



# FCC RADIO TEST REPORT

Applicant : Ever Win International Corporation

Address : 17579 Railroad Street City of Industry, CA 91748

Equipment : Bluetooth Speaker

Model No. : EP40819, KS-40819, KS-CLOCK

Trademark : 

FCC ID : MS3-KS40819

## I HEREBY CERTIFY THAT :

The sample was received on Apr. 22, 2015 and the testing was carried out on Apr. 27, 2015 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:



Miro Chueh  
EMC/RF B.U. Manager

Laboratory Accreditation:

☐ CerpPASS Technology Corporation Test Laboratory

|                 |          |
|-----------------|----------|
| NVLAP LAB Code: | 200954-0 |
| TAF LAB Code:   | 1439     |

☒ CerpPASS Technology(SuZhou) Co., Ltd.

|                 |          |
|-----------------|----------|
| NVLAP LAB Code: | 200814-0 |
| CNAS LAB Code:  | L5515    |



## Contents

|                                                           |           |
|-----------------------------------------------------------|-----------|
| <b>1. Report of Measurements and Examinations.....</b>    | <b>5</b>  |
| 1.1 List of Measurements and Examinations.....            | 5         |
| <b>2. Test Configuration of Equipment under Test.....</b> | <b>6</b>  |
| 2.1 Feature of Equipment under Test.....                  | 6         |
| 2.2 Carrier Frequency of Channels.....                    | 7         |
| 2.3 Test Mode & Test Software .....                       | 8         |
| 2.4 Description of Test System.....                       | 8         |
| 2.5 General Information of Test.....                      | 9         |
| 2.6 Measurement Uncertainty .....                         | 10        |
| <b>3. Antenna Requirements.....</b>                       | <b>11</b> |
| 3.1 Standard Applicable .....                             | 11        |
| 3.2 Antenna Construction and Directional Gain.....        | 11        |
| <b>4. Test of Conducted Emission.....</b>                 | <b>12</b> |
| 4.1 Test Limit .....                                      | 12        |
| 4.2 Test Procedures .....                                 | 12        |
| 4.3 Typical Test Setup .....                              | 13        |
| 4.4 Measurement equipment .....                           | 13        |
| 4.5 Test Result and Data.....                             | 14        |
| <b>5. Test of Radiated Emission .....</b>                 | <b>16</b> |
| 5.1 Test Limit .....                                      | 16        |
| 5.2 Test Procedures.....                                  | 17        |
| 5.3 Typical Test Setup .....                              | 17        |
| 5.4 Measurement equipment .....                           | 18        |
| 5.5 Test Result and Data.....                             | 19        |
| <b>6. 20dB Bandwidth Measurement Data.....</b>            | <b>26</b> |
| 6.1 Test Limit .....                                      | 26        |
| 6.2 Test Procedures .....                                 | 26        |
| 6.3 Test Setup Layout .....                               | 26        |
| 6.4 Measurement equipment .....                           | 26        |
| 6.5 Test Result and Data.....                             | 26        |
| <b>7. Frequencies Separation .....</b>                    | <b>31</b> |
| 7.1 Test Limit .....                                      | 31        |
| 7.2 Test Procedures .....                                 | 31        |
| 7.3 Test Setup Layout .....                               | 31        |
| 7.4 Measurement equipment .....                           | 31        |
| 7.5 Test Result and Data.....                             | 31        |
| <b>8. Dwell Time on each channel.....</b>                 | <b>33</b> |
| 8.1 Test Limit .....                                      | 33        |
| 8.2 Test Procedures .....                                 | 33        |
| 8.3 Test Setup Layout .....                               | 33        |
| 8.4 Measurement equipment .....                           | 33        |
| 8.5 Test Result and Data.....                             | 34        |



|            |                                              |           |
|------------|----------------------------------------------|-----------|
| <b>9.</b>  | <b>Number of Hopping Channels .....</b>      | <b>39</b> |
| 9.1        | Test Limit .....                             | 39        |
| 9.2        | Test Procedures .....                        | 39        |
| 9.3        | Test Setup Layout .....                      | 39        |
| 9.4        | Measurement equipment .....                  | 39        |
| 9.5        | Test Result and Data.....                    | 39        |
| <b>10.</b> | <b>Maximum Peak Output Power .....</b>       | <b>41</b> |
| 10.1       | Test Limit .....                             | 41        |
| 10.2       | Test Procedures .....                        | 41        |
| 10.3       | Test Setup Layout .....                      | 41        |
| 10.4       | Measurement equipment .....                  | 41        |
| 10.5       | Test Result and Data.....                    | 41        |
| <b>11.</b> | <b>Band Edges Measurement.....</b>           | <b>45</b> |
| 11.1       | Test Limit .....                             | 45        |
| 11.2       | Test Procedure .....                         | 45        |
| 11.3       | Test Setup Layout .....                      | 45        |
| 11.4       | List of Measuring Equipment Used .....       | 45        |
| 11.5       | Test Result and Data.....                    | 45        |
| 11.6       | Restrict band emission Measurement Data..... | 51        |
| <b>12.</b> | <b>Restricted Bands of Operation .....</b>   | <b>53</b> |
| 12.1       | Labeling Requirement.....                    | 53        |

## History of this test report

ORIGINAL

☐ Additional attachment as following record:

[illegible]



## 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(a)    | . Conducted Emission                     | Pass   |
| § 15.209(a)    | . Radiated Emission                      | Pass   |
| § 15.247(a)(1) | . Channel Carrier Frequencies Separation | Pass   |
| § 15.247(a)(1) | . 20dB Bandwidth Measurement             | Pass   |
| § 15.247(a)(1) | . Dwell Time                             | Pass   |
| § 15.247(b)    | . Number of Hopping Channels             | Pass   |
| § 15.247(b)    | . Peak Output Power Measurement Data     | Pass   |
| § 15.247(d)    | . Band Edges Measurement Data            | Pass   |



## 2. Test Configuration of Equipment under Test

### 2.1 Feature of Equipment under Test

|                    |                                                        |                                                                                                |
|--------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Product Name:      | Bluetooth Speaker                                      |                                                                                                |
| Model Name:        | EP40819                                                |                                                                                                |
| Series Model:      | KS-40819, KS-CLOCK                                     |                                                                                                |
| Model Discrepancy: | All models are identical except for marketing purpose. |                                                                                                |
| Frequency          | 2.402GHz~2.480GHz                                      |                                                                                                |
| Number of Channel  | 79 channel                                             |                                                                                                |
| Modulation type    | GFSK, $\pi/4$ PSK, 8DPSK                               |                                                                                                |
| Transmit Power     | GFSK: 5.01dBm                                          |                                                                                                |
|                    | 8DPSK: 3.53dBm                                         |                                                                                                |
| Antenna type       | PCB Antenna with 1.54dBi                               |                                                                                                |
| EUT Power Rating:  | Input: DC 12V, 3A supplied by adapter                  |                                                                                                |
| Adapter #1         | Manufacturer:                                          |             |
|                    | Model No.:                                             | CP1230                                                                                         |
|                    | Input Rating:                                          | 100-240Vac 50/60Hz 0.8A                                                                        |
|                    | Output Rating:                                         | 12V  3A     |
| Adapter #2         | Manufacturer:                                          | SHENZHEN UNIONTOP ELECTRONIC CO LTD                                                            |
|                    | Model No.:                                             | UT36-120300                                                                                    |
|                    | Input Rating:                                          | 100-240V~ 50-60Hz 0.8A                                                                         |
|                    | Output Rating:                                         | 12V  3000mA |

Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



## 2.2 Carrier Frequency of Channels

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 20      | 2422            | 40      | 2442            | 60      | 2462            |
| 01      | 2403            | 21      | 2423            | 41      | 2443            | 61      | 2463            |
| 02      | 2404            | 22      | 2424            | 42      | 2444            | 62      | 2464            |
| 03      | 2405            | 23      | 2425            | 43      | 2445            | 63      | 2465            |
| 04      | 2406            | 24      | 2426            | 44      | 2446            | 64      | 2466            |
| 05      | 2407            | 25      | 2427            | 45      | 2447            | 65      | 2467            |
| 06      | 2408            | 26      | 2428            | 46      | 2448            | 66      | 2468            |
| 07      | 2409            | 27      | 2429            | 47      | 2449            | 67      | 2469            |
| 08      | 2410            | 28      | 2430            | 48      | 2450            | 68      | 2470            |
| 09      | 2411            | 29      | 2431            | 49      | 2451            | 69      | 2471            |
| 10      | 2412            | 30      | 2432            | 50      | 2452            | 70      | 2472            |
| 11      | 2413            | 31      | 2433            | 51      | 2453            | 71      | 2473            |
| 12      | 2414            | 32      | 2434            | 52      | 2454            | 72      | 2474            |
| 13      | 2415            | 33      | 2435            | 53      | 2455            | 73      | 2475            |
| 14      | 2416            | 34      | 2436            | 54      | 2456            | 74      | 2476            |
| 15      | 2417            | 35      | 2437            | 55      | 2457            | 75      | 2477            |
| 16      | 2418            | 36      | 2438            | 56      | 2458            | 76      | 2478            |
| 17      | 2419            | 37      | 2439            | 57      | 2459            | 77      | 2479            |
| 18      | 2420            | 38      | 2440            | 58      | 2460            | 78      | 2480            |
| 19      | 2421            | 39      | 2441            | 59      | 2461            | ---     | ---             |



## 2.3 Test Mode & Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4
- b. The complete test system included EUT for RF test.
- c. The EUT was executed to keep transmitting and receiving data via Bluetooth.
- d. The following test mode was performed for conduction and radiation test:  
GFSK: CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.  
8DPSK: CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.

## 2.4 Description of Test System

| No | Device    | Manufacturer | Model No.  | Description |
|----|-----------|--------------|------------|-------------|
| 1  | USB Mouse | DELL         | OXN967     | R41108      |
| 2  | Notebook  | SONY         | PCG-71811P | R33021      |

### Use Cable:

| No. | Cable           | Quantity | Description        |
|-----|-----------------|----------|--------------------|
| A   | Audio Cable     | 1        | 1m Non Shielding   |
| B   | DC Cable        | 1        | 1.7m Non Shielding |
| C   | USB Mouse Cable | 1        | 1.5m Non Shielding |



## 2.5 General Information of Test

|                                     |           |                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | Test Site | <b>CerpPASS Technology Corporation Test Laboratory</b><br>Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.)<br>Tel:+886-3-3226-888<br>Fax:+886-3-3226-881<br>Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C.<br>Tel: +886-2-2663-8582 |
|                                     | FCC       | TW1079, TW1061,390316, 228391, 641184                                                                                                                                                                                                                                                                           |
|                                     | IC        | 4934B-1, 4934E-1, 4934E-2                                                                                                                                                                                                                                                                                       |
|                                     | VCCI      | T-2205 for Telecommunication Test<br>C-4663 for Conducted emission test<br>R-3428, R-4218 for Radiated emission test<br>G-812, G-813 for radiated disturbance above 1GHz                                                                                                                                        |
| <input checked="" type="checkbox"/> | Test Site | <b>CerpPASS Technology (Suzhou) Co.,Ltd</b><br>Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China<br>Tel: +86-512-6917-5888<br>Fax: +86-512-6917-5666                                                                                                                                |
|                                     | FCC       | 916572, 331395                                                                                                                                                                                                                                                                                                  |
|                                     | IC        | 7290A-1, 7290A-2                                                                                                                                                                                                                                                                                                |
|                                     | VCCI      | T-343 for Telecommunication Test<br>C-2919 for Conducted emission test<br>R-2670 for Radiated emission test<br>G-227 for radiated disturbance above 1GHz                                                                                                                                                        |
| Frequency Range Investigated:       |           | Conducted: from 150kHz to 30 MHz<br>Radiation: from 30 MHz to 25000MHz                                                                                                                                                                                                                                          |
| Test Distance:                      |           | The test distance of radiated emission from antenna to EUT is 3 M.                                                                                                                                                                                                                                              |



## 2.6 Measurement Uncertainty

| Measurement Item                         | Measurement Uncertainty   |
|------------------------------------------|---------------------------|
| Conducted Emission                       | $\pm 2.71$ dB             |
| Radiation test (10m) below 1GHz          | Vertical : $\pm 3.89$ dB  |
|                                          | Horizontal: $\pm 4.11$ dB |
| Radiation test (3m) below 1GHz           | Vertical : $\pm 4.11$ dB  |
|                                          | Horizontal: $\pm 4.10$ dB |
| 20 dB Bandwidth                          | 7500 Hz                   |
| Maximum Peak Output Power                | $\pm 1.4$ dB              |
| 100kHz Bandwidth of Frequency Band Edges | $\pm 2.2$ dB              |
| Power Spectral Density                   | $\pm 1.3870$ 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: PCB Antenna

Antenna Gain: 1.54 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                      |

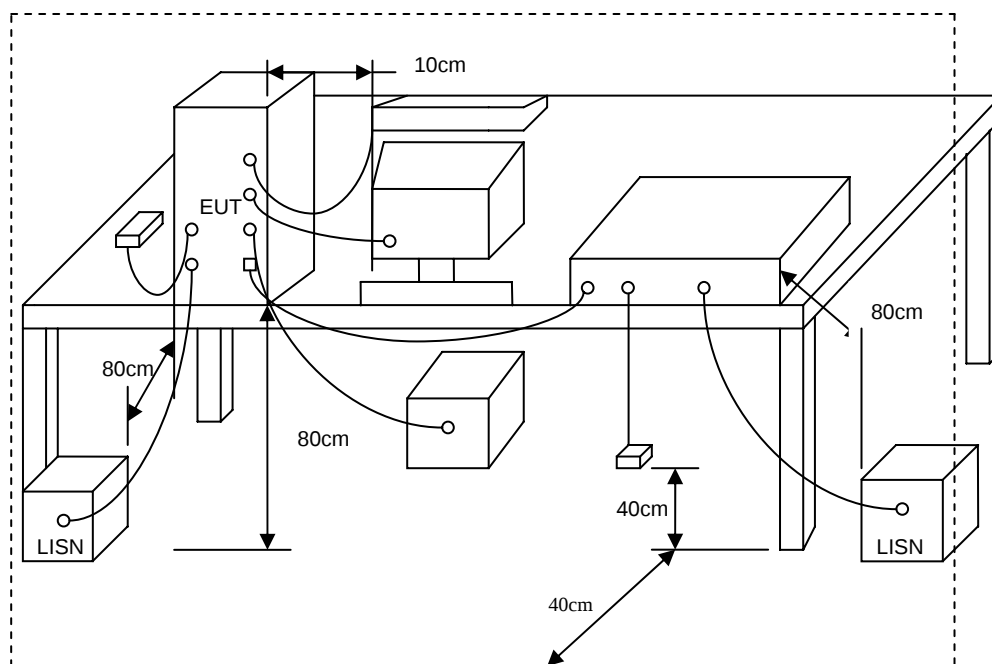
\*Decreases with the logarithm of the frequency.

