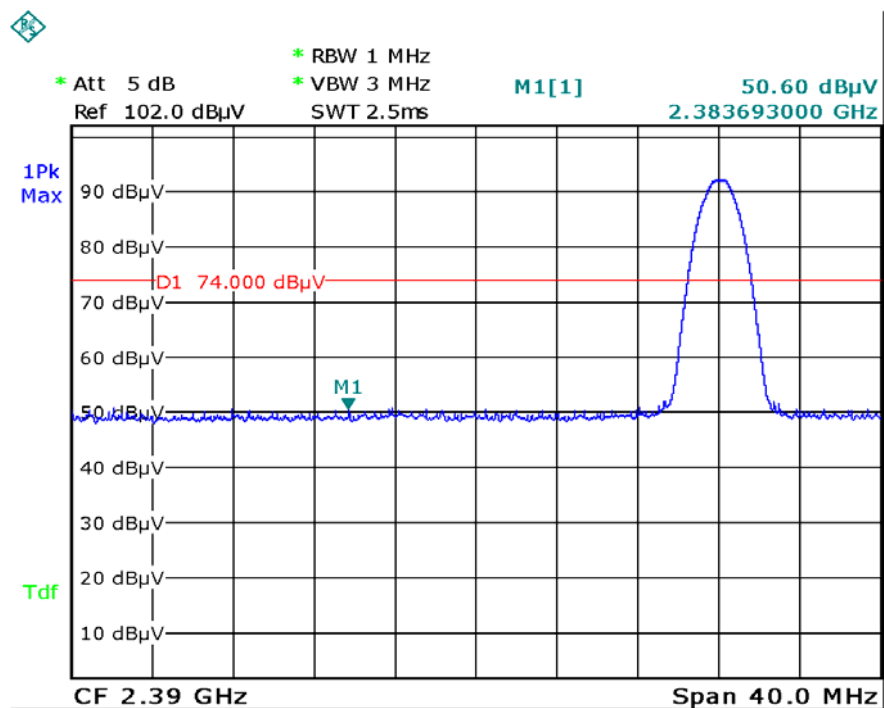
Date: 18.JUN.2014 14:17:22

## 2M-HOPPING-Right Side-AV



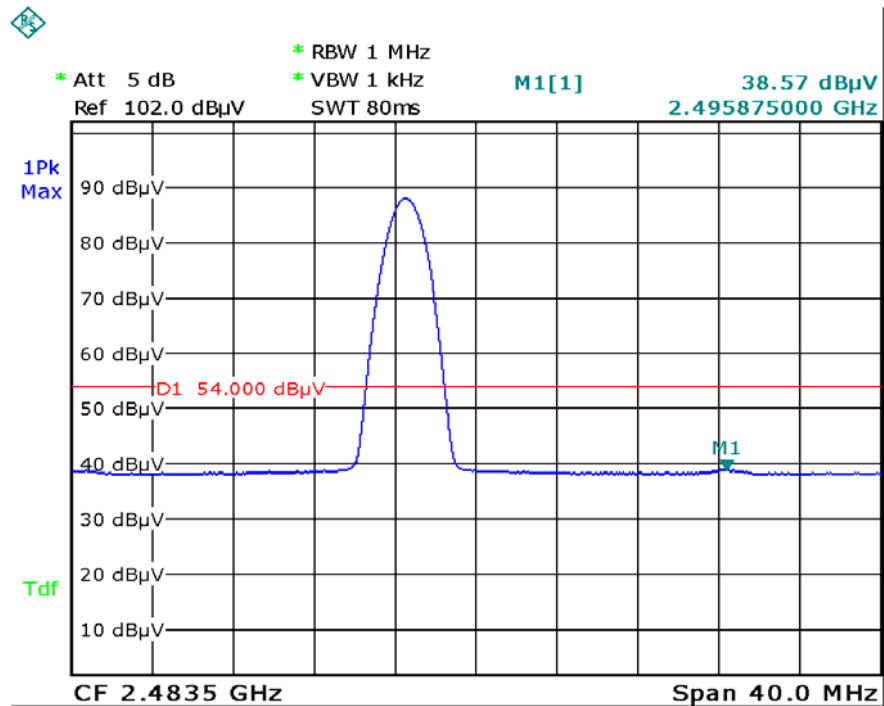
Date: 18.JUN.2014 14:03:38

2M-Left Side-AV



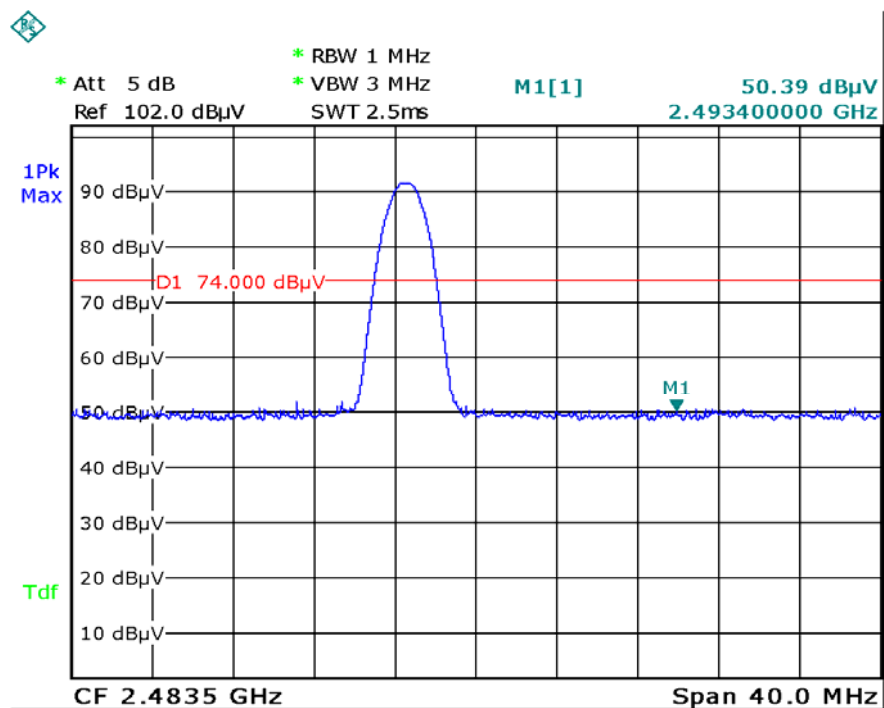
Date: 18.JUN.2014 14:04:49

2M-Left Side-PK



Date: 18.JUN.2014 13:50:41

## 2M-Right Side-AV

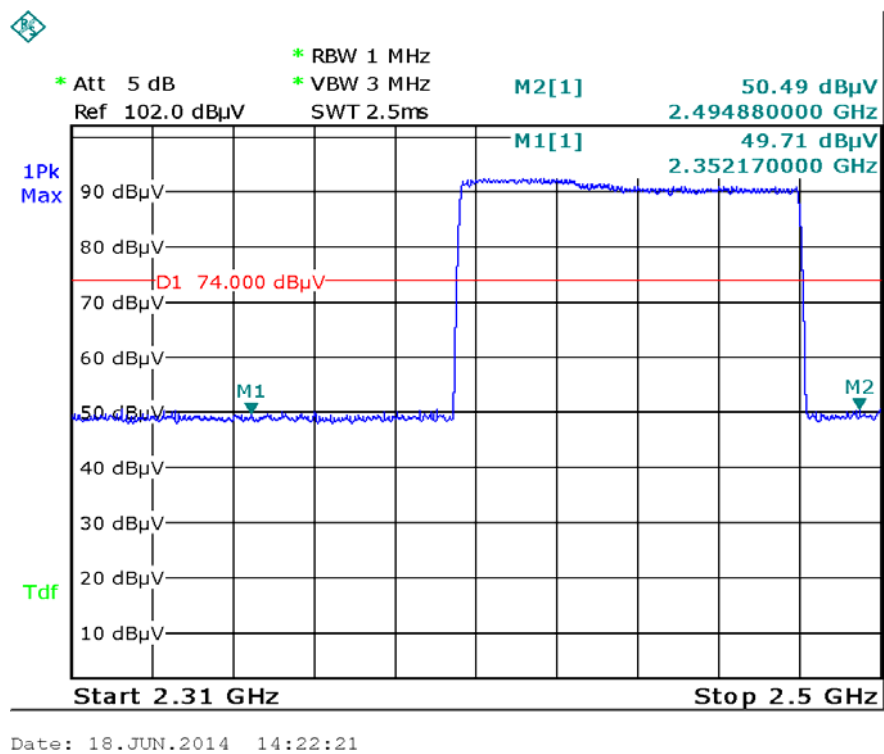


Date: 18.JUN.2014 13:49:04

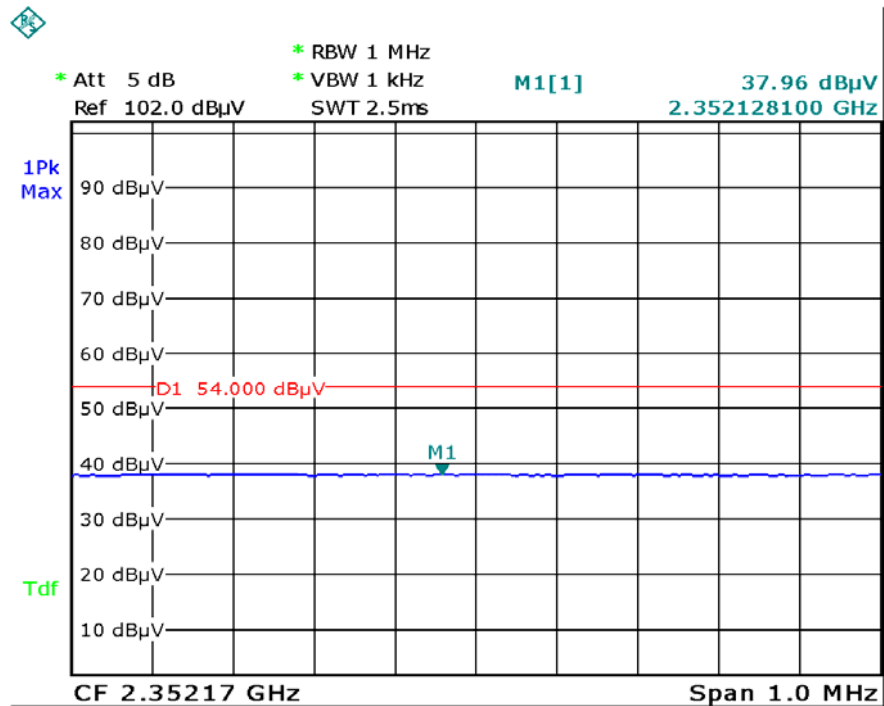
## 2M-Right Side-PK

|                   |                                        |
|-------------------|----------------------------------------|
| <b>Test Mode:</b> | <b>8DPSK Hopping&amp; Transmitting</b> |
|-------------------|----------------------------------------|

Please refer to the following plots.

