



## FCC 47 CFR PART 15 SUBPART C

Product Type : Sensation 3.0  
Applicant : One Media Partners Inc.  
Address : 1701 E. Woodfield Road, Suite 315, Schaumburg, IL 60173, USA  
  
Trade Name : OneMedia  
Model Number : W01  
Test Specification : FCC 47 CFR PART 15 SUBPART C: Oct., 2012  
ANSI C63.4:2009  
  
Receive Date : July 08, 2015  
Test Period : July 09, 2015 to July 29, 2015  
Issue Date : July 30, 2015

### Issue by

A Test Lab Techno Corp.  
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Taiwan Accreditation Foundation accreditation number: 1330



## Revision History

| Rev. | Issue Date    | Revisions     | Revised By |
|------|---------------|---------------|------------|
| 00   | July 30, 2015 | Initial Issue |            |
|      |               |               |            |
|      |               |               |            |
|      |               |               |            |



## Verification of Compliance

Issued Date: 07/30/2015

Product Type : Sensation 3.0  
Applicant : One Media Partners Inc.  
Address : 1701 E. Woodfield Road, Suite 315, Schaumburg, IL 60173, USA  
Trade Name : OneMedia  
Model Number : W01  
FCC ID : 2AFF5W01  
EUT Rated Voltage : 3.7V/360mAh  
Test Voltage : 120 Vac / 60 Hz  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C: Oct., 2012  
ANSI C63.4:2009

Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.  
No. 140-1, Changan Street, Bade City,  
Taoyuan County 334, Taiwan R.O.C.  
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Taiwan Accreditation Foundation accreditation number: 1330  
<http://www.atl-lab.com.tw/e-index.htm>

The above equipment was tested by A Test Lab Techno Corp. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 .

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

Approved By :

(Manager)

(Murphy Wang)

Reviewed By :

(Testing Engineer)

(Fly Lu)



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## 1 General Information

### 1.1. Summary of Test Result

| Standard          | Item                                    | Result | Remark |
|-------------------|-----------------------------------------|--------|--------|
| 15.207            | AC Power Conducted Emission             | PASS   | ----   |
| 15.247(b)(1)      | Max. Output Power                       | PASS   | ----   |
| 15.247(c)         | Transmitter Radiated Emissions          | PASS   | ----   |
| 15.247(a)(1)      | 20dB RF Bandwidth                       | PASS   | ----   |
| 15.247(a)(1)(iii) | Carrier Frequency Separation            | PASS   | ----   |
| 15.247(a)(1)(iii) | Number of Hopping                       | PASS   | ----   |
| 15.247(a)(1)(iii) | Time of Occupancy (Dwell Time)          | PASS   | ----   |
| 15.247(c)         | Out of Band Conducted Spurious Emission | PASS   | ----   |
| 15.247(c)         | Band Edge Measurement                   | PASS   | ----   |
| 15.247(c)         | Occupied Bandwidth Measurement          | PASS   | ----   |
| 15.203            | Antenna Requirement                     | PASS   | ----   |

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

### 1.2. Measurement Uncertainty

| Test Item          | Frequency Range     |            | Uncertainty (dB) |
|--------------------|---------------------|------------|------------------|
| Conducted Emission | 9kHz ~ 30MHz        |            | ± 2.02           |
| Radiated Emission  | 9kHz ~ 30MHz        |            | ± 3.49           |
|                    | 30MHz ~ 1000MHz     | Horizontal | ± 3.98           |
|                    |                     | Vertical   | ± 3.62           |
|                    | 1000MHz ~ 18000MHz  | Horizontal | ± 3.11           |
|                    |                     | Vertical   | ± 3.07           |
|                    | 18000MHz ~ 40000MHz | Horizontal | ± 3.66           |
|                    |                     | Vertical   | ± 3.54           |