### 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



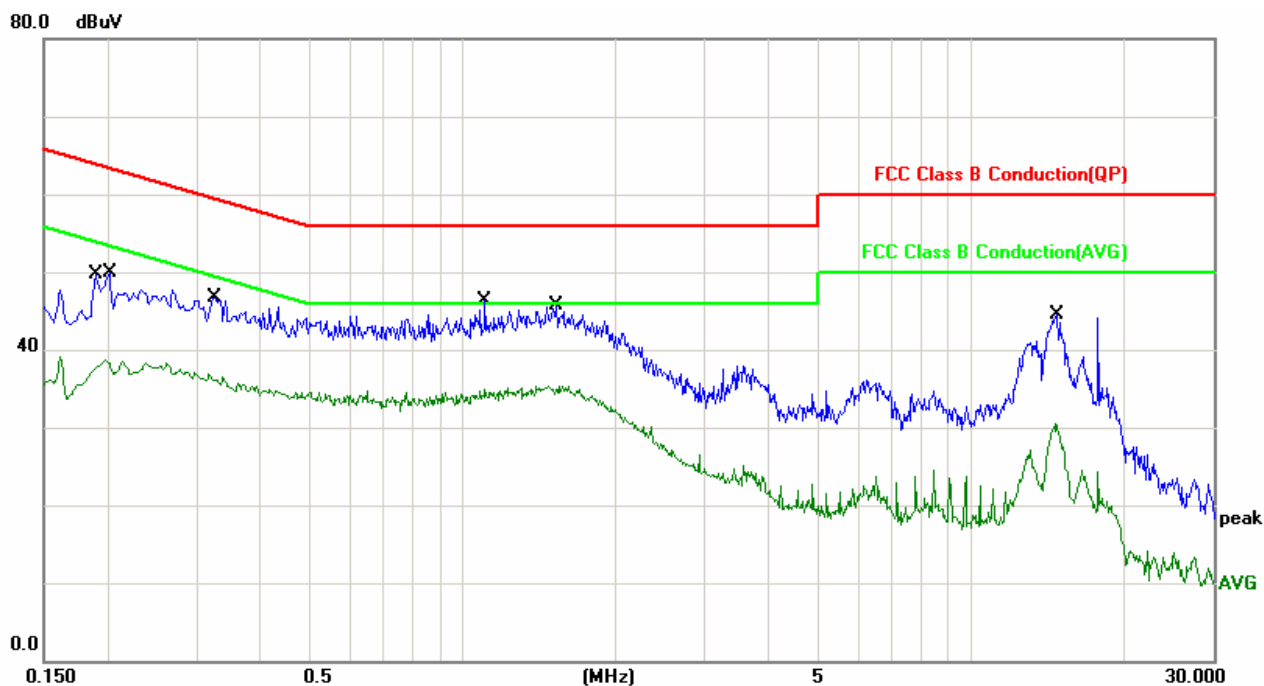
### 4.4 Measurement equipment

| 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

|                 |             |           |            |
|-----------------|-------------|-----------|------------|
| Test Mode :     | Normal Link | Phase :   | Line       |
| Temperature :   | 20 °C       | Humidity: | 51%        |
| Pressur(mbar) : | 1002        | Date:     | 2015/04/25 |

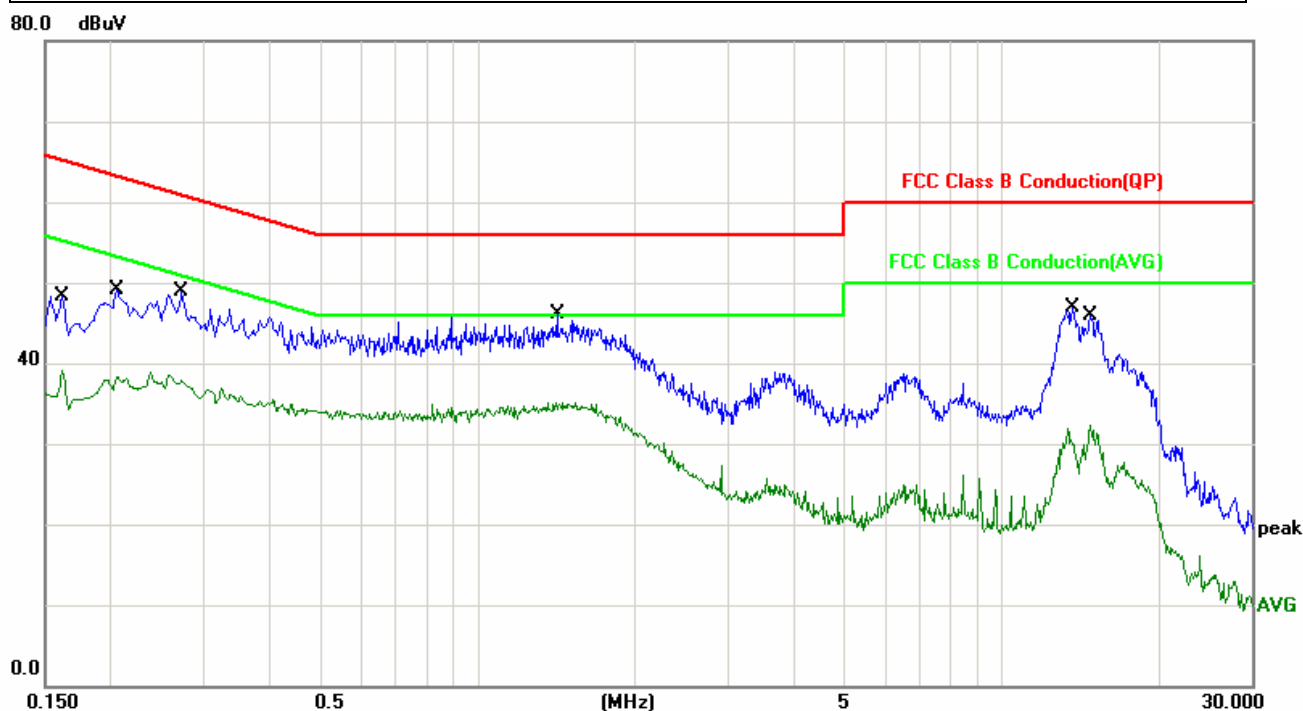


| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.1900          | 11.38       | 32.73          | 44.11        | 64.03        | -19.92      | QP       |
| 2   | 0.1900          | 11.38       | 26.01          | 37.39        | 54.03        | -16.64      | AVG      |
| 3   | 0.2020          | 10.95       | 33.31          | 44.26        | 63.52        | -19.26      | QP       |
| 4   | 0.2020          | 10.95       | 26.71          | 37.66        | 53.52        | -15.86      | AVG      |
| 5   | 0.3260          | 10.69       | 30.73          | 41.42        | 59.55        | -18.13      | QP       |
| 6   | 0.3260          | 10.69       | 25.39          | 36.08        | 49.55        | -13.47      | AVG      |
| 7   | 1.1060          | 10.34       | 28.81          | 39.15        | 56.00        | -16.85      | QP       |
| 8   | 1.1060          | 10.34       | 23.55          | 33.89        | 46.00        | -12.11      | AVG      |
| 9   | 1.5300          | 10.66       | 29.60          | 40.26        | 56.00        | -15.74      | QP       |
| 10  | 1.5300          | 10.66       | 24.17          | 34.83        | 46.00        | -11.17      | AVG      |
| 11  | 14.7500         | 10.43       | 26.67          | 37.10        | 60.00        | -22.90      | QP       |
| 12  | 14.7500         | 10.43       | 16.69          | 27.12        | 50.00        | -22.88      | AVG      |

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



|                 |             |            |            |
|-----------------|-------------|------------|------------|
| Test Mode :     | Normal Link | Phase :    | Neutral    |
| Temperature :   | 20°C        | Humidity : | 51%        |
| Pressur(mbar) : | 1002        | Date :     | 2015/04/25 |



| No. | Frequency (MHz) | Factor (dB) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector |
|-----|-----------------|-------------|----------------|--------------|--------------|-------------|----------|
| 1   | 0.1620          | 12.93       | 32.59          | 45.52        | 65.36        | -19.84      | QP       |
| 2   | 0.1620          | 12.93       | 27.22          | 40.15        | 55.36        | -15.21      | AVG      |
| 3   | 0.2060          | 10.95       | 32.51          | 43.46        | 63.36        | -19.90      | QP       |
| 4   | 0.2060          | 10.95       | 26.44          | 37.39        | 53.36        | -15.97      | AVG      |
| 5   | 0.2740          | 10.81       | 31.61          | 42.42        | 60.99        | -18.57      | QP       |
| 6   | 0.2740          | 10.81       | 26.20          | 37.01        | 50.99        | -13.98      | AVG      |
| 7   | 1.4220          | 10.27       | 29.75          | 40.02        | 56.00        | -15.98      | QP       |
| 8   | 1.4220          | 10.27       | 24.45          | 34.72        | 46.00        | -11.28      | AVG      |
| 9   | 13.6580         | 10.42       | 22.78          | 33.20        | 60.00        | -26.80      | QP       |
| 10  | 13.6580         | 10.42       | 13.05          | 23.47        | 50.00        | -26.53      | AVG      |
| 11  | 14.7900         | 10.43       | 27.77          | 38.20        | 60.00        | -21.80      | QP       |
| 12  | 14.7900         | 10.43       | 18.73          | 29.16        | 50.00        | -20.84      | AVG      |

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



## 5. Test of Radiated Emission

### 5.1 Test Limit

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defined in ANSI C63.4-2009. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions. For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| FREQUENCIES(MHz) | FIELD STRENGTH(microvolts/meter) | MEASUREMENT DISTANCE(meters) |
|------------------|----------------------------------|------------------------------|
| 0.009~0.490      | 2400/F(kHz)                      | 300                          |
| 0.490~1.705      | 24000/F(kHz)                     | 30                           |
| 1.705~30.0       | 30                               | 30                           |
| 30~88            | 100                              | 3                            |
| 88~216           | 150                              | 3                            |
| 216~960          | 200                              | 3                            |
| Above 960        | 500                              | 3                            |

For unintentional device, according to CISPR PUB.22, for Class B digital devices, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 10 meters shall not exceed the above table.

| Frequency (MHz) | Distance Meters | Radiated (dB $\mu$ V/ M) |
|-----------------|-----------------|--------------------------|
| 30-230          | 10              | 30                       |
| 230-1000        | 10              | 37                       |

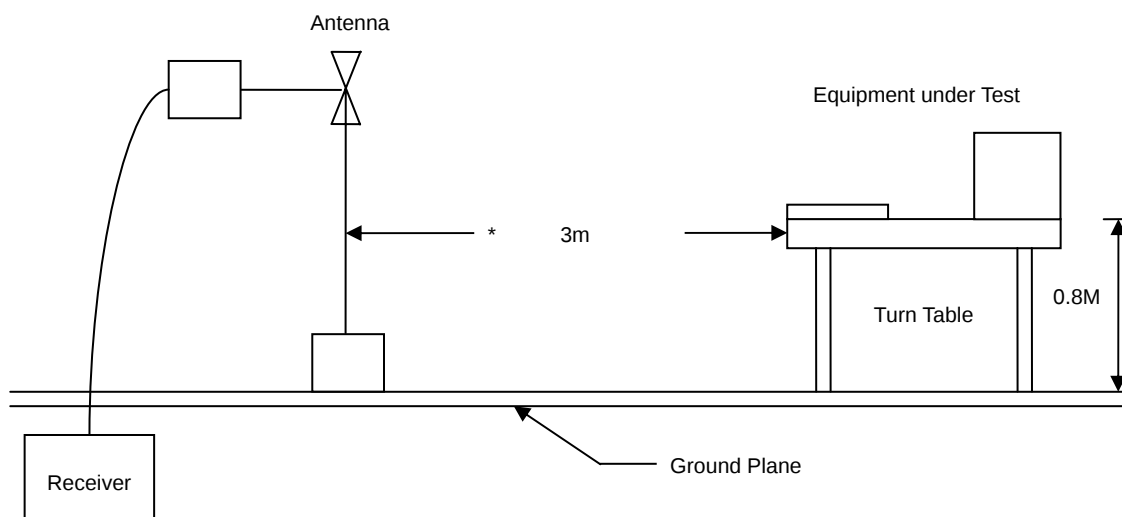


## 5.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- 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.
- 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.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- 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.
- 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.

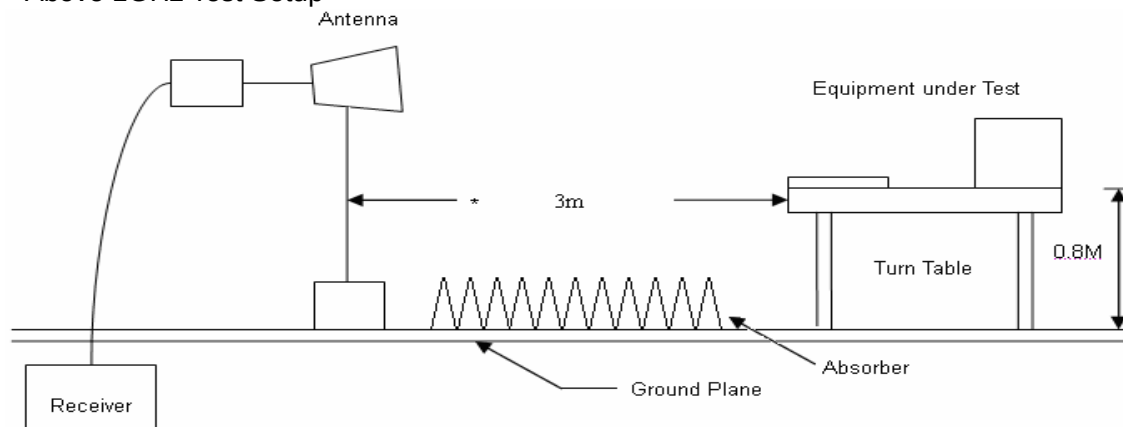
## 5.3 Typical Test Setup

### 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

The 9kHz-30MHz spurious emission is under limit 20dB more.

### 5.5.1 Test Result and Data of Transmitter

#### Below 1GHz

|                            |                              |
|----------------------------|------------------------------|
| Engineer :Amos             |                              |
| Site : EMC Lab AC 102      | Time : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP | Margin : 6                   |
| EUT : Bluetooth Speaker    | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz       | Note : Normal Link           |

| Frequency<br>(MHz) | AntPol.<br>H/V | Correct<br>Factor<br>(dB) | Reading<br>level<br>(dBuV) | Measure<br>Level<br>(dBuV/m) | Limit 3m<br>(dBuV/m) | Safe<br>Margin<br>(dB) | Detector<br>mode<br>(PK/QP) |
|--------------------|----------------|---------------------------|----------------------------|------------------------------|----------------------|------------------------|-----------------------------|
| 32.9099            | H              | -4.78                     | 32.47                      | 27.69                        | 40.00                | -12.31                 | QP                          |
| 151.2500           | H              | -11.02                    | 44.24                      | 33.22                        | 43.50                | -10.28                 | QP                          |
| 173.5600           | H              | -11.79                    | 48.23                      | 36.44                        | 43.50                | -7.06                  | QP                          |
| 199.7500           | H              | -9.65                     | 47.74                      | 38.09                        | 43.50                | -5.41                  | QP                          |
| 328.7600           | H              | -4.40                     | 40.53                      | 36.13                        | 46.00                | -9.87                  | QP                          |
| 480.0800           | H              | -1.10                     | 32.40                      | 31.30                        | 46.00                | -14.70                 | QP                          |
|                    |                |                           |                            |                              |                      |                        |                             |
| 32.9100            | V              | -4.78                     | 41.00                      | 36.22                        | 40.00                | -3.78                  | QP                          |
| 43.5800            | V              | -11.77                    | 48.40                      | 36.63                        | 40.00                | -3.37                  | QP                          |
| 53.2800            | V              | -14.73                    | 51.23                      | 36.50                        | 40.00                | -3.50                  | QP                          |
| 77.5300            | V              | -13.65                    | 51.02                      | 37.37                        | 40.00                | -2.63                  | QP                          |
| 88.2000            | V              | -11.58                    | 48.25                      | 36.67                        | 43.50                | -6.83                  | QP                          |
| 199.7500           | V              | -9.65                     | 49.32                      | 39.67                        | 43.50                | -3.83                  | QP                          |

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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP              | Margin : 6                   |
| Test mode: Transmit by GFSK(1M) 2402MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                    |                              |