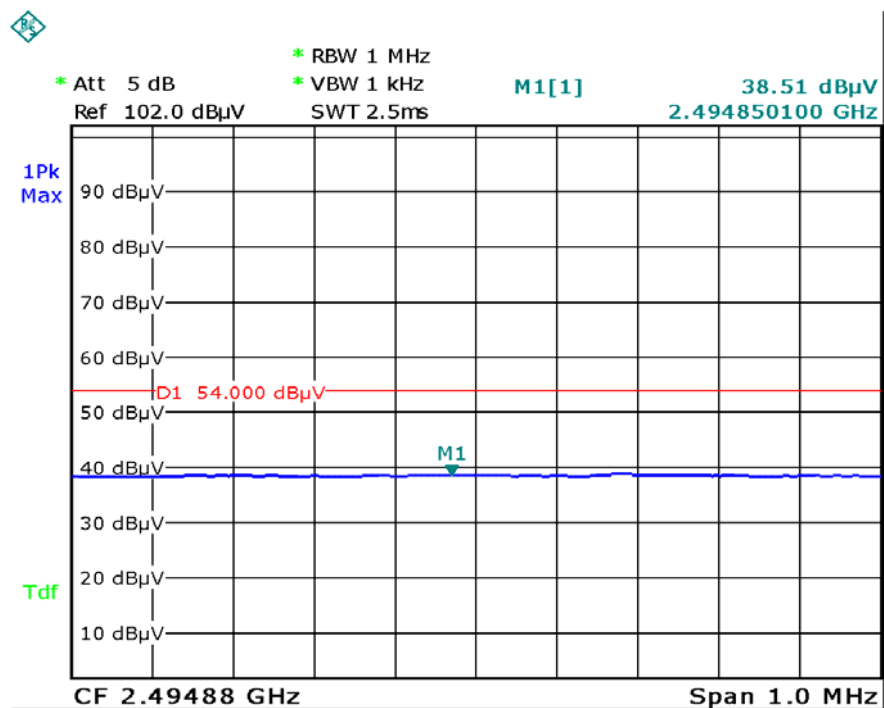


3M-HOPPING-PK



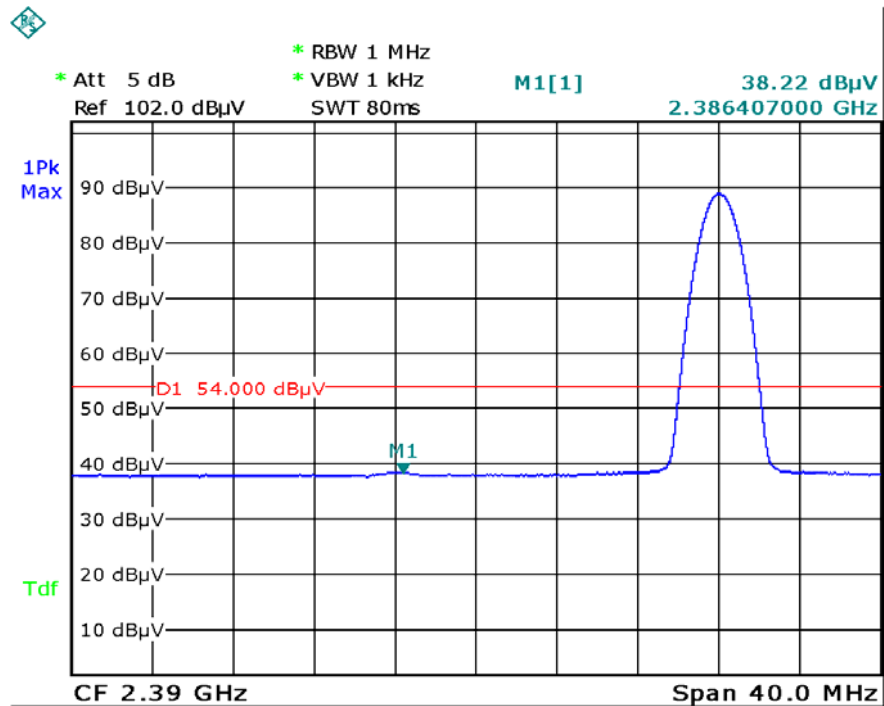
Date: 18.JUN.2014 14:24:57

### 3M-HOPPING-Left Side-AV



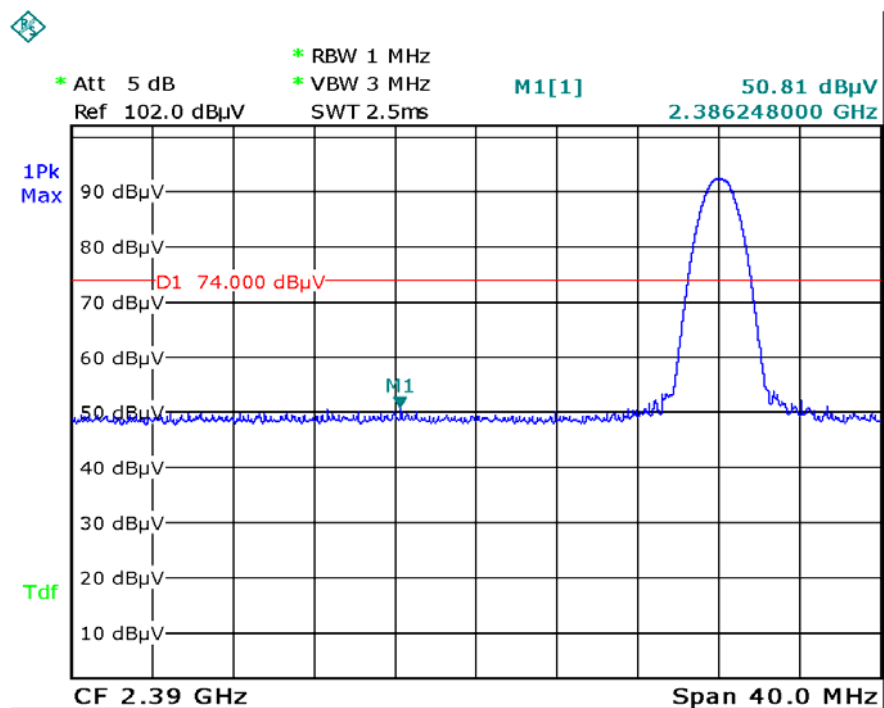
Date: 18.JUN.2014 14:24:06

### 3M-HOPPING-Right Side-AV



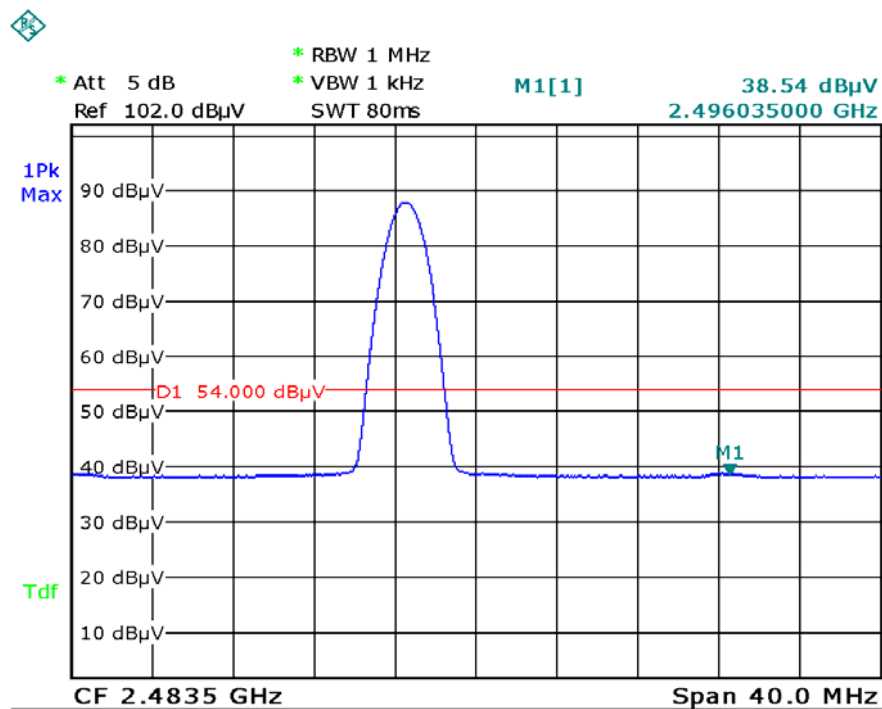
Date: 18.JUN.2014 13:58:51