## 2 EUT Description

|                                |                                                                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Product                        | Sensation 3.0                                                                                                                                       |
| Trade Name                     | OneMedia                                                                                                                                            |
| Model Number                   | W01                                                                                                                                                 |
| Applicant                      | One Media Partners Inc.                                                                                                                             |
| Applicant Address              | 1701 E. Woodfield Road, Suite 315, Schaumburg, IL 60173, USA                                                                                        |
| Manufacturer                   | Yinuo Technologies, Ltd.                                                                                                                            |
| Manufacturer Address           | Rm 409-410, Building A, Pengnian University City Area Honghualing Industrial District 1213 Liuxian Avenue · Xili, Nanshan District, Shenzhen, China |
| FCC ID                         | 2AFF5W01                                                                                                                                            |
| Frequency Range                | 2402 ~ 2480 MHz                                                                                                                                     |
| Bluetooth version              | BT3.0+EDR                                                                                                                                           |
| Modulation Type                | GFSK for 1Mbps                                                                                                                                      |
|                                | $\pi/4$ -DQPSK for 2Mbps                                                                                                                            |
|                                | 8DPSK for 3Mbps                                                                                                                                     |
| Antenna Type                   | Internal Antenna                                                                                                                                    |
| Antenna Gain                   | 1.0 dBi                                                                                                                                             |
| IMEI No.                       | 865621452863597                                                                                                                                     |
| Hardware Version               | V2.0                                                                                                                                                |
| Software Version               | V1.0.13                                                                                                                                             |
| PK Output Power<br>(Conducted) | GFSK for 1Mbps      8.03 dBm /    0.00635    W                                                                                                      |
|                                | $\pi/4$ -DQPSK      for    7.32 dBm /    0.00540    W                                                                                               |
|                                | 8DPSK for 3Mbps      7.33 dBm /    0.00541    W                                                                                                     |
| Emission Bandwidth             | GFSK: 1.106MHz                                                                                                                                      |
|                                | 8DPSK: 1.278MHz                                                                                                                                     |
| Emission Designator            | GFSK: 1M11F1D                                                                                                                                       |
|                                | 8DPSK: 1M28G1D                                                                                                                                      |



## 3 Test Methodology

### 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode                                   |
|---------------------------------------------|
| Mode 1: Normal Operation Mode               |
| Mode 2: GFSK Mode with No-hopping           |
| Mode 3: $\pi/4$ -DQPSK Mode with No-hopping |
| Mode 4: 8DPSK Mode with No-hopping          |
| Mode 5: GFSK Mode with hopping              |
| Mode 6: $\pi/4$ -DQPSK Mode with hopping    |
| Mode 7: 8DPSK Mode with hopping             |
| --                                          |

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

#### Description of Test Modes

Preliminary tests were performed in different modulation to find the worst case. The modulation has shown the worst-case in section 6.5. Investigation has been done on all the possible configurations for searching the worst cases.

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests.

#### Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

|    | Product          | Manufacturer | Model Number | Serial Number | Power Cord |
|----|------------------|--------------|--------------|---------------|------------|
| 1. | Bluetooth Tester | R & S        | CBT          | 100350        | NA         |

### 3.2. EUT Exercise Software

|   |                                                           |
|---|-----------------------------------------------------------|
| 1 | Setup the EUT and Bluetooth Tester (CBT) as shown on 3.3. |
| 2 | Turn on the power of all equipment.                       |
| 3 | EUT run test program.                                     |
| 4 | Open Bluetooth function link to CBT.                      |
| 5 | The test program is MTK engineering model.                |

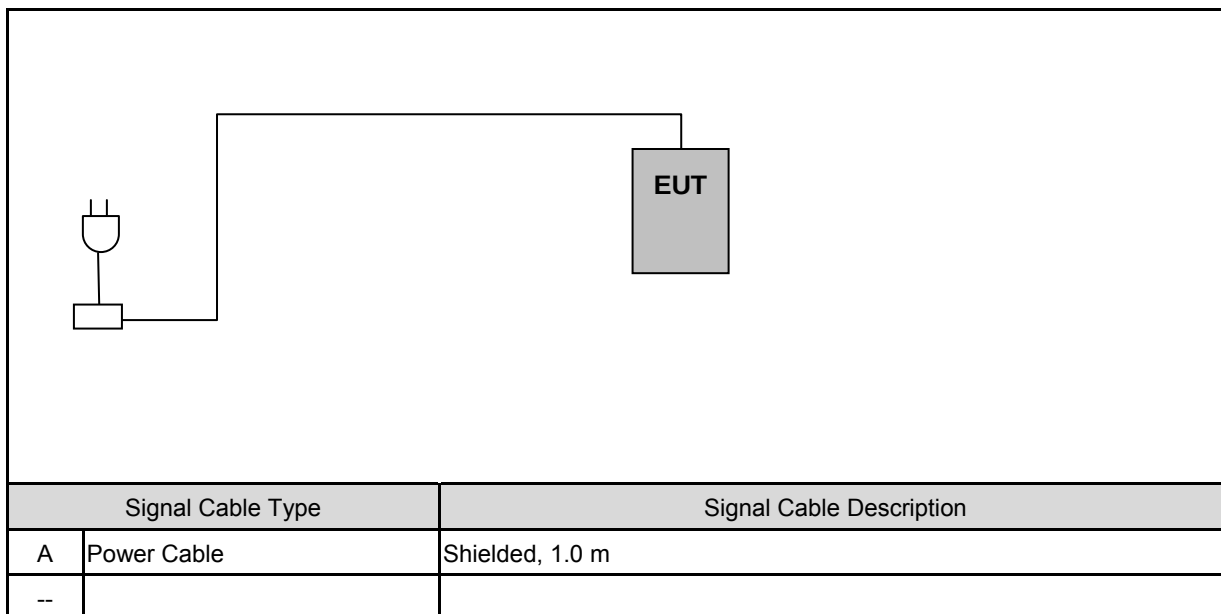
Note : We used fully-charged battery during the test.