**VERTICAL**

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 62.01                | 51.00                  | 74.00          | -23.00      | peak          |
| 2   | 1382.500        | -8.68               | 55.48                | 46.80                  | 74.00          | -27.20      | peak          |
| 3   | 1637.500        | -6.82               | 54.22                | 47.40                  | 74.00          | -26.60      | peak          |
| 4   | 1935.000        | -5.10               | 51.20                | 46.10                  | 74.00          | -27.90      | peak          |
| 5   | 2955.000        | 0.47                | 41.38                | 41.85                  | 74.00          | -32.15      | peak          |
| 6   | 4825.000        | 8.27                | 40.48                | 48.75                  | 74.00          | -25.25      | peak          |

**HORIZONTAL**

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 54.16                | 43.15                  | 74.00          | -30.85      | peak          |
| 2   | 1637.500        | -6.82               | 53.23                | 46.41                  | 74.00          | -27.59      | peak          |
| 3   | 2020.000        | -4.64               | 47.33                | 42.69                  | 74.00          | -31.31      | peak          |
| 4   | 2870.000        | -0.10               | 42.27                | 42.17                  | 74.00          | -31.83      | peak          |
| 5   | 3210.000        | 1.87                | 40.98                | 42.85                  | 74.00          | -31.15      | peak          |
| 6   | 4825.000        | 8.27                | 43.30                | 51.57                  | 74.00          | -22.43      | peak          |

**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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP              | Margin : 6                   |
| Test mode: Transmit by GFSK(1M) 2441MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                    |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 62.26                | 51.25                  | 74.00          | -22.75      | peak          |
| 2   | 1637.500        | -6.82               | 54.28                | 47.46                  | 74.00          | -26.54      | peak          |
| 3   | 1935.000        | -5.10               | 52.15                | 47.05                  | 74.00          | -26.95      | peak          |
| 4   | 2955.000        | 0.47                | 42.00                | 42.47                  | 74.00          | -31.53      | peak          |
| 5   | 3210.000        | 1.87                | 40.52                | 42.39                  | 74.00          | -31.61      | peak          |
| 6   | 4825.000        | 8.27                | 38.66                | 46.93                  | 74.00          | -27.07      | peak          |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 54.75                | 43.74                  | 74.00          | -30.26      | peak          |
| 2   | 1552.500        | -7.31               | 54.86                | 47.55                  | 74.00          | -26.45      | peak          |
| 3   | 1977.500        | -4.86               | 45.76                | 40.90                  | 74.00          | -33.10      | peak          |
| 4   | 2955.000        | 0.47                | 40.86                | 41.33                  | 74.00          | -32.67      | peak          |
| 5   | 3210.000        | 1.87                | 40.83                | 42.70                  | 74.00          | -31.30      | peak          |
| 6   | 4825.000        | 8.27                | 42.96                | 51.23                  | 74.00          | -22.77      | peak          |

## 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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP              | Margin : 6                   |
| Test mode: Transmit by GFSK(1M) 2480MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                    |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 60.56                | 49.55                  | 74.00          | -24.45      | peak          |
| 2   | 1382.500        | -8.68               | 55.93                | 47.25                  | 74.00          | -26.75      | peak          |
| 3   | 1637.500        | -6.82               | 54.23                | 47.41                  | 74.00          | -26.59      | peak          |
| 4   | 1935.000        | -5.10               | 49.85                | 44.75                  | 74.00          | -29.25      | peak          |
| 5   | 2912.500        | 0.18                | 41.89                | 42.07                  | 74.00          | -31.93      | peak          |
| 6   | 4825.000        | 8.27                | 41.11                | 49.38                  | 74.00          | -24.62      | peak          |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 60.56                | 49.55                  | 74.00          | -24.45      | peak          |
| 2   | 1382.500        | -8.68               | 55.93                | 47.25                  | 74.00          | -26.75      | peak          |
| 3   | 1637.500        | -6.82               | 54.23                | 47.41                  | 74.00          | -26.59      | peak          |
| 4   | 1935.000        | -5.10               | 49.85                | 44.75                  | 74.00          | -29.25      | peak          |
| 5   | 2190.000        | -3.91               | 47.02                | 43.11                  | 74.00          | -30.89      | peak          |
| 6   | 4825.000        | 8.27                | 41.11                | 49.38                  | 74.00          | -24.62      | peak          |

## 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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP               | Margin : 6                   |
| Test mode: Transmit by 8DPSK(3M) 2402MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                     |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 62.92                | 51.91                  | 74.00          | -22.09      | peak          |
| 2   | 1637.500        | -6.82               | 55.25                | 48.43                  | 74.00          | -25.57      | peak          |
| 3   | 1935.000        | -5.10               | 51.85                | 46.75                  | 74.00          | -27.25      | peak          |
| 4   | 2955.000        | 0.47                | 41.70                | 42.17                  | 74.00          | -31.83      | peak          |
| 5   | 4187.500        | 6.07                | 35.31                | 41.38                  | 74.00          | -32.62      | peak          |
| 6   | 4825.000        | 8.27                | 39.34                | 47.61                  | 74.00          | -26.39      | peak          |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 55.15                | 44.14                  | 74.00          | -29.86      | peak          |
| 2   | 1637.500        | -6.82               | 52.80                | 45.98                  | 74.00          | -28.02      | peak          |
| 3   | 1977.500        | -4.86               | 46.85                | 41.99                  | 74.00          | -32.01      | peak          |
| 4   | 2870.000        | -0.10               | 41.81                | 41.71                  | 74.00          | -32.29      | peak          |
| 5   | 3210.000        | 1.87                | 40.69                | 42.56                  | 74.00          | -31.44      | peak          |
| 6   | 4825.000        | 8.27                | 42.98                | 51.25                  | 74.00          | -22.75      | peak          |

## 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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP               | Margin : 6                   |
| Test mode: Transmit by 8DPSK(3M) 2441MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                     |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 62.57                | 51.56                  | 74.00          | -22.44      | peak          |
| 2   | 1765.000        | -6.08               | 59.35                | 53.27                  | 74.00          | -20.73      | peak          |
| 3   | 1935.000        | -5.10               | 50.97                | 45.87                  | 74.00          | -28.13      | peak          |
| 4   | 4527.500        | 7.71                | 35.02                | 42.73                  | 74.00          | -31.27      | peak          |
| 5   | 4825.000        | 8.27                | 40.14                | 48.41                  | 74.00          | -25.59      | peak          |
| 6   | 5717.500        | 9.56                | 34.00                | 43.56                  | 74.00          | -30.44      | peak          |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1170.000        | -10.62              | 54.53                | 43.91                  | 74.00          | -30.09      | peak          |
| 2   | 1637.500        | -6.82               | 53.50                | 46.68                  | 74.00          | -27.32      | peak          |
| 3   | 2955.000        | 0.47                | 41.90                | 42.37                  | 74.00          | -31.63      | peak          |
| 4   | 3210.000        | 1.87                | 40.08                | 41.95                  | 74.00          | -32.05      | peak          |
| 5   | 4825.000        | 8.27                | 43.40                | 51.67                  | 74.00          | -22.33      | peak          |
| 6   | 6312.500        | 10.38               | 34.04                | 44.42                  | 74.00          | -29.58      | peak          |

## 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 : 2015-4-26             |
| Limit : FCC_CLASS_B_03M_QP               | Margin : 6                   |
| Test mode: Transmit by 8DPSK(3M) 2480MHz | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz                     |                              |

## VERTICAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1127.500        | -11.01              | 61.77                | 50.76                  | 74.00          | -23.24      | peak          |
| 2   | 1637.500        | -6.82               | 54.35                | 47.53                  | 74.00          | -26.47      | peak          |
| 3   | 1935.000        | -5.10               | 49.25                | 44.15                  | 74.00          | -29.85      | peak          |
| 4   | 2870.000        | -0.10               | 42.58                | 42.48                  | 74.00          | -31.52      | peak          |
| 5   | 4825.000        | 8.27                | 39.33                | 47.60                  | 74.00          | -26.40      | peak          |
| 6   | 5250.000        | 8.81                | 34.24                | 43.05                  | 74.00          | -30.95      | peak          |

## HORIZONTAL

| No. | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Measure Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------------|----------------------|------------------------|----------------|-------------|---------------|
| 1   | 1170.000        | -10.62              | 53.84                | 43.22                  | 74.00          | -30.78      | peak          |
| 2   | 1637.500        | -6.82               | 53.00                | 46.18                  | 74.00          | -27.82      | peak          |
| 3   | 2020.000        | -4.64               | 46.10                | 41.46                  | 74.00          | -32.54      | peak          |
| 4   | 2955.000        | 0.47                | 42.37                | 42.84                  | 74.00          | -31.16      | peak          |
| 5   | 3210.000        | 1.87                | 39.98                | 41.85                  | 74.00          | -32.15      | peak          |
| 6   | 4825.000        | 8.27                | 43.48                | 51.75                  | 74.00          | -22.25      | peak          |

## 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

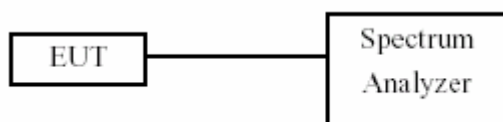
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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 30 KHz and VBW to 100 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 | Manufacturer | Model No. | 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: Apr. 24, 2015

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) |
|---------|-----------------|----------------------|
| 00      | 2402            | 836.342              |
| 39      | 2441            | 762.995              |
| 78      | 2480            | 865.986              |

3M

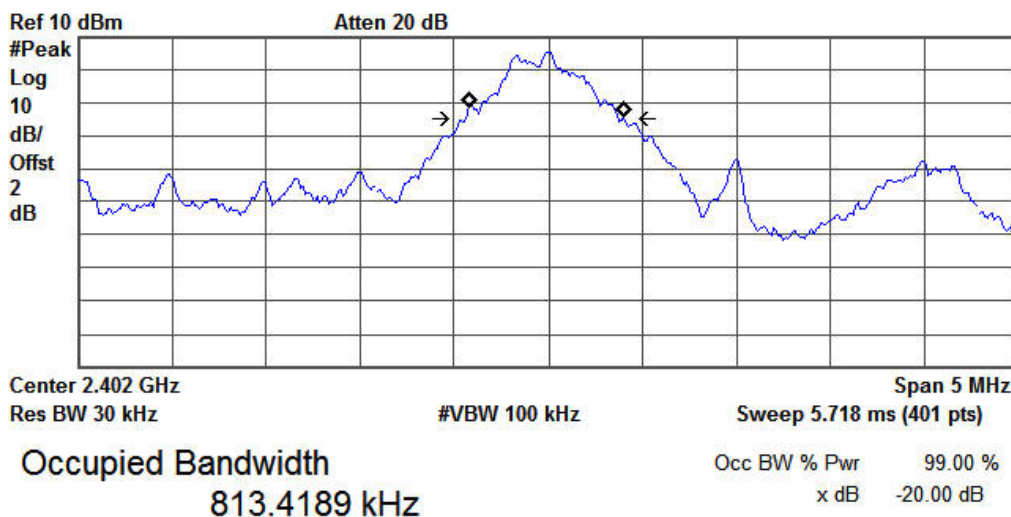
| Channel | Frequency (MHz) | 20dB Bandwidth (KHz) |
|---------|-----------------|----------------------|
| 00      | 2402            | 1156.00              |
| 39      | 2441            | 1152.00              |
| 78      | 2480            | 1165.00              |



Modulation Standard: GFSK (1Mbps)

Channel: 00

Agilent R T

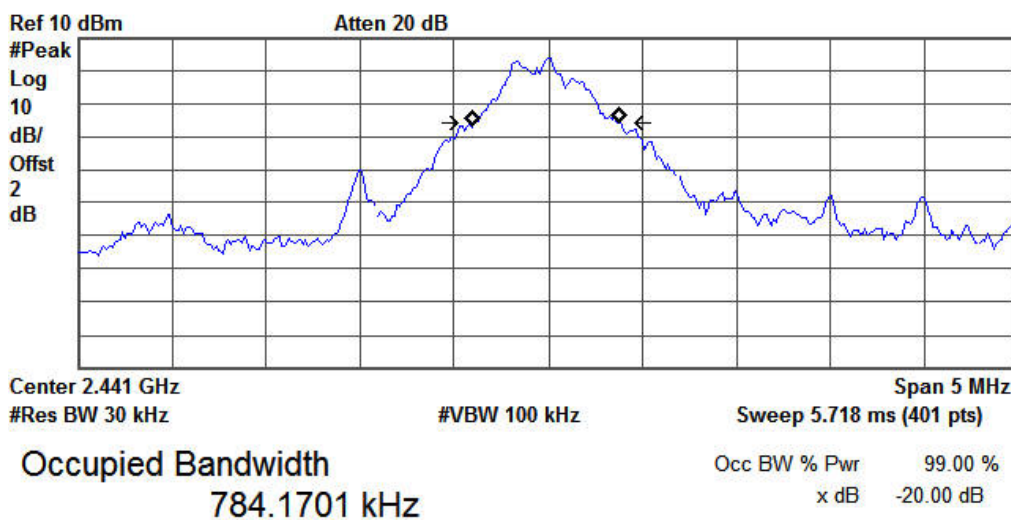


Transmit Freq Error -9.864 kHz  
x dB Bandwidth 836.342 kHz

Modulation Standard: GFSK (1Mbps)

Channel: 39

Agilent R T



Transmit Freq Error -13.998 kHz  
x dB Bandwidth 762.995 kHz

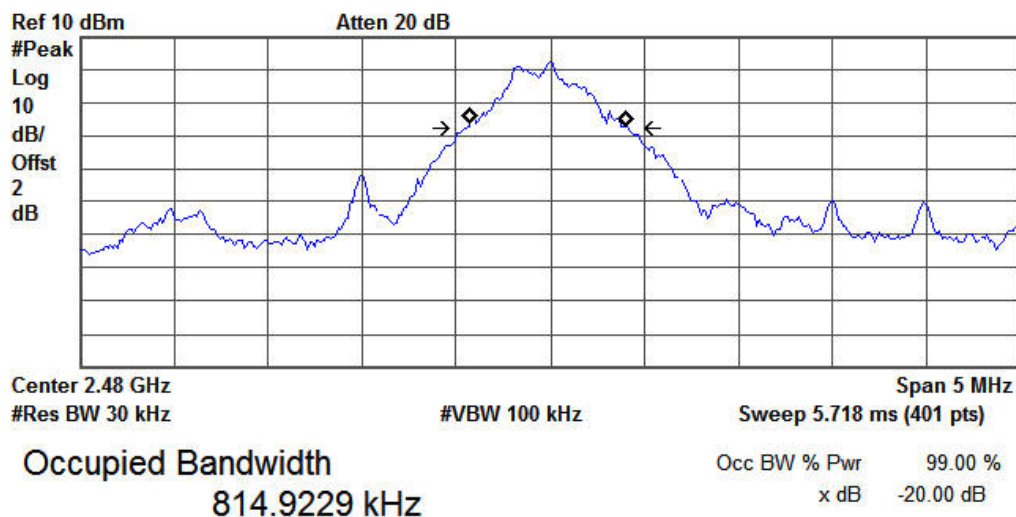


Modulation Standard: GFSK (1Mbps)