### 3M-Left Side-AV



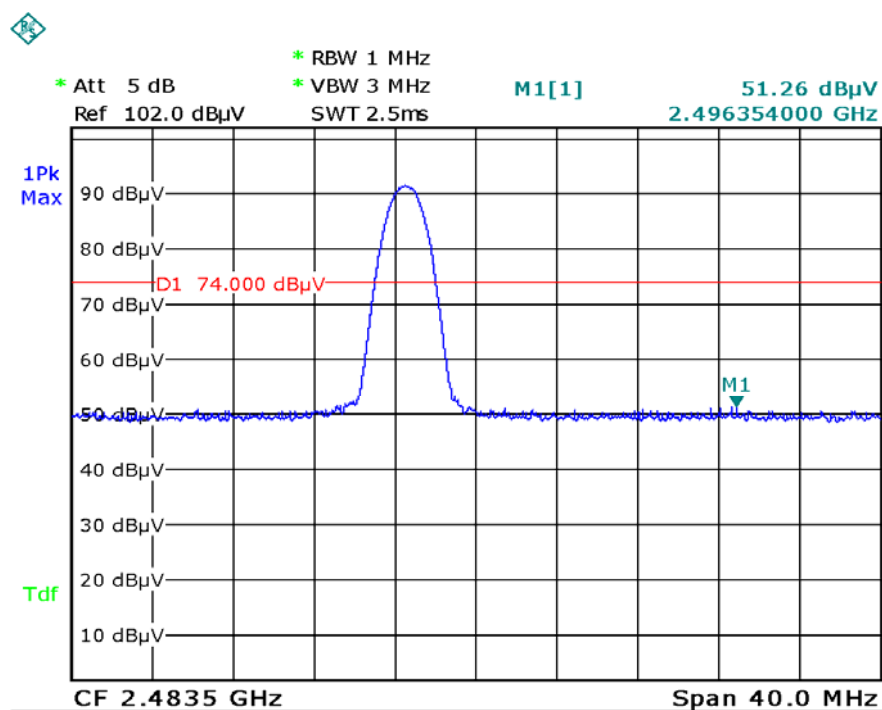
Date: 18.JUN.2014 13:57:24

### 3M-Left Side-PK



Date: 18.JUN.2014 13:53:52

3M-Right Side-AV



Date: 18.JUN.2014 13:55:26

3M-Right Side-PK

## **Annex A. TEST INSTRUMENT & METHOD**

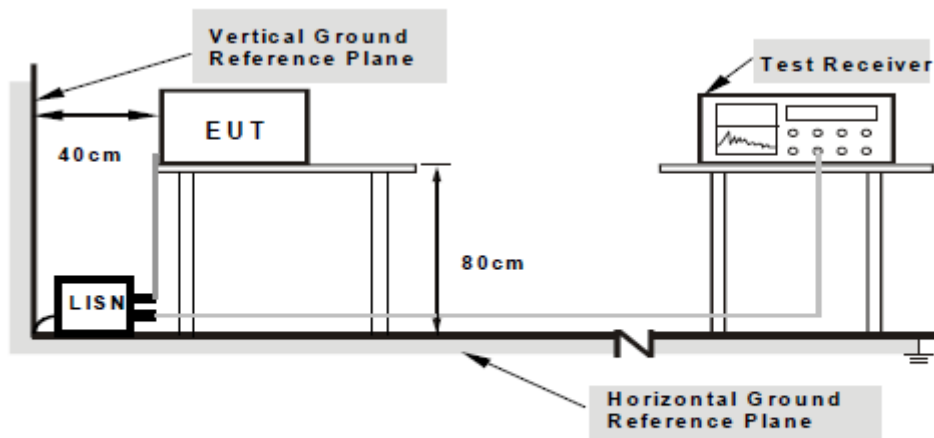
### **Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES**