Channel: 78

Agilent

R T



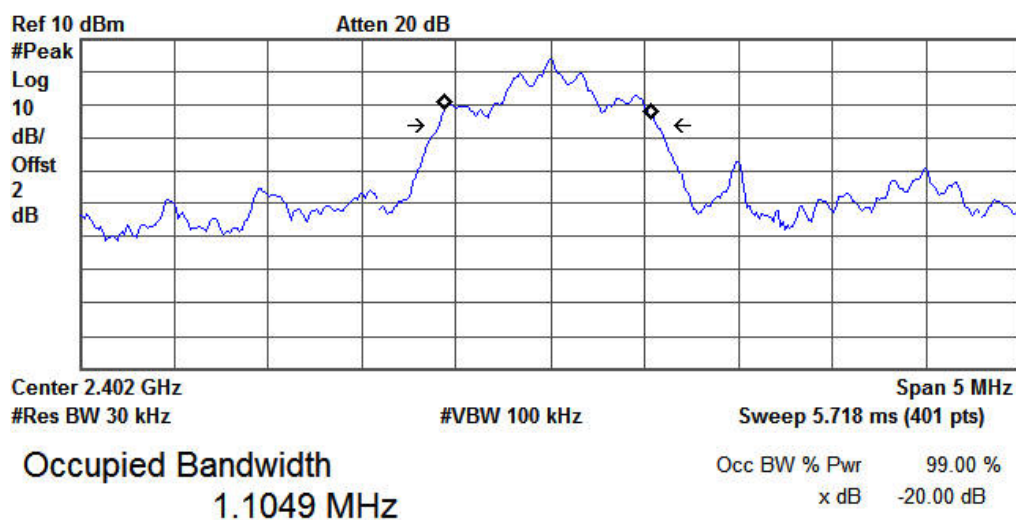
Transmit Freq Error -13.271 kHz  
x dB Bandwidth 865.986 kHz

Modulation Standard: 8DPSK (3Mbps)

Channel: 00

Agilent

R T



Transmit Freq Error -9.193 kHz  
x dB Bandwidth 1.156 MHz

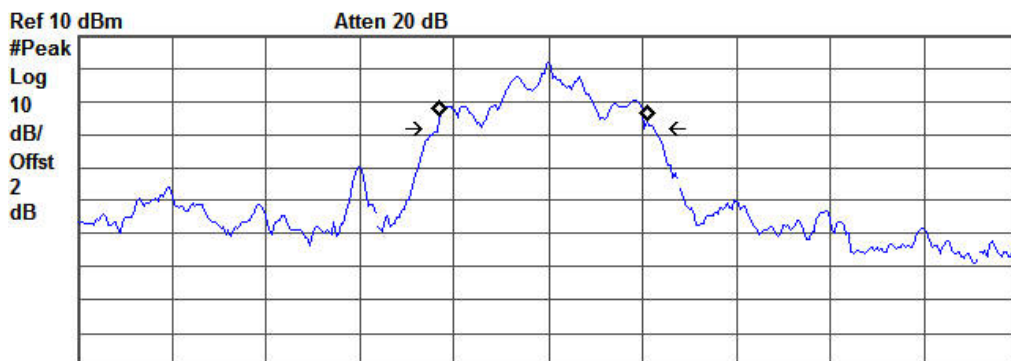


Modulation Standard: 8DPSK (3Mbps)

Channel: 39

Agilent

R T



Center 2.441 GHz

Span 5 MHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 5.718 ms (401 pts)

Occupied Bandwidth  
1.0978 MHz

Occ BW % Pwr 99.00 %  
x dB -20.00 dB

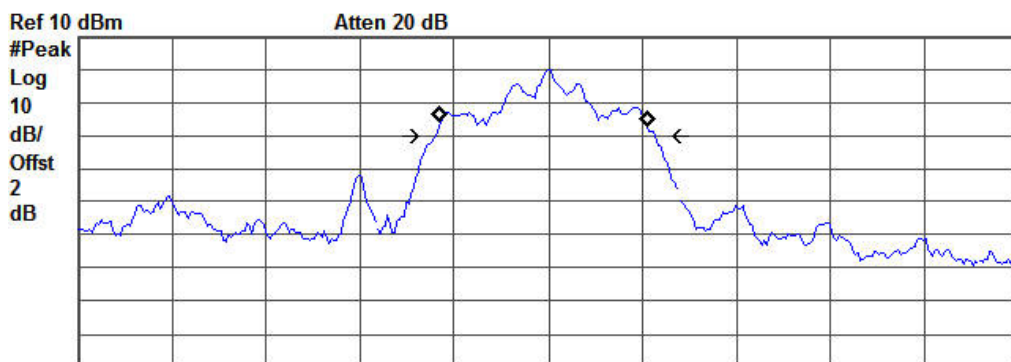
Transmit Freq Error -21.478 kHz  
x dB Bandwidth 1.152 MHz

Modulation Standard: 8DPSK (3Mbps)

Channel: 78

Agilent

R T



Center 2.48 GHz

Span 5 MHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 5.718 ms (401 pts)

Occupied Bandwidth  
1.0955 MHz

Occ BW % Pwr 99.00 %  
x dB -20.00 dB

Transmit Freq Error -21.435 kHz  
x dB Bandwidth 1.165 MHz





## 7. Frequencies Separation

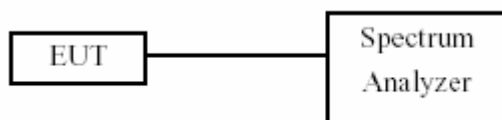
### 7.1 Test Limit

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.

### 7.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels.

### 7.3 Test Setup Layout



### 7.4 Measurement equipment

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

### 7.5 Test Result and Data

Test Date: Apr. 24, 2015

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

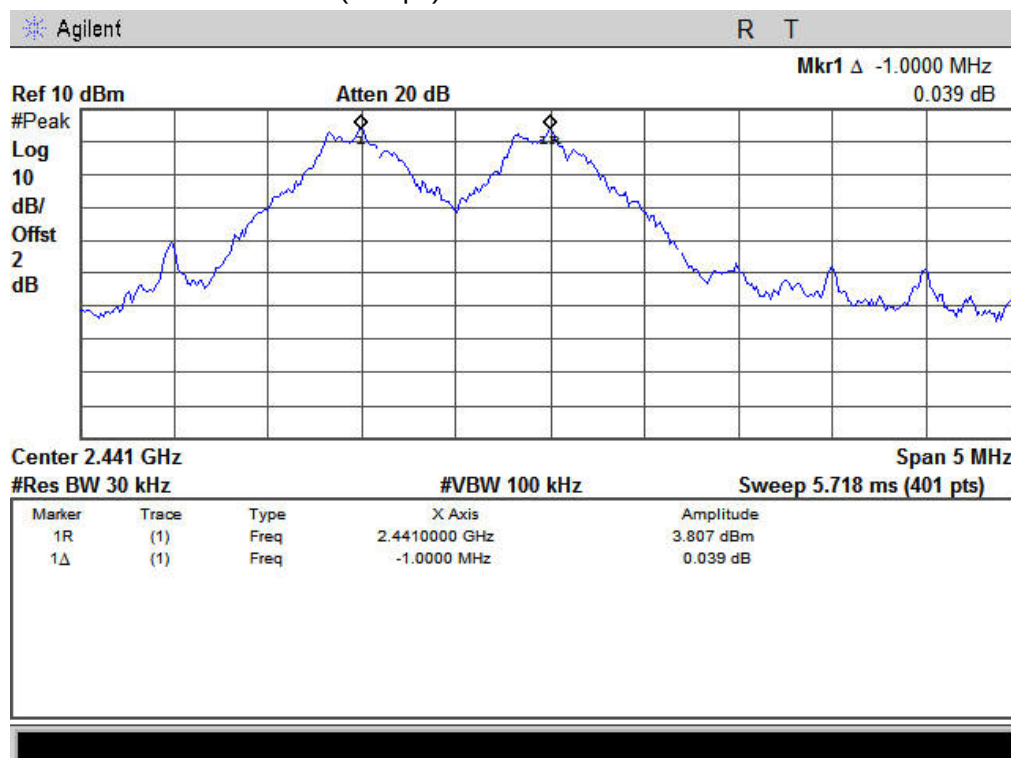
| Channel Separation | Result |
|--------------------|--------|
| (MHz)              |        |
| 1.000              | Pass   |

3M

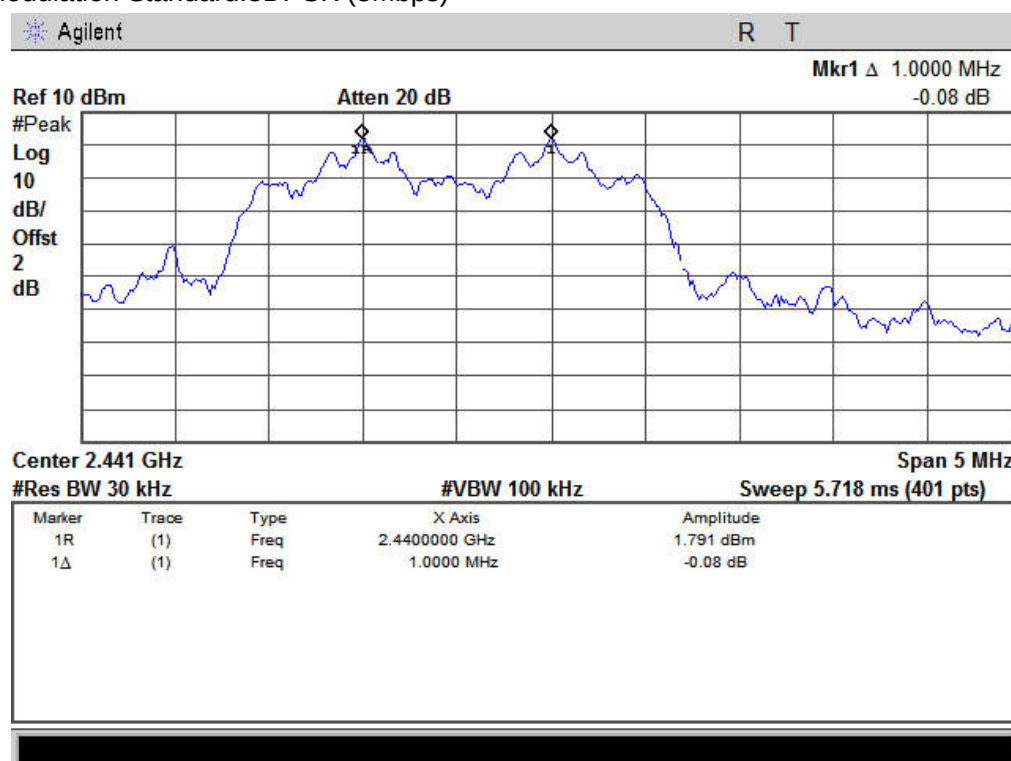
| Channel Separation | Result |
|--------------------|--------|
| (MHz)              |        |
| 1.000              | Pass   |



Modulation Standard: GFSK (1Mbps)



Modulation Standard:8DPSK (3Mbps)





## 8. Dwell Time on each channel

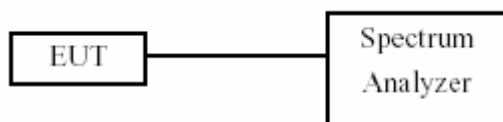
### 8.1 Test Limit

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.

### 8.2 Test Procedures

1. The transmitter output was connected to the spectrum analyzer.
2. Adjust the center frequency to measure frequency, then set zero span mode.
2. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
4. Measure the time duration of one transmission on the measured frequency.

### 8.3 Test Setup Layout



### 8.4 Measurement equipment

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



## 8.5 Test Result and Data

Test Date: Apr. 24, 2015

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

DH 1

$0.40 * (1600/2)/79 * 31.6 = 128.00$  (ms)

| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 0.40               | 128.00                 | 31.60              | 400           | PASS   |

DH 3

$1.67 * (1600/4)/79 * 31.6 = 267.20$  (ms)

| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 1.67               | 267.20                 | 31.60              | 400           | PASS   |

DH 5

$2.92 * (1600/6)/79 * 31.6 = 311.47$  (ms)

| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 2.92               | 311.47                 | 31.60              | 400           | PASS   |



3M

DH 1

$$0.40 * (1600/2)/79 * 31.6 = 128.00 \text{ (ms)}$$

| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 0.40               | 128.00                 | 31.60              | 400           | PASS   |

DH 3

$$1.67 * (1600/4)/79 * 31.6 = 267.20 \text{ (ms)}$$

| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 1.67               | 267.20                 | 31.60              | 400           | PASS   |

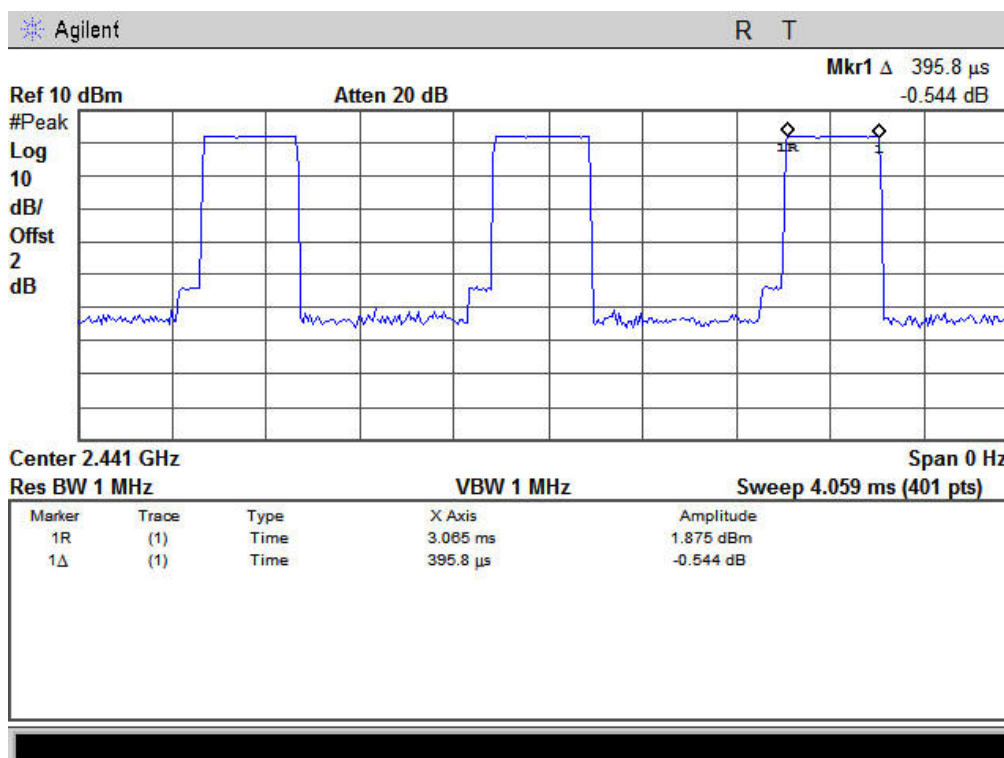
DH 5

$$2.92 * (1600/6)/79 * 31.6 = 311.47 \text{ (ms)}$$

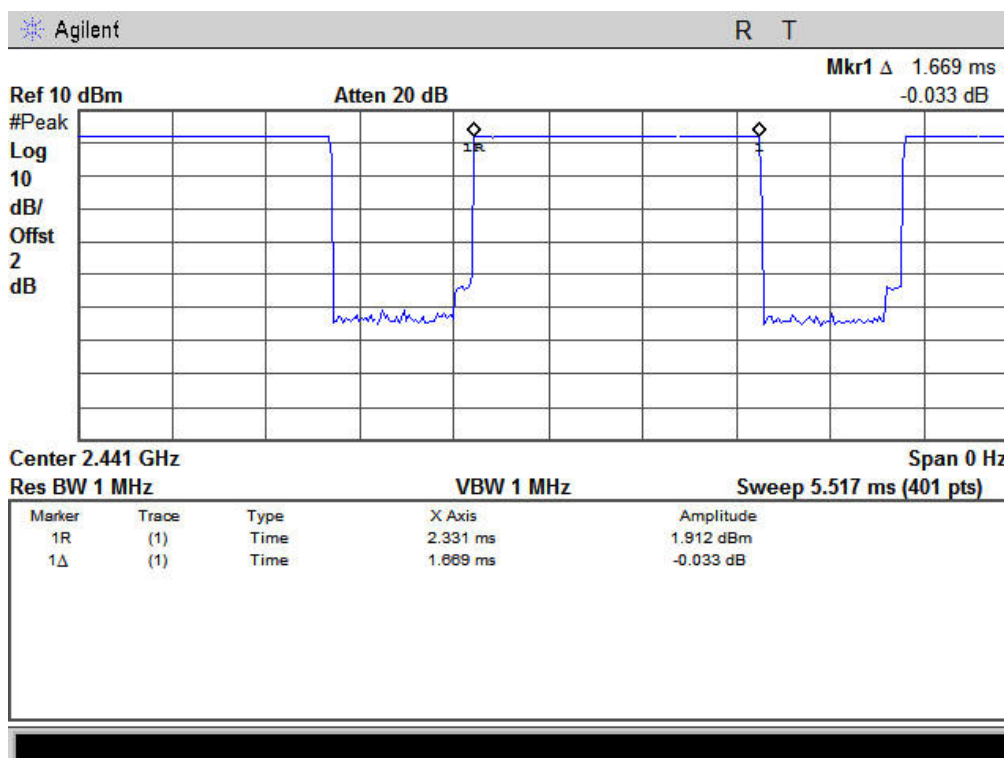
| Pulse Time<br>(ms) | Total of Dwell<br>(ms) | Period Time<br>(s) | Limit<br>(ms) | Result |
|--------------------|------------------------|--------------------|---------------|--------|
| 2.92               | 311.47                 | 31.60              | 400           | PASS   |



Modulation Standard: GFSK (1Mbps)  
DH1

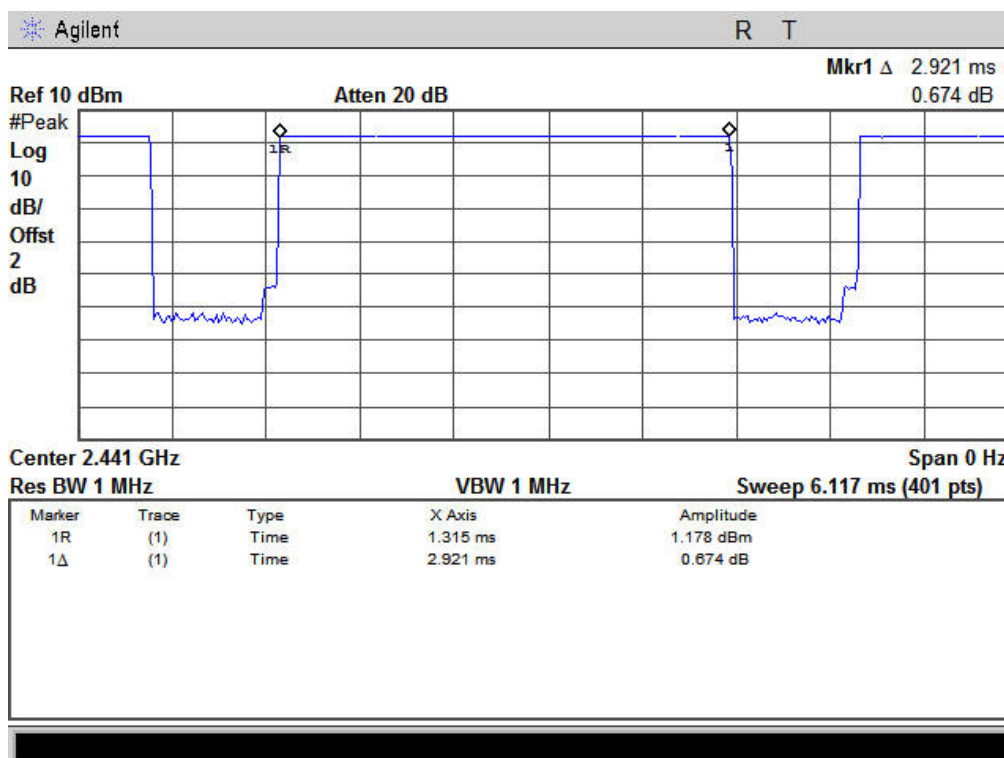


Modulation Standard: GFSK (1Mbps)  
DH3

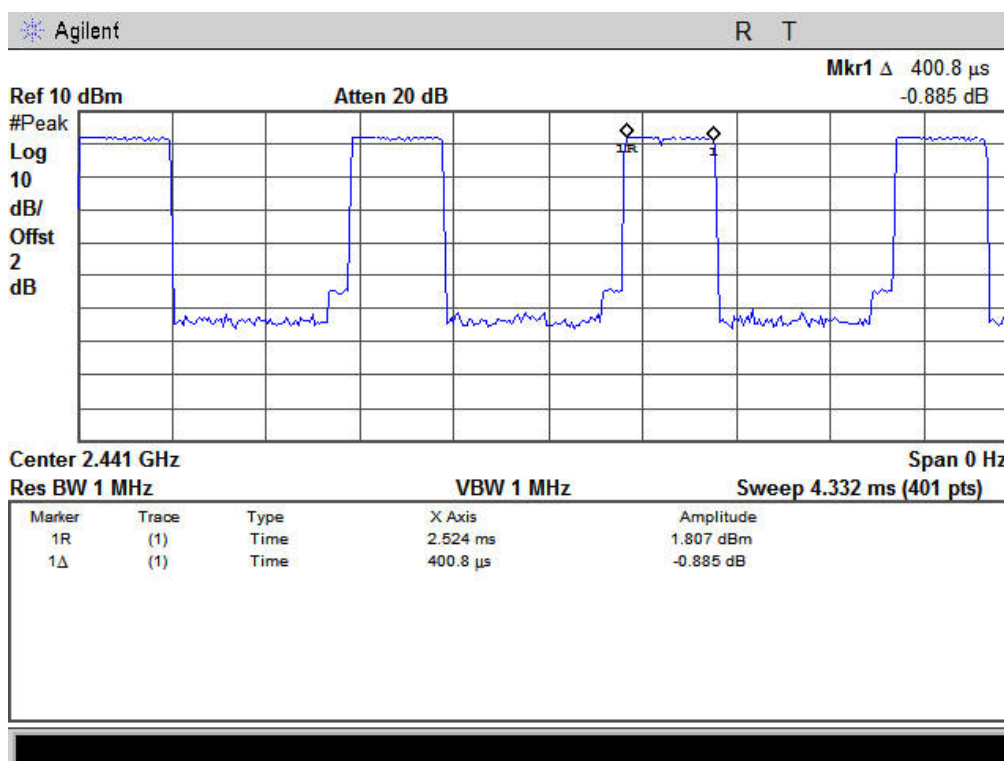




Modulation Standard: GFSK (1Mbps)  
DH5

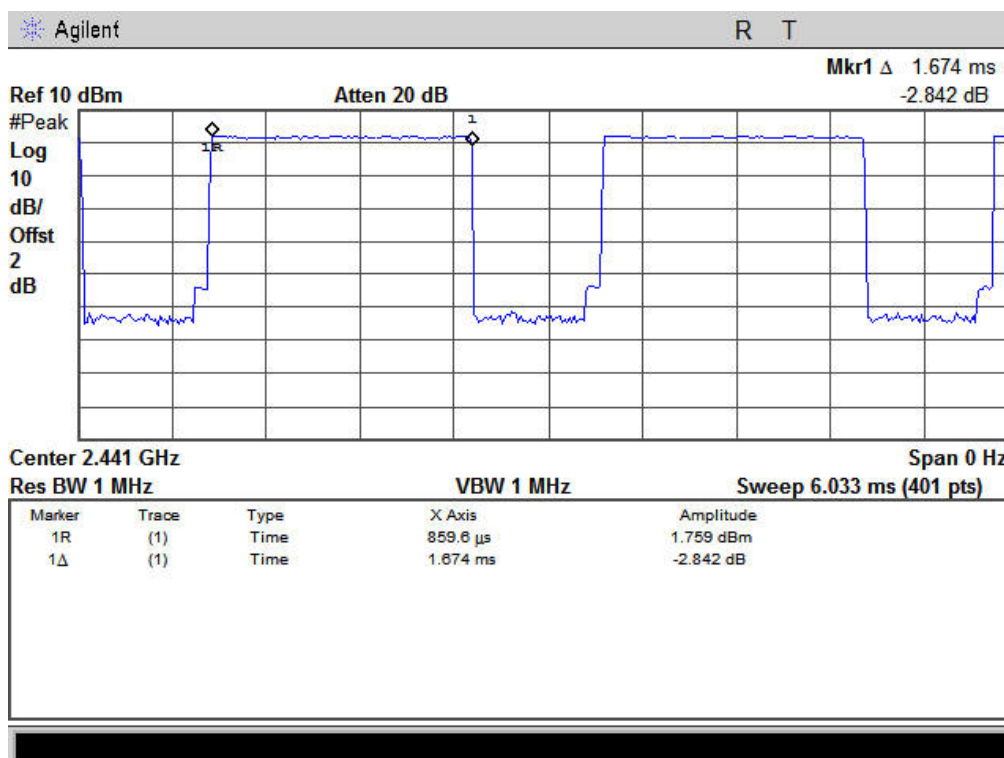


Modulation Standard: 8DPSK (3Mbps)  
DH1

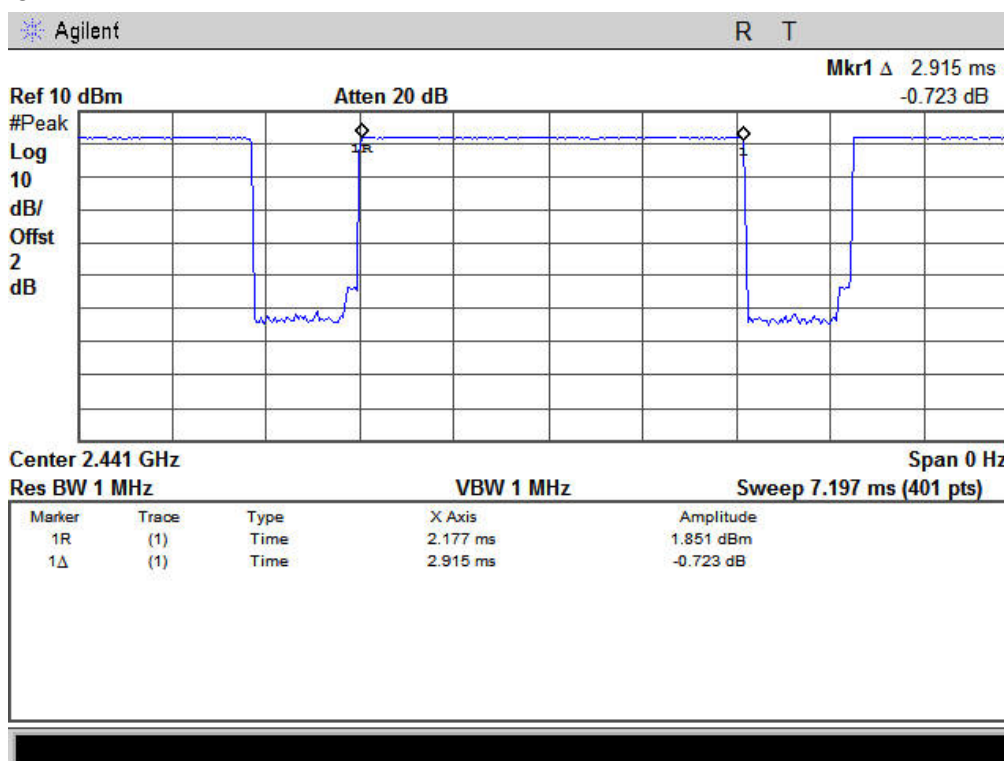




Modulation Standard: 8DPSK (3Mbps)  
DH3



Modulation Standard: 8DPSK (3Mbps)  
DH5





## 9. Number of Hopping Channels

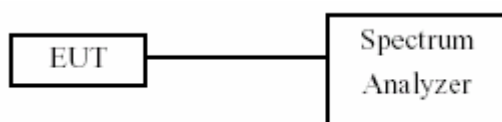
### 9.1 Test Limit

Frequency hopping systems in the 2400 ~ 2483.5 MHz band shall use at least 15 channels.

### 9.2 Test Procedures

- The transmitter output was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 300 KHz and VBW to 300 KHz.
3. Set the MaxHold function, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been record.

### 9.3 Test Setup Layout



### 9.4 Measurement equipment

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

### 9.5 Test Result and Data

Test Date: Apr. 24, 2015

Temperature: 25℃

Atmospheric pressure: 1020 hPa

Humidity: 55%

Modulation Standard: GFSK (1Mbps)

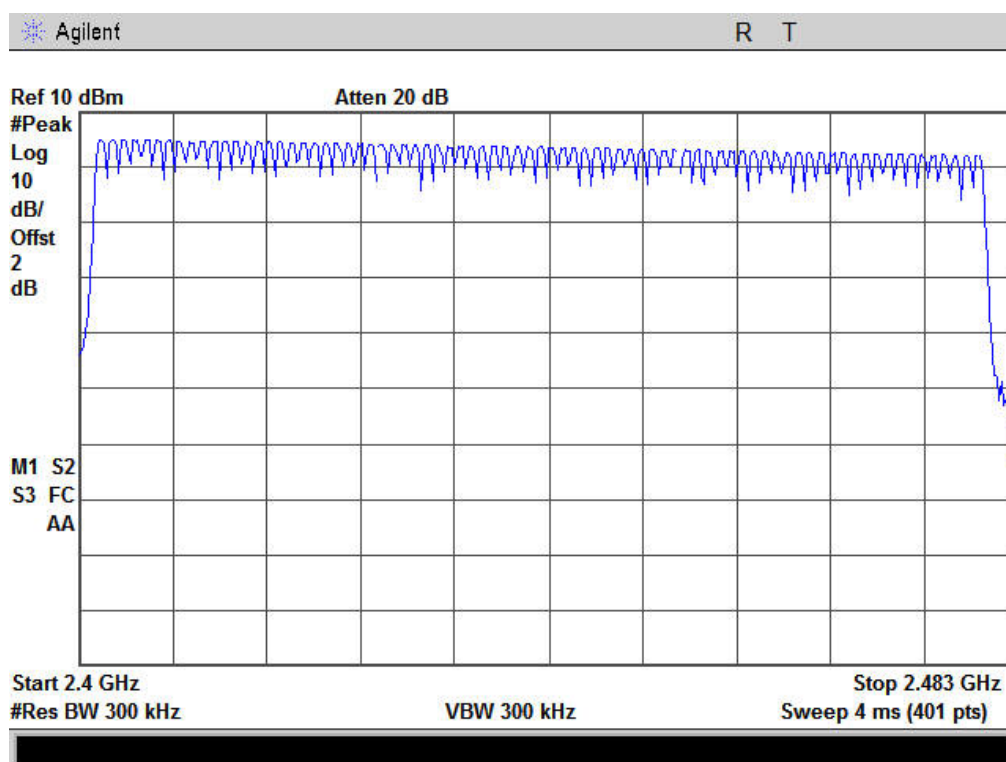
|                             |    |          |
|-----------------------------|----|----------|
| Number of hopping channels: | 79 | Channels |
|-----------------------------|----|----------|

Modulation Standard: 8DPSK (3Mbps)