| Instrument                             | Model    | Serial #    | Calibration Date | Calibration Due Date |
|----------------------------------------|----------|-------------|------------------|----------------------|
| <b>AC Line Conducted Emissions</b>     |          |             |                  |                      |
| EMI test receiver                      | ESCS30   | 8471241027  | 05/27/2014       | 05/26/2015           |
| Line Impedance Stabilization Network   | LI-125A  | 191106      | 11/14/2013       | 11/13/2014           |
| Line Impedance Stabilization Network   | LI-125A  | 191107      | 11/14/2013       | 11/13/2014           |
| LISN                                   | ISN T800 | 34373       | 01/11/2014       | 01/10/2015           |
| Double Ridge Horn Antenna (1 ~18GHz)   | AH-118   | 71283       | 11/20/2013       | 11/19/2014           |
| Transient Limiter                      | LIT-153  | 531118      | 09/02/2013       | 09/01/2014           |
| <b>RF conducted test</b>               |          |             |                  |                      |
| Agilent ESA-E SERIES SPECTRUM ANALYZER | E4407B   | MY45108319  | 09/17/2013       | 09/16/2014           |
| Power Splitter                         | 1#       | 1#          | 09/02/2013       | 09/01/2014           |
| DC Power Supply                        | E3640A   | MY40004013  | 09/17/2013       | 09/16/2014           |
| Wireless Connectivity Test Set         | N4010A   | GB444440198 | 03/20/2014       | 03/19/2015           |
| <b>Radiated Emissions</b>              |          |             |                  |                      |
| EMI test receiver                      | ESL6     | 100262      | 11/23/2013       | 11/22/2014           |
| Positioning Controller                 | UC3000   | MF780208282 | 11/19/2013       | 11/19/2014           |
| OPT 010 AMPLIFIER (0.1-1300MHz)        | 8447E    | 2727A02430  | 09/02/2013       | 09/01/2014           |
| Microwave Preamplifier (0.5~18GHz)     | PAM-118  | 443008      | 09/02/2013       | 09/01/2014           |
| Bilog Antenna (30MHz~6GHz)             | JB6      | A110712     | 09/23/2013       | 09/22/2014           |
| Double Ridge Horn Antenna (1 ~18GHz)   | AH-118   | 71283       | 11/20/2013       | 11/19/2014           |
| Universal Radio Communication Tester   | CMU200   | 121393      | 09/17/2013       | 09/16/2014           |

## Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

### Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipments were powered separately from another main supply.



**Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.**

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration1.

### Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

### Description of Conducted Emission Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the common scan range from 150 kHz to 30 MHz; the program will first start a peak and average scan on selectable measurement time and step size. After the program complete the pre-scan, this program will perform the Quasi Peak and Average measurement, based on the pre-scan peak data reduction result.

### **Sample Calculation Example**

At 20 MHz limit = 250  $\mu$ V = 47.96 dB $\mu$ V

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dB $\mu$ V  
(Calibrated for system losses)

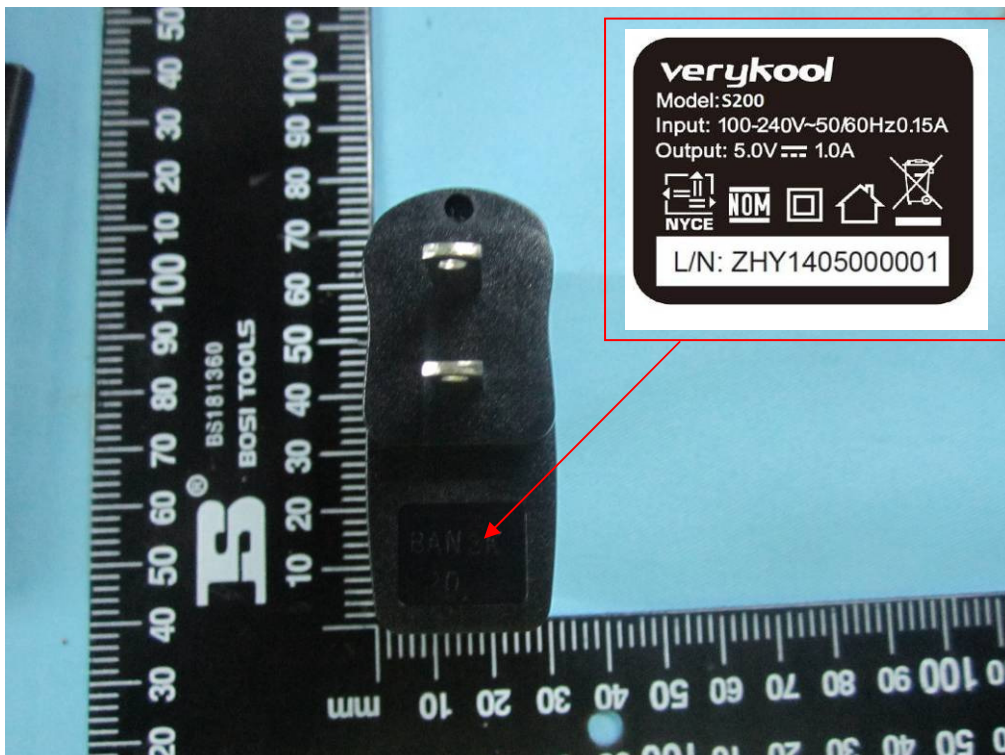
Therefore, Q-P margin = 47.96 – 40.00 = 7.96 i.e. **7.96 dB below limit**