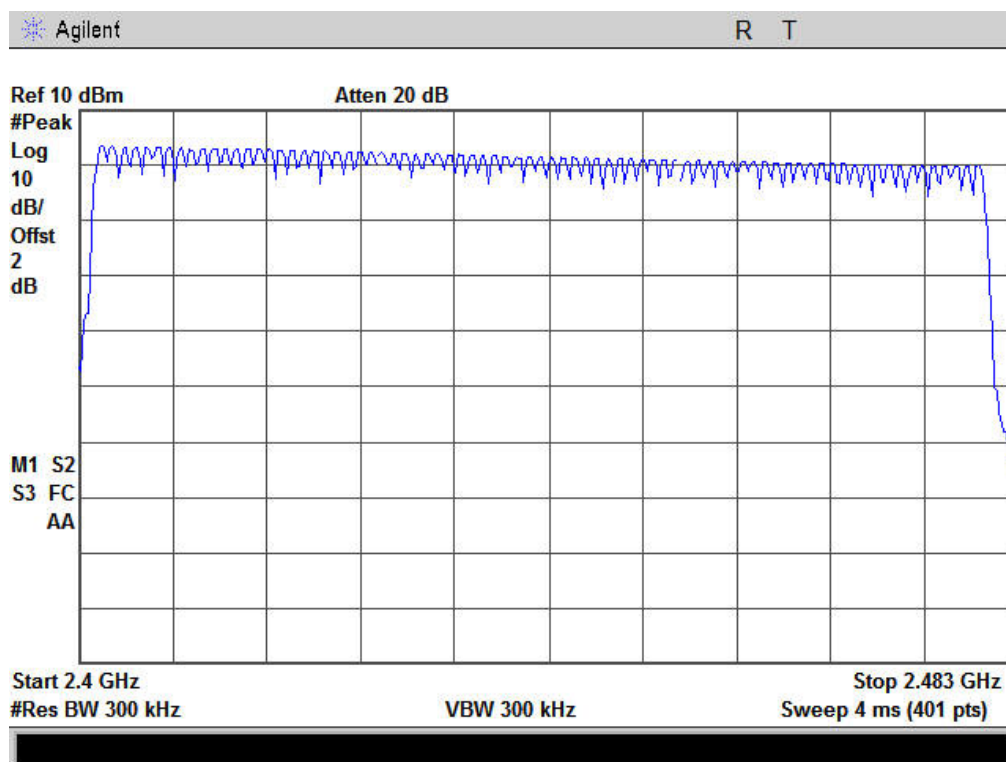
|                             |    |          |
|-----------------------------|----|----------|
| Number of hopping channels: | 79 | Channels |
|-----------------------------|----|----------|



Modulation Standard: GFSK (1Mbps)



Modulation Standard: 8DPSK (3Mbps)





## 10. Maximum Peak Output Power

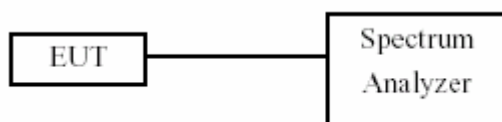
### 10.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

### 10.2 Test Procedures

The antenna port( RF output )of the EUT was connected to the input( RF input )of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

### 10.3 Test Setup Layout



### 10.4 Measurement equipment

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

### 10.5 Test Result and Data

Test Date: Apr. 24, 2015

Temperature: 25℃

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

| Channel | Frequency (MHz) | Peak Power Output (dBm) | Peak Power Output (mW) |
|---------|-----------------|-------------------------|------------------------|
| 00      | 2402            | 5.01                    | 3.1696                 |
| 39      | 2441            | 3.55                    | 2.2646                 |
| 78      | 2478            | 2.19                    | 1.6558                 |

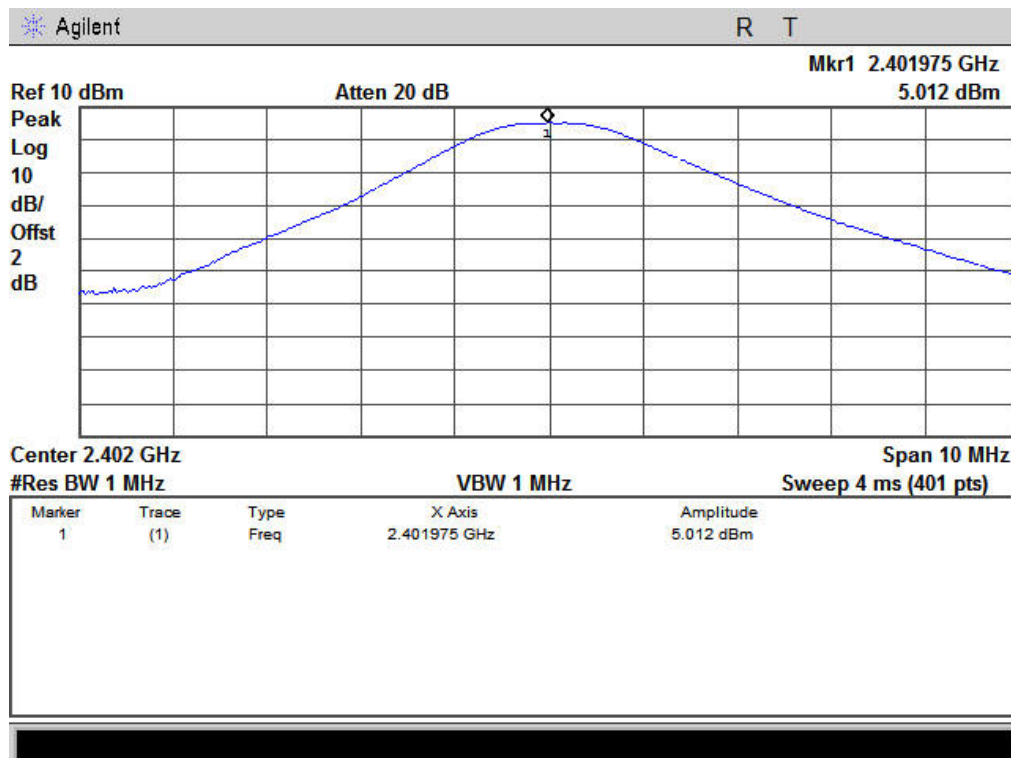
3M

| Channel | Frequency (MHz) | Peak Power Output (dBm) | Peak Power Output (mW) |
|---------|-----------------|-------------------------|------------------------|
| 00      | 2402            | 3.53                    | 2.2542                 |
| 39      | 2441            | 1.67                    | 1.4689                 |
| 78      | 2478            | -0.03                   | 0.9931                 |



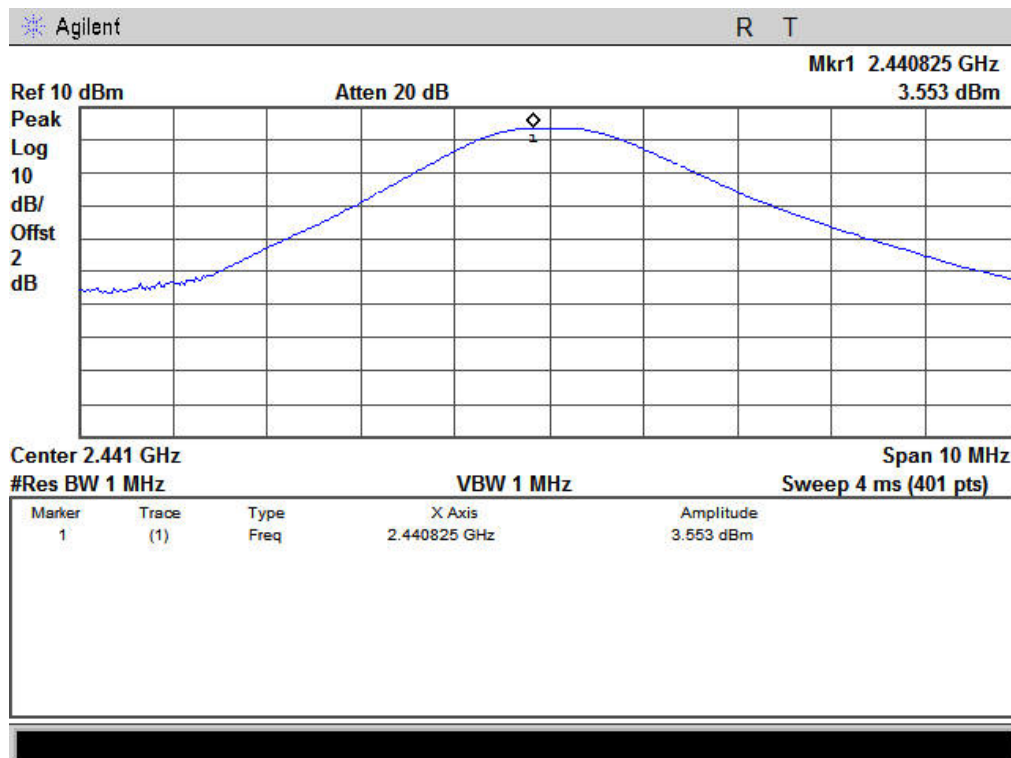
Modulation Standard: GFSK (1Mbps)

Channel: 00



Modulation Standard: GFSK (1Mbps)

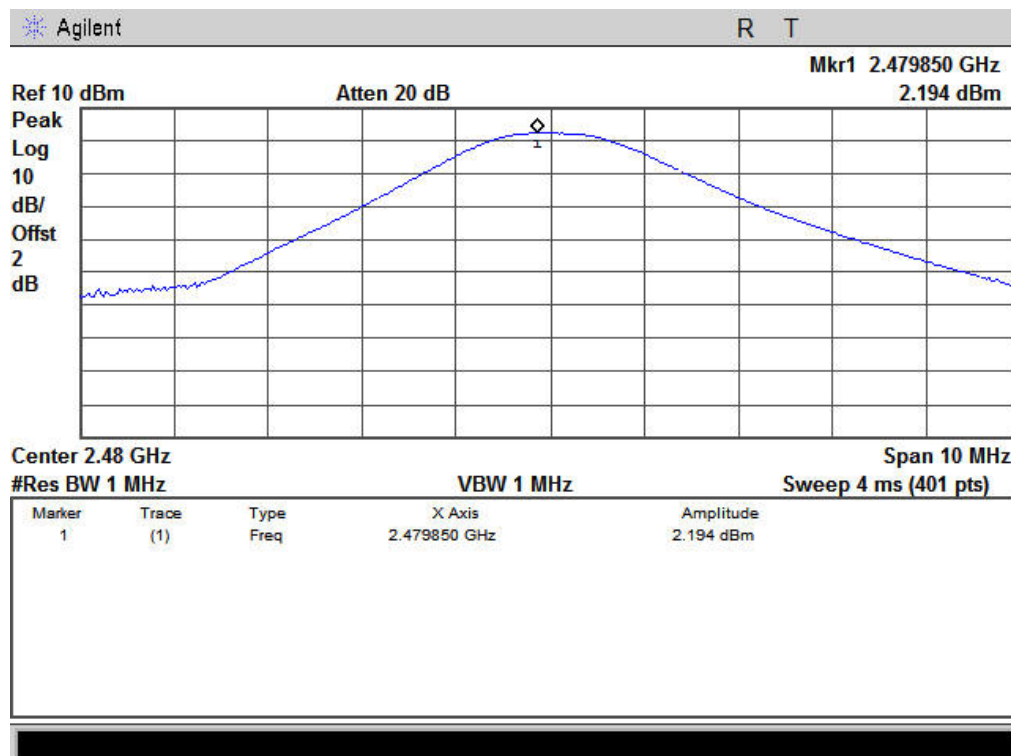
Channel: 39





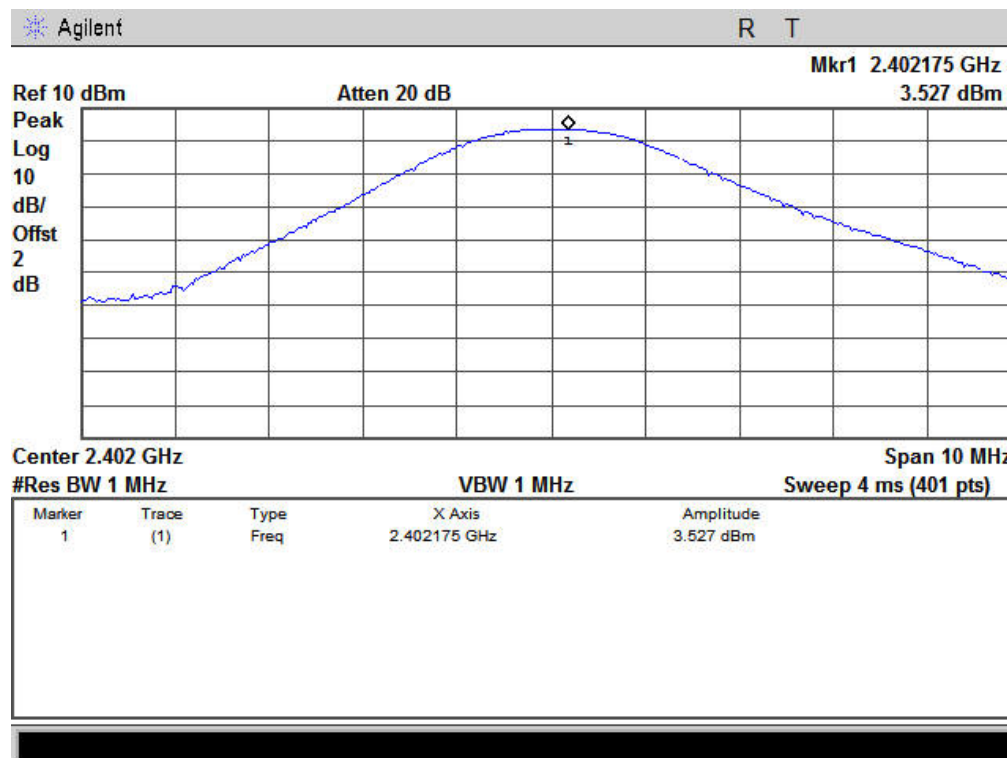
Modulation Standard: GFSK (1Mbps)

Channel: 78



Modulation Standard:8DPSK (3Mbps)