## Annex B. EUT AND TEST SETUP PHOTOGRAPHS

### Annex B.i. Photograph 1: EUT External Photo



Whole Package - Top View



Adapter – Front View



EUT - Front View



EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

## Annex B.ii. Photograph 2: EUT Internal Photo



Cover Off - Top View 1



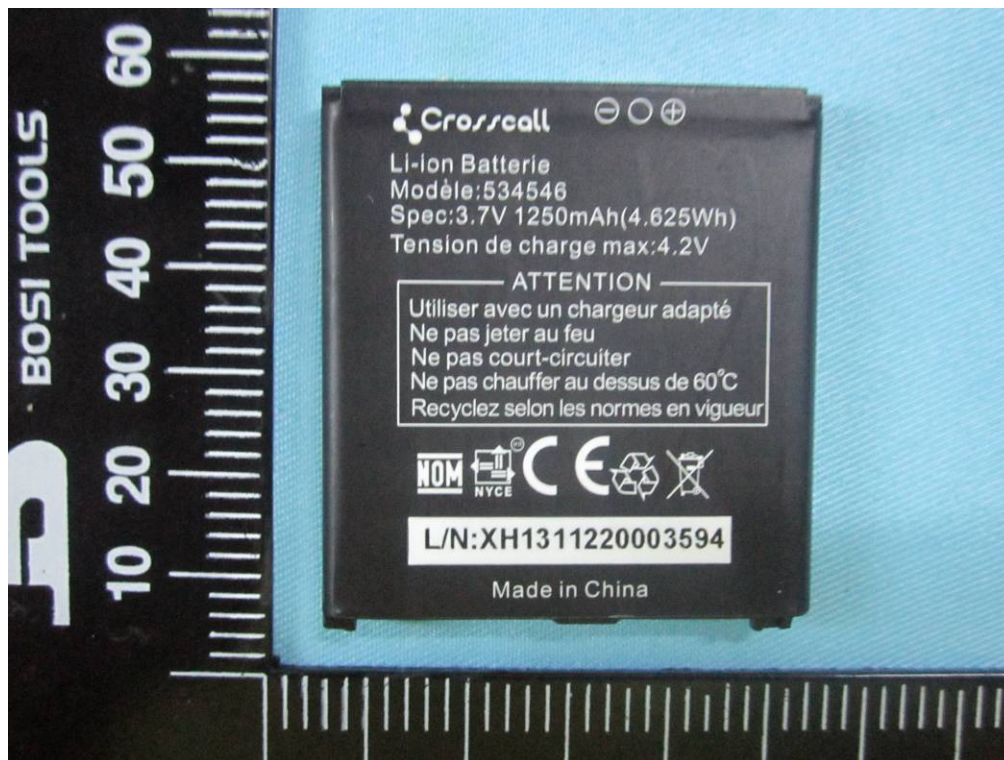
Cover Off - Top View 2



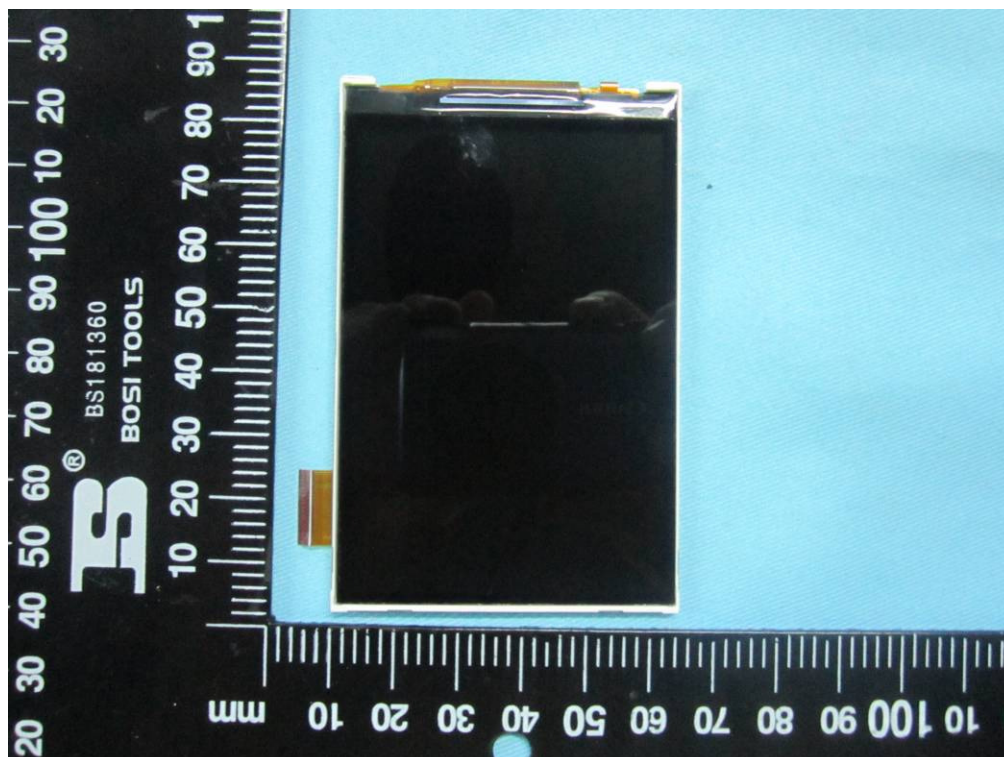
Cover Off - Top View 3



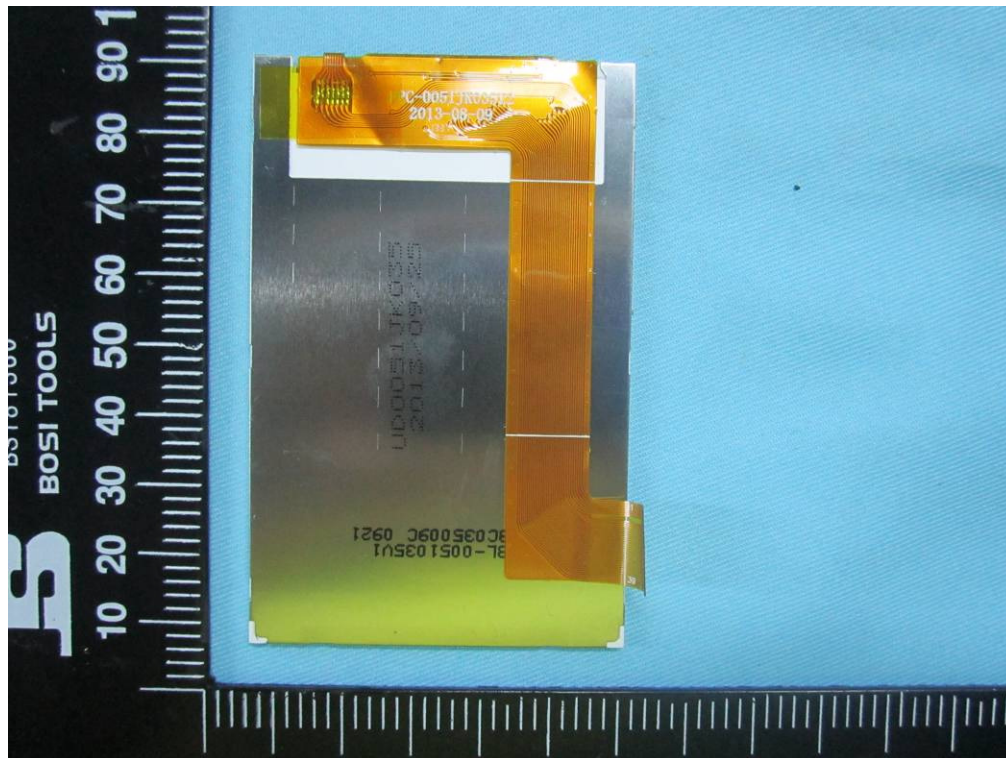
Battery - Top View



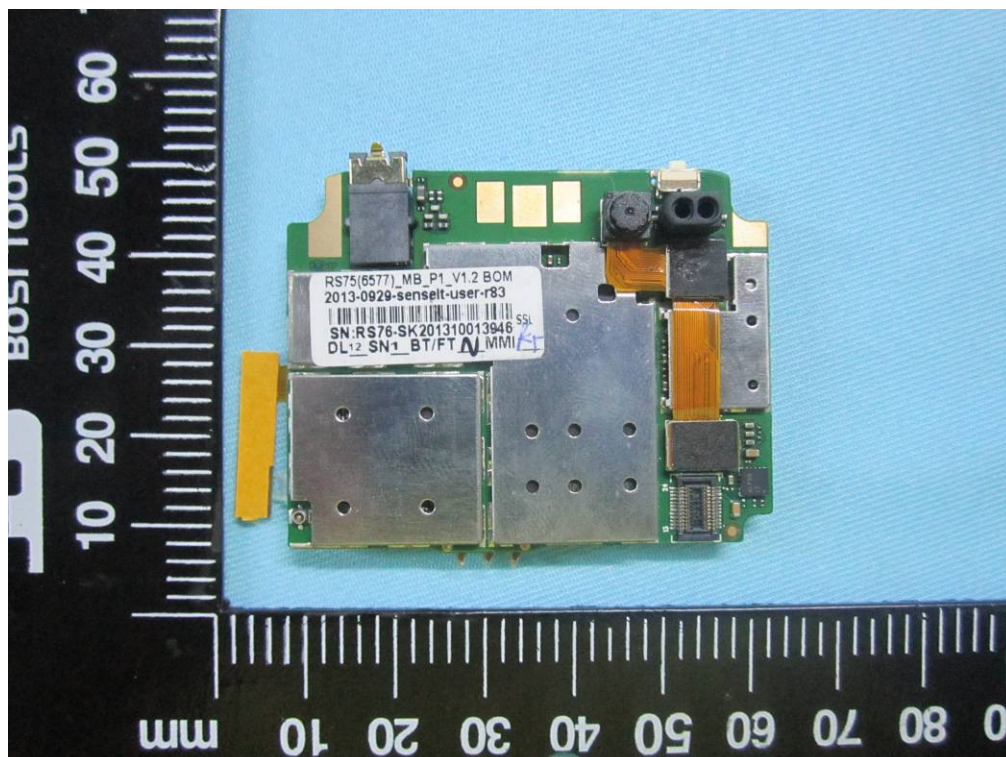
Battery – Rear View



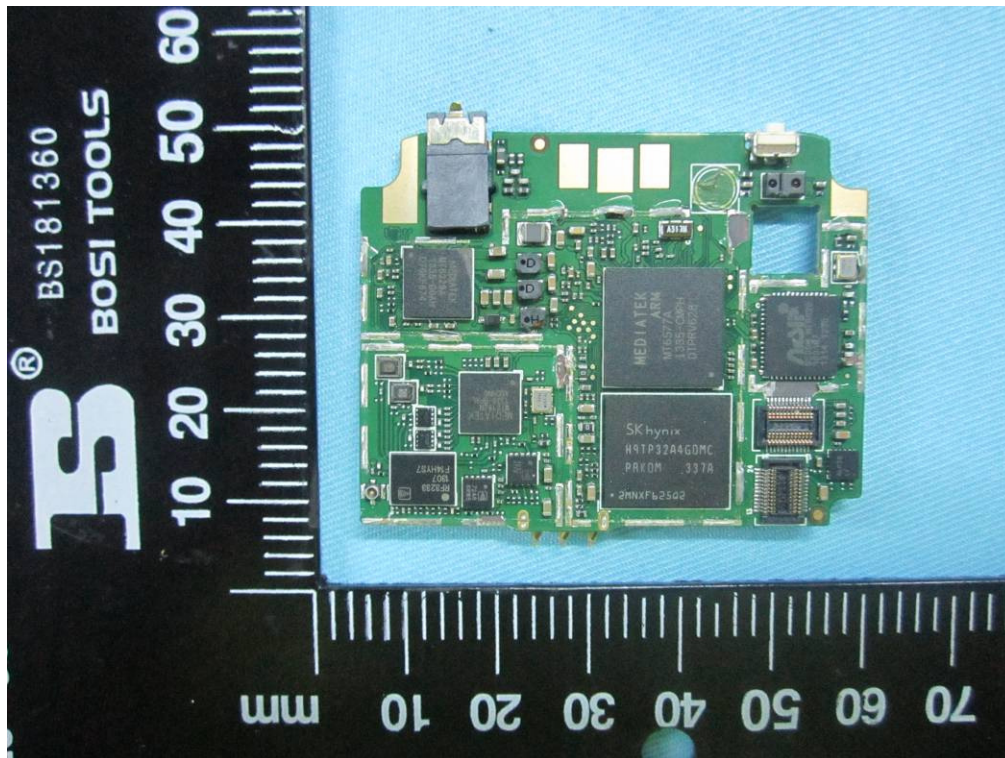
LCD – Front View



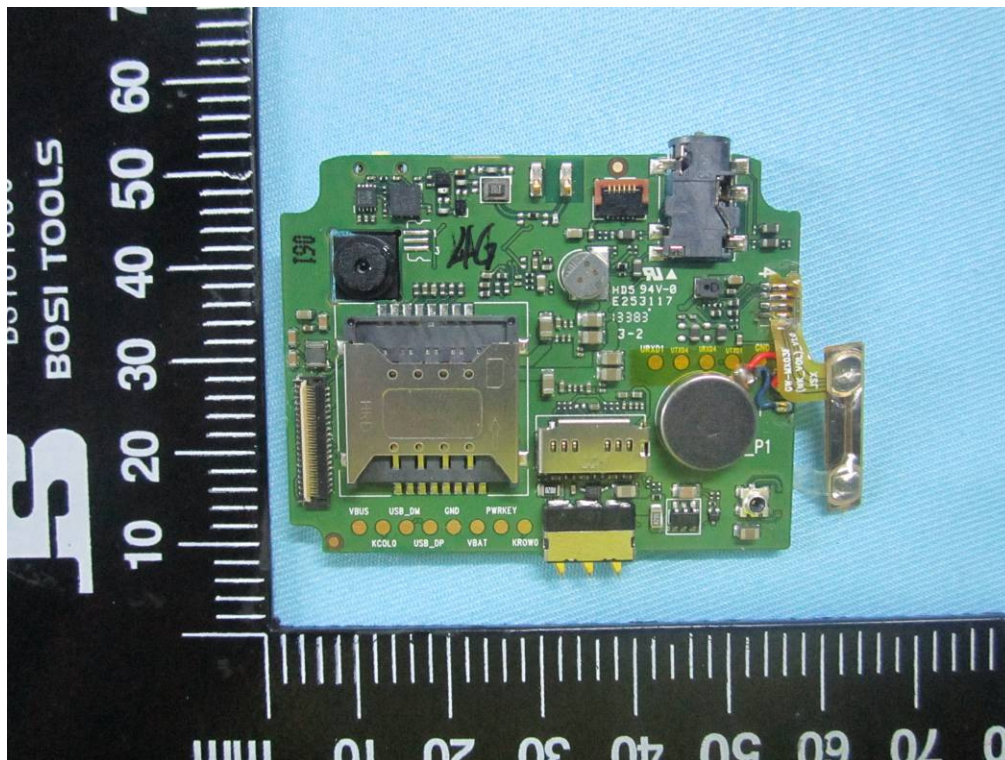
LCD – Rear View



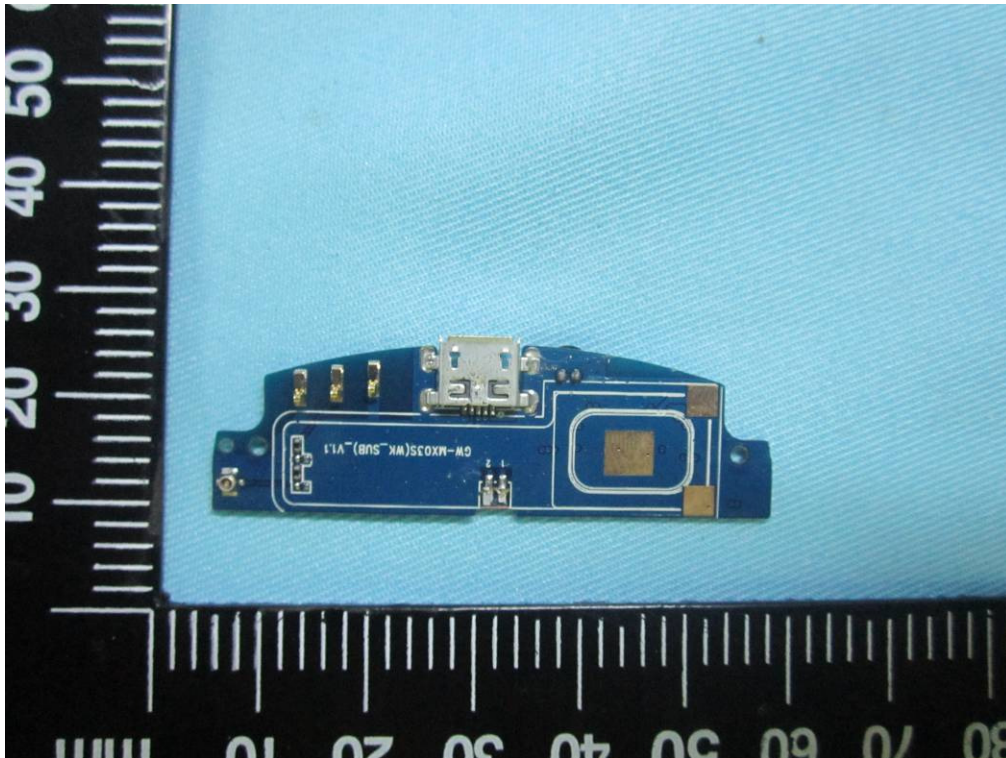