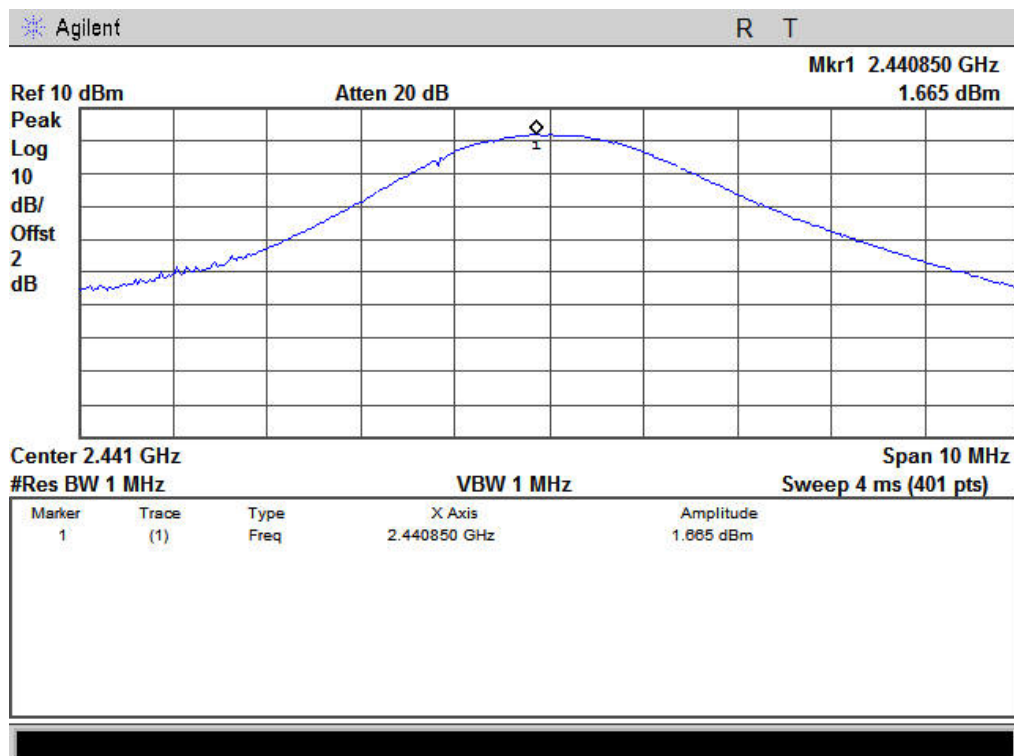
Channel: 00





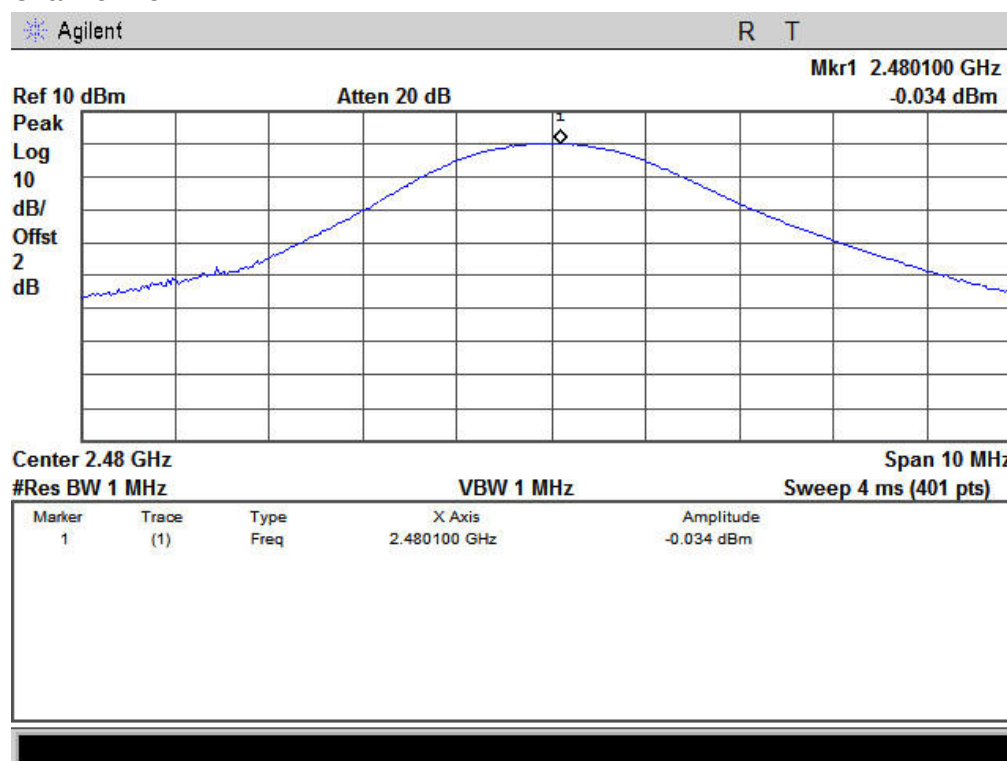
Modulation Standard: 8DPSK (3Mbps)

Channel: 39



Modulation Standard: 8DPSK (3Mbps)

Channel: 78





## 11. Band Edges Measurement

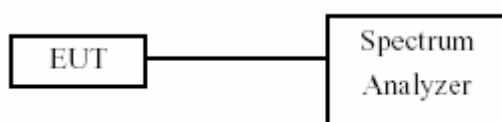
### 11.1 Test Limit

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

### 11.2 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.

### 11.3 Test Setup Layout



### 11.4 List of Measuring Equipment Used

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

### 11.5 Test Result and Data

Test Date: Apr. 24, 2015

Temperature: 25°C

Atmospheric pressure: 1020 hPa

Humidity: 55%

1M

| Channel | Frequency | maximum value in frequency (MHz) | maximum value is (dBm) |
|---------|-----------|----------------------------------|------------------------|
| 00      | 2402      | 2400.00                          | -30.80                 |
| 78      | 2480      | 4970.00                          | -47.14                 |

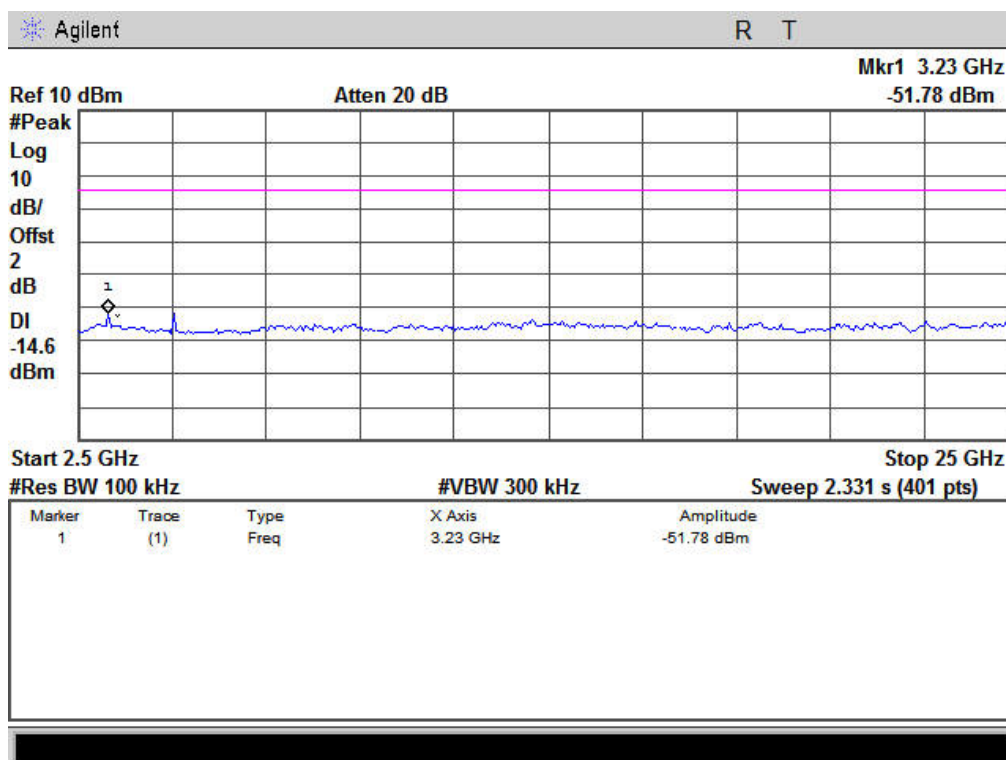
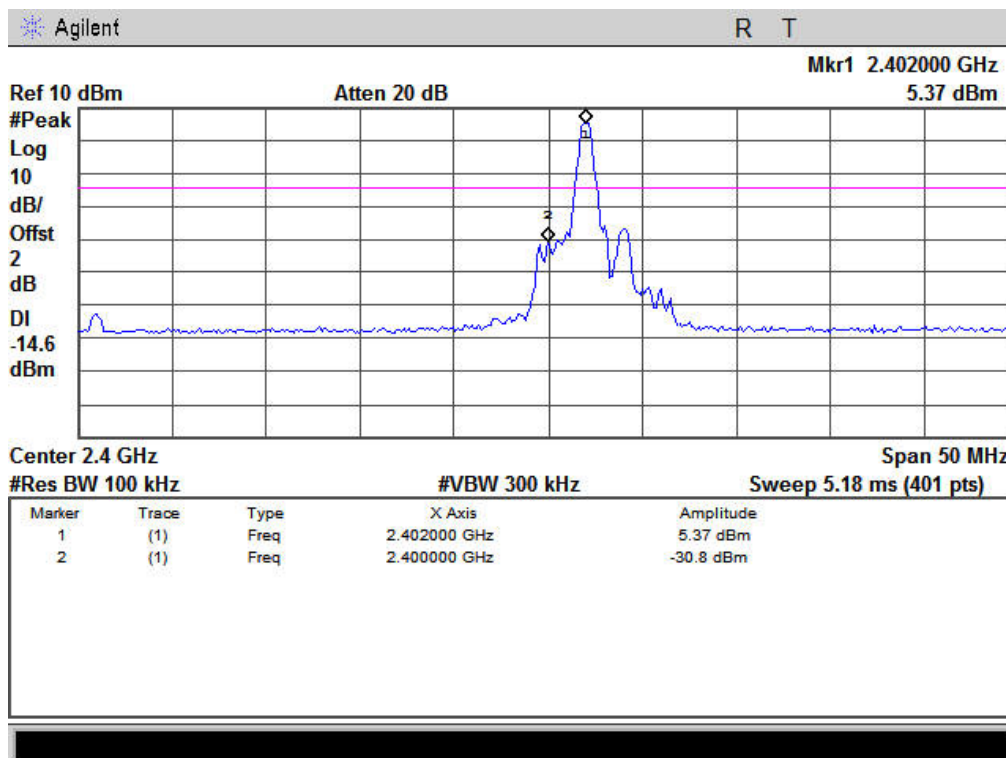
3M

| Channel | Frequency | maximum value in frequency (MHz) | maximum value is (dBm) |
|---------|-----------|----------------------------------|------------------------|
| 00      | 2402      | 2400.00                          | -35.80                 |
| 78      | 2480      | 3310.00                          | -48.34                 |



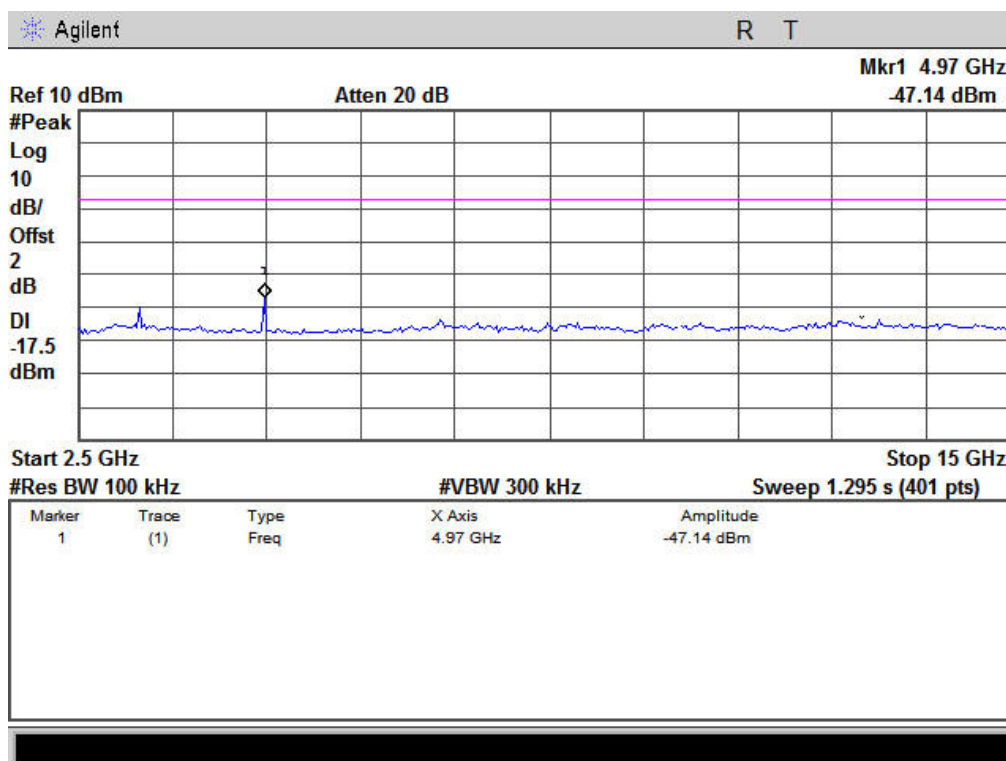
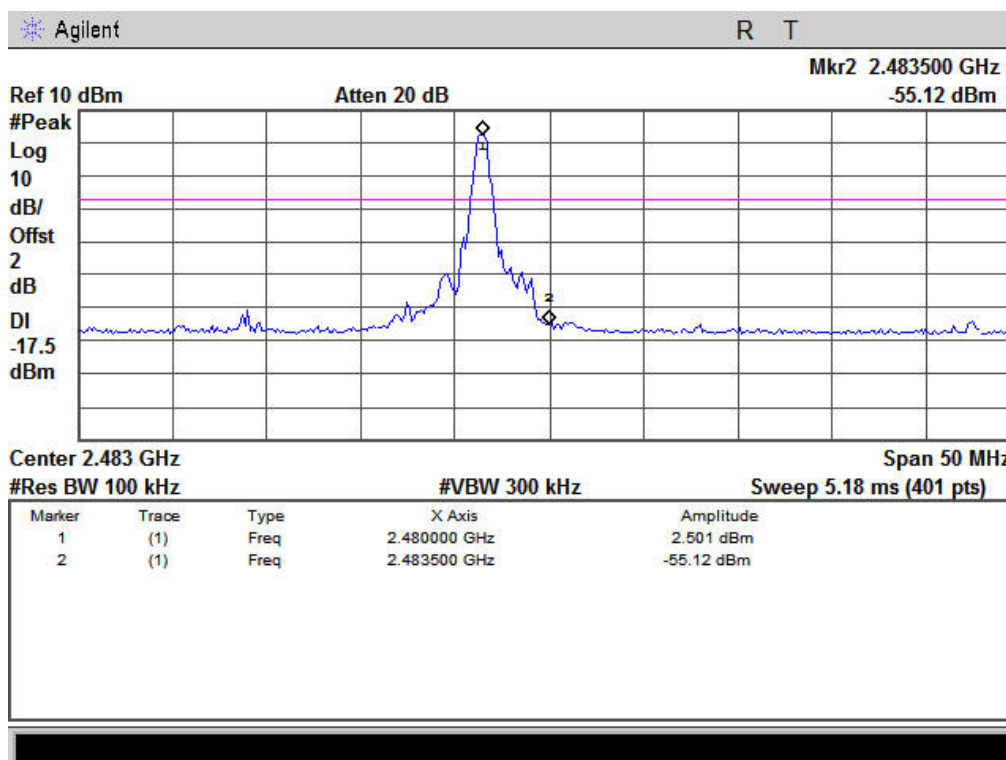
Modulation Standard: GFSK (1Mbps)