Mainboard With Shielding – Front View



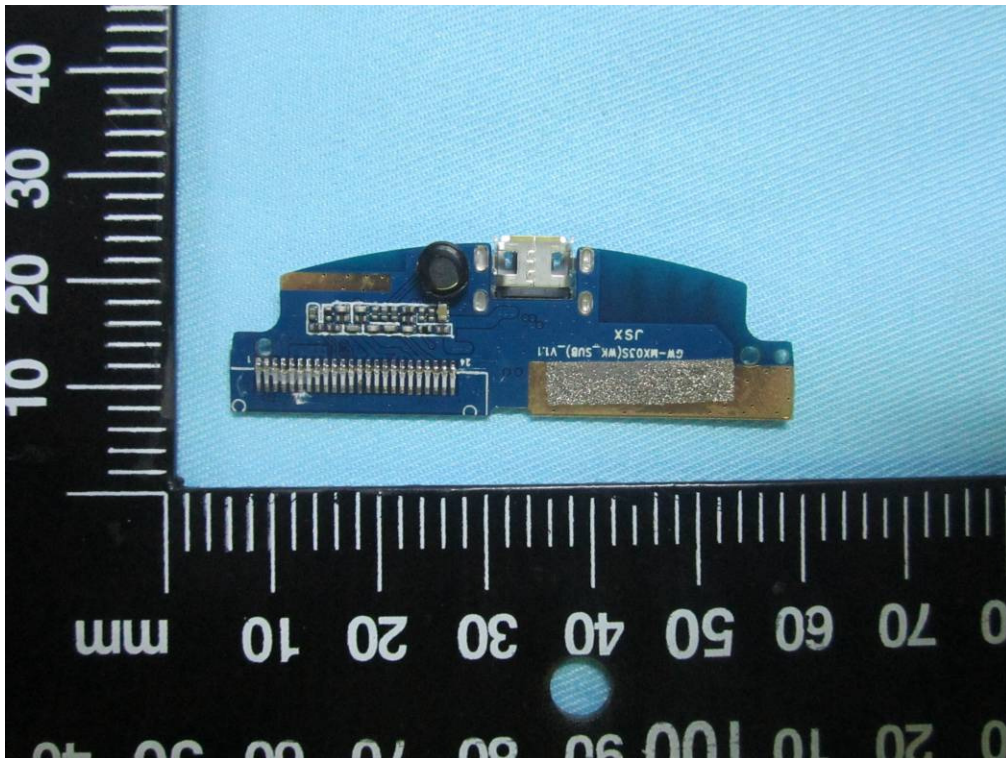
Mainboard Without Shielding – Front View



Mainboard – Rear View



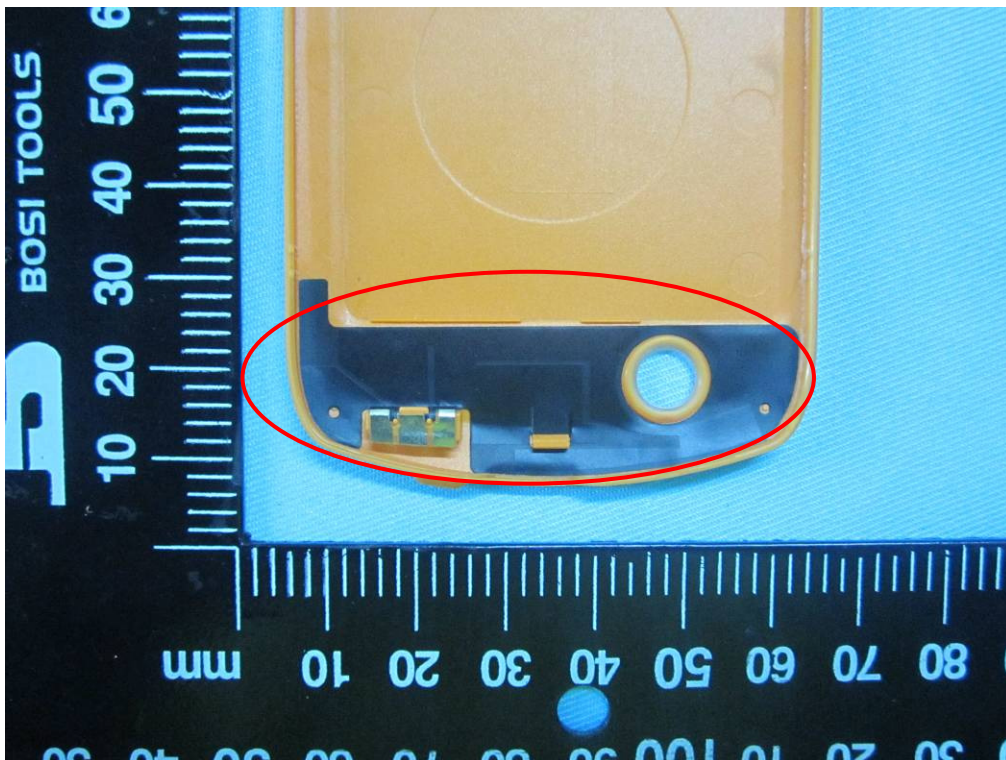
Connect board – Front View



Connect board – Rear View



BT/BLE/WIFI Antenna View



GSM/PCS Antenna

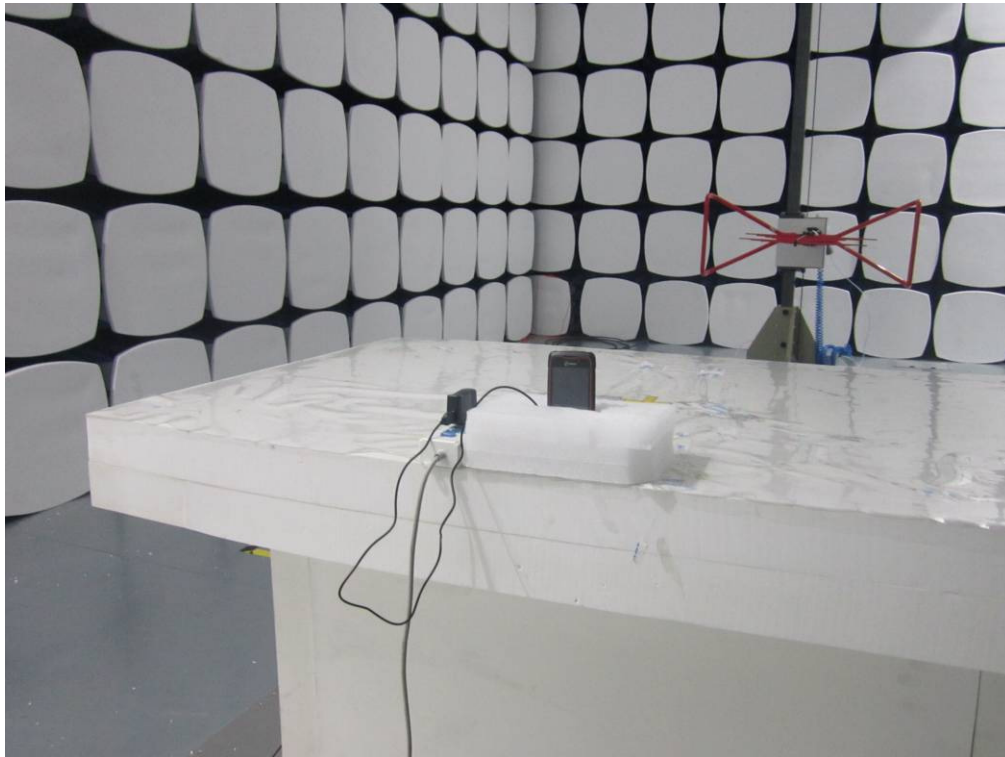
### **Annex B.iii. Photograph 3: Test Setup Photo**