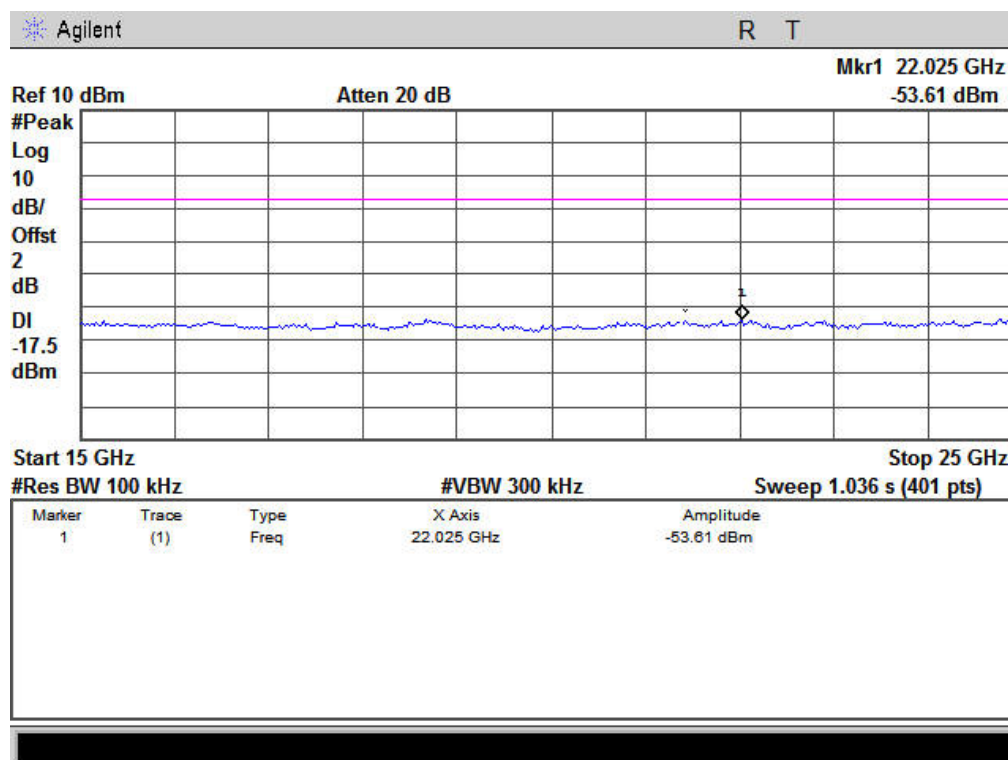
Channel: 00





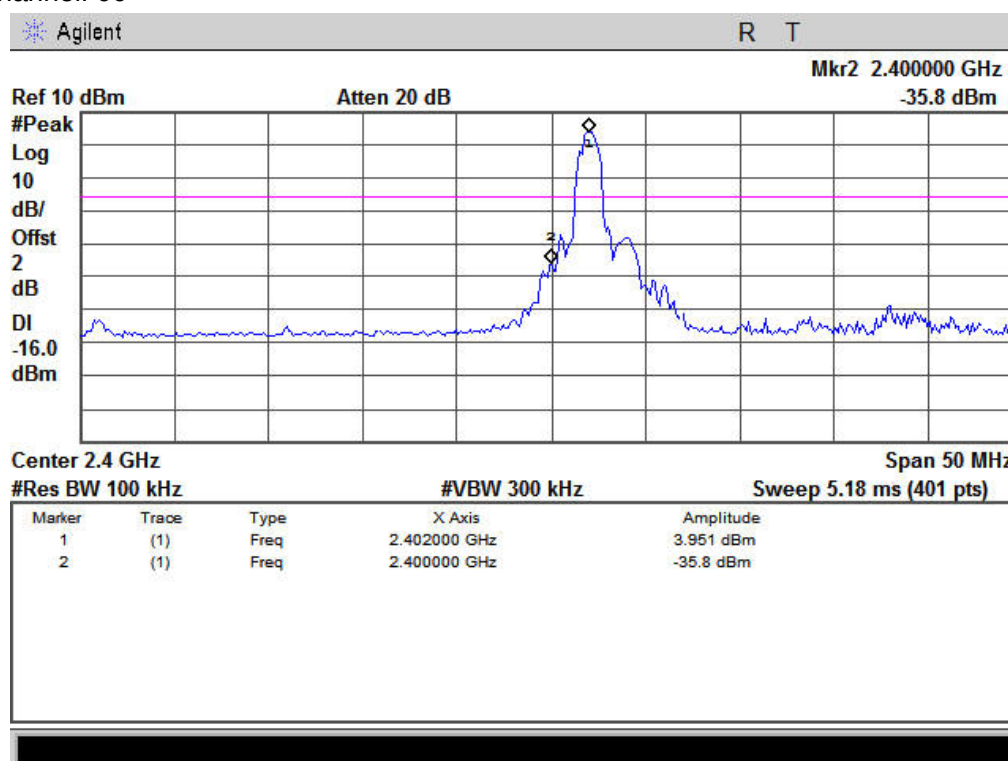
Modulation Standard: GFSK (1Mbps)  
Channel: 78

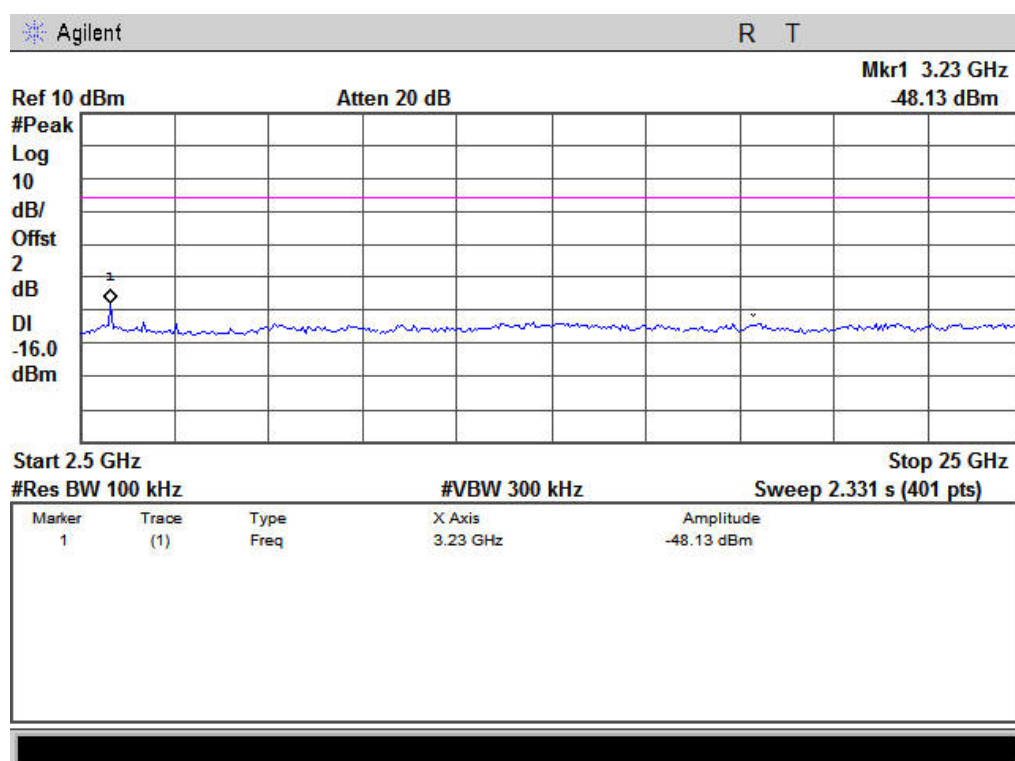




Modulation Standard: 8DPSK (3Mbps)

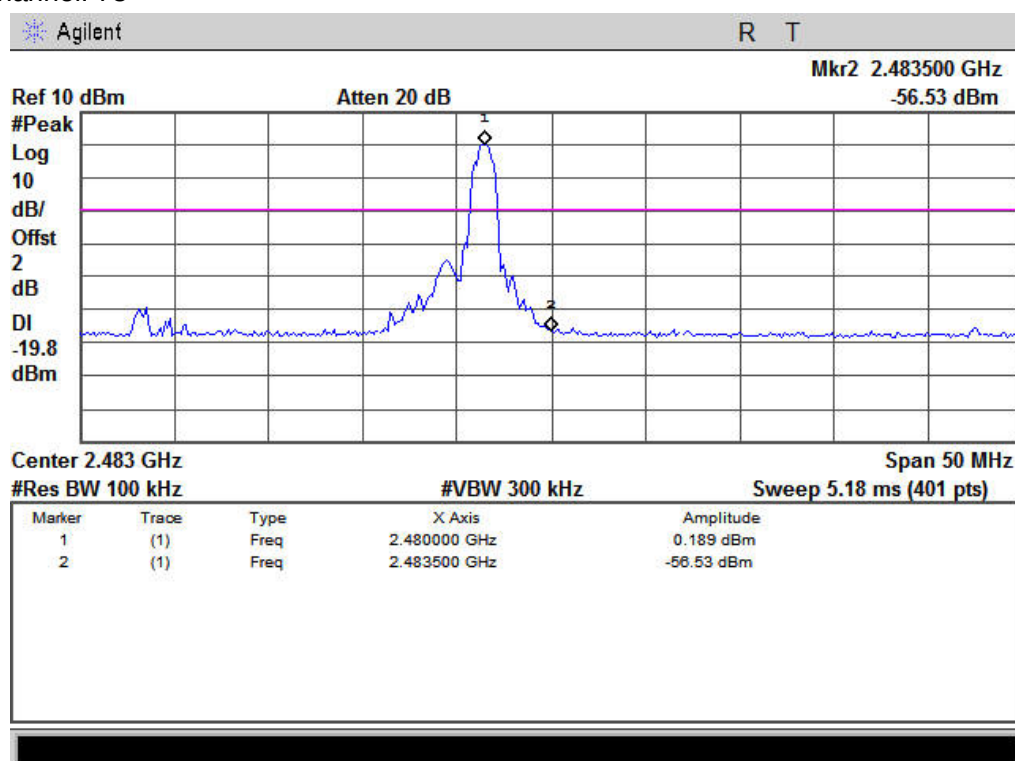
Channel: 00

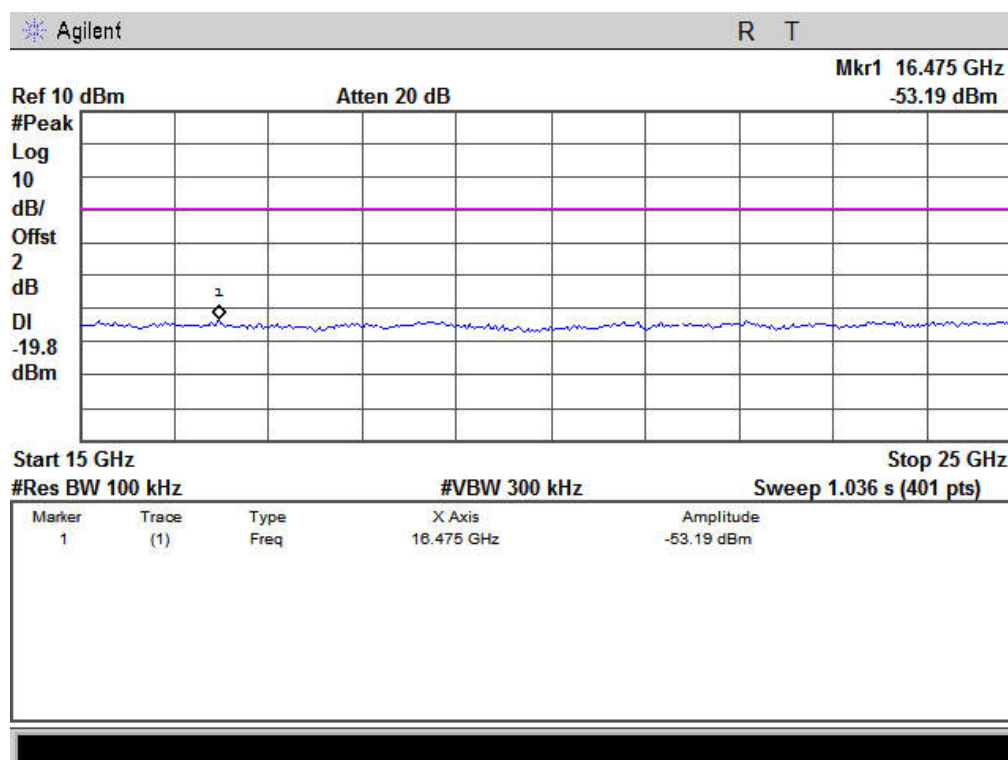
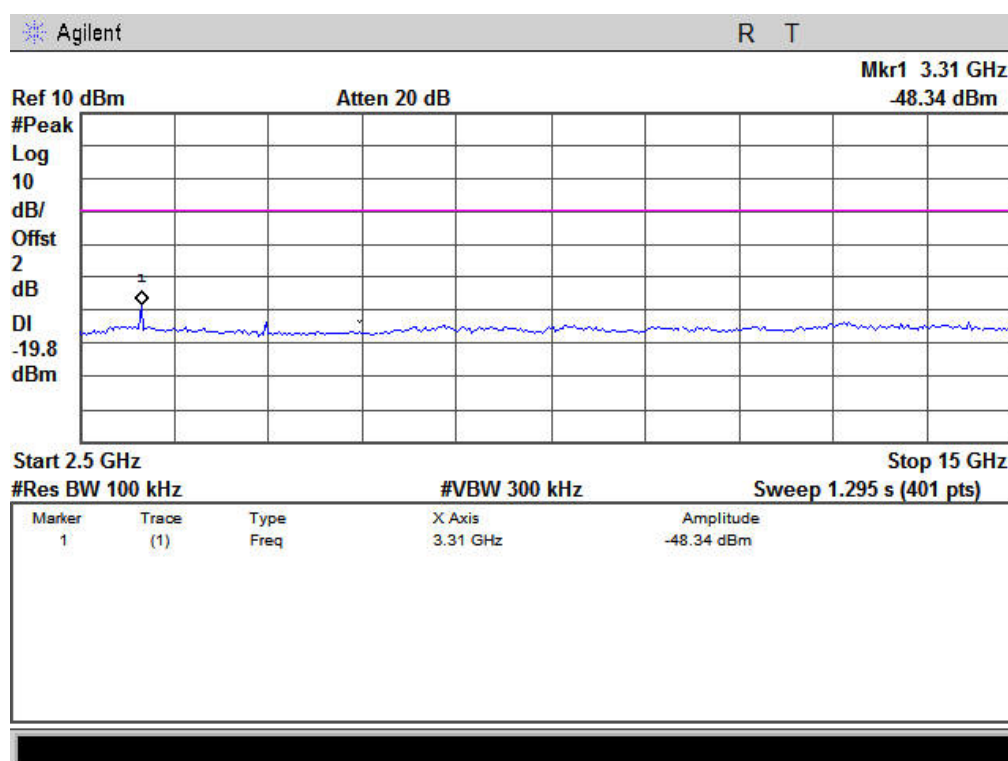




Modulation Standard: 8DPSK (3Mbps)

Channel: 78







### 11.6 Restrict band emission Measurement Data

Test Date : Apr. 24, 2015  
Temperature : 25°C  
Humidity : 55%  
Atmospheric Pressure : 1020 hPa

1M

Channel 0 Fundamental Frequency: 2402 MHz

#### VERTICAL

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------------------|
| 1   | 2390.000           | -3.05            | 50.97             | 47.92             | 74.00             | -26.08         | peak             |
| 2   | 2390.000           | -3.05            | 38.54             | 35.49             | 54.00             | -18.51         | AVG              |

#### HORIZONTAL

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------------------|
| 1   | 2390.000           | -3.05            | 51.83             | 48.78             | 74.00             | -25.22         | AVG              |
| 2   | 2390.000           | -3.05            | 40.10             | 37.05             | 54.00             | -16.95         | PEAK             |

Channel 78 Fundamental Frequency: 2480 MHz

#### VERTICAL

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------------------|
| 1   | 2483.500           | -2.65            | 56.27             | 53.62             | 74.00             | -20.38         | PEAK             |
| 2   | 2483.500           | -2.65            | 42.68             | 40.03             | 54.00             | -13.97         | AVG              |

#### HORIZONTAL

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Detector<br>Type |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------------------|
| 1   | 2483.500           | -2.65            | 53.85             | 51.20             | 74.00             | -22.80         | AVG              |
| 2   | 2483.500           | -2.65            | 40.23             | 37.58             | 54.00             | -16.42         | PEAK             |



3M

Channel 0 Fundamental Frequency: 2402 MHz

## VERTICAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|---------------|
| 1   | 2390.000        | -3.05         | 54.40          | 51.35          | 74.00          | -22.65      | PEAK          |
| 2   | 2390.000        | -3.05         | 41.21          | 38.16          | 54.00          | -15.84      | AVG           |

## HORIZONTAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|---------------|
| 1   | 2390.000        | -3.05         | 54.04          | 50.99          | 74.00          | -23.01      | PEAK          |
| 2   | 2390.000        | -3.05         | 40.48          | 37.43          | 54.00          | -16.57      | AVG           |

Channel 78 Fundamental Frequency: 2480 MHz

## VERTICAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|---------------|
| 1   | 2483.500        | -2.65         | 53.58          | 50.93          | 74.00          | -23.07      | PEAK          |
| 2   | 2483.500        | -2.65         | 41.03          | 38.38          | 54.00          | -15.62      | AVG           |

## HORIZONTAL

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|---------------|
| 1   | 2483.500        | -2.65         | 53.63          | 50.98          | 74.00          | -23.02      | PEAK          |
| 2   | 2483.500        | -2.65         | 40.70          | 38.05          | 54.00          | -15.95      | 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



## 12. 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

### 12.1 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.