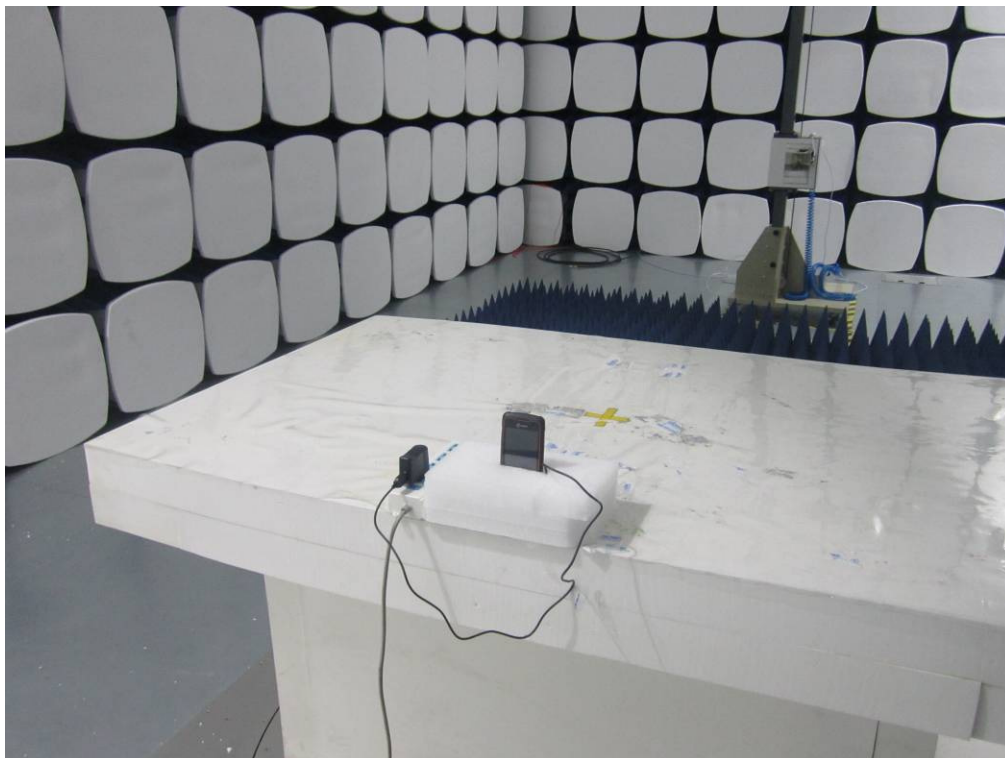
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

## **Annex C. TEST SETUP AND SUPPORTING EQUIPMENT**

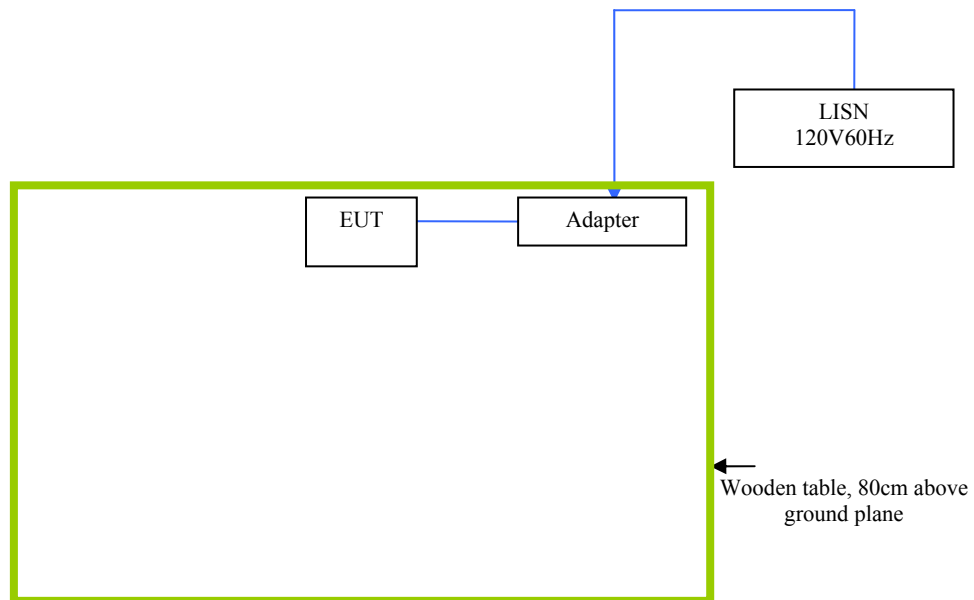
### **EUT TEST CONDITIONS**

#### **Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION**

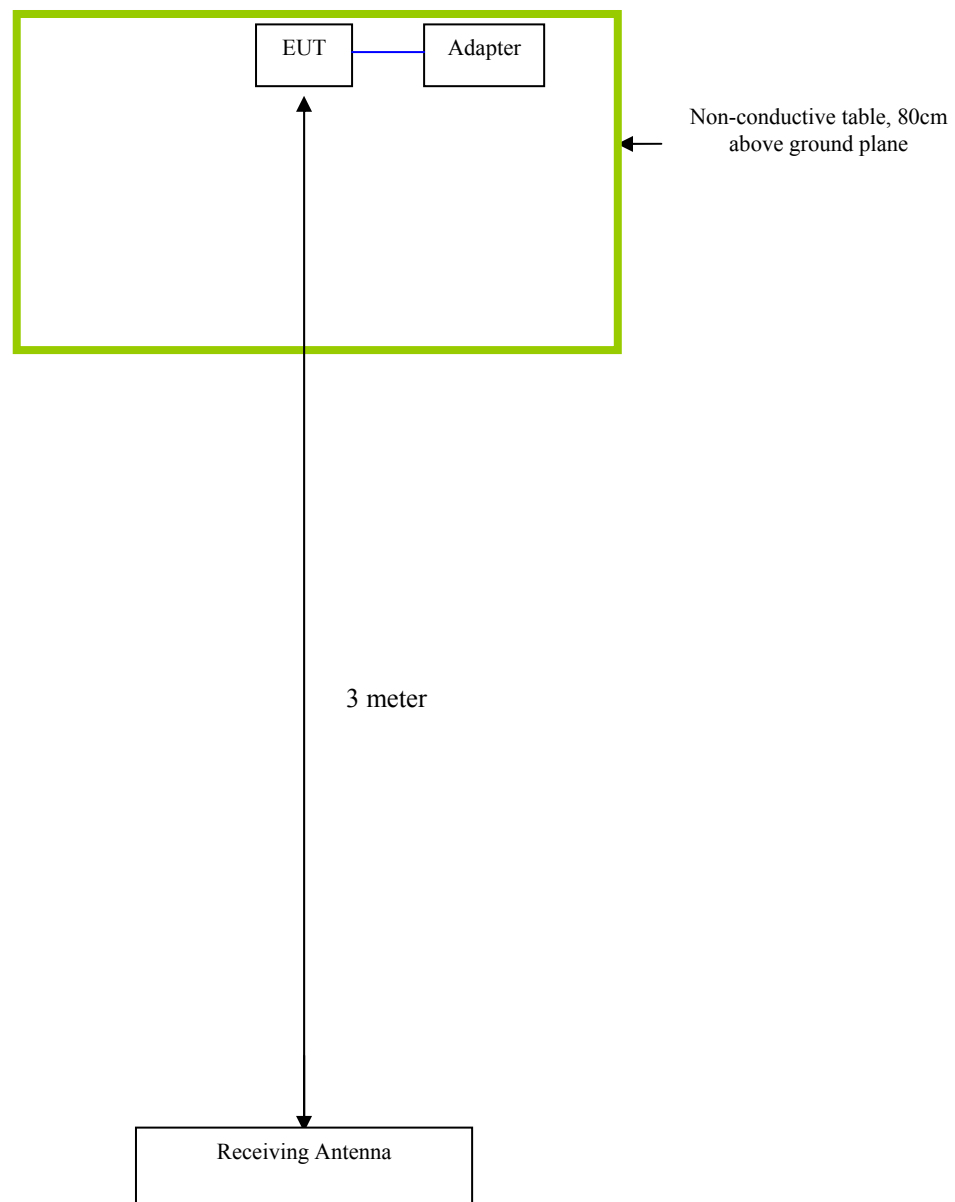
The following is a description of supporting equipment and details of cables used with the EUT.

| Manufacturer | Equipment<br>Description<br>(Including Brand<br>Name) | Model | Calibration<br>Date | Calibration<br>Due Date |
|--------------|-------------------------------------------------------|-------|---------------------|-------------------------|
| N/A          | N/A                                                   | N/A   | N/A                 | N/A                     |

## Block Configuration Diagram for AC Line Conducted Emissions



## Block Configuration Diagram for Radiated Emissions



## **Annex C.ii. EUT OPERATING CONDITIONS**

The following is the description of how the EUT is exercised during testing.

| Test              | Description Of Operation                                           |
|-------------------|--------------------------------------------------------------------|
| Emissions Testing | The EUT was continuously transmitting to stimulate the worst case. |

## **Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST**

**Please see attachment**

## **Annex E. DECLARATION OF SIMILARITY**

**N/A**