### 3.3. power supply

| power supply | Model Number         | Manufacturer                               |
|--------------|----------------------|--------------------------------------------|
| BATTERY      | 353232 (3.7V/360mAh) | SHENZHEN JIAYUAN TONGDA TECHNOLOGY CO.,LTD |



## 3.4. Configuration of Test System Details



| Auxiliary equipmentdescription |               |              |              |               |
|--------------------------------|---------------|--------------|--------------|---------------|
| Product                        |               | Manufacturer | Model Number | S/N           |
| (1)                            | Power Adapter | Sony         | --           | 3513W51304150 |
| --                             | --            | --           | --           | --            |

## 3.5. Test Site Environment

| Items                      | Required (IEC 68-1) | Actual |
|----------------------------|---------------------|--------|
| Temperature (°C)           | 15-35               | 26     |
| Humidity (%RH)             | 25-75               | 60     |
| Barometric pressure (mbar) | 860-1060            | 950    |

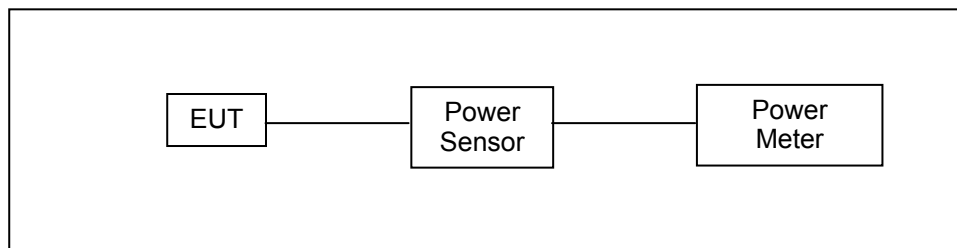


## 4 Maximum Conducted Output Power Measurement

### 4.1. Limit

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels < 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band < 0.125 watts.

### 4.2. Test Setup



### 4.3. Test Instruments

| Equipment                      | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|--------------------------------|--------------|--------------|---------------|------------|--------|
| Single Channel PK Power Sensor | Agilent      | N1911A       | MY45101619    | 12/15/2014 | (1)    |
| Wideband Power Meter           | Agilent      | N1921A       | MY45241957    | 12/15/2014 | (1)    |
| Test Site                      | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                       | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                       | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector    | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request.

All the RF cables apply to 9 KHz to 40GHz.

### 4.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.



## 4.5. Test Result

| Model Number    | W01                            |               |         |            |         |           |
|-----------------|--------------------------------|---------------|---------|------------|---------|-----------|
| Test Item       | Maximum Conducted Output Power |               |         |            |         |           |
| Test Mode       | Mode 2                         |               |         |            |         |           |
| Date of Test    | 07/09/2015                     |               |         | Test Site  | TE02    |           |
| Frequency (MHz) | Packet Type                    | Average Power |         | Peak Power |         | Limit (W) |
|                 |                                | (dBm)         | (W)     | (dBm)      | (W)     |           |
| 2402            | DH1                            | 1.53          | 0.00142 | 7.05       | 0.00507 | < 1       |
|                 | DH3                            | 4.75          | 0.00299 | 7.08       | 0.00511 | < 1       |
|                 | DH5                            | 5.39          | 0.00346 | 7.11       | 0.00514 | < 1       |
| 2441            | DH1                            | 1.52          | 0.00142 | 7.18       | 0.00522 | < 1       |
|                 | DH3                            | 4.89          | 0.00308 | 7.16       | 0.00520 | < 1       |
|                 | DH5                            | 6.01          | 0.00399 | 7.22       | 0.00527 | < 1       |
| 2480            | DH1                            | 2.18          | 0.00165 | 7.98       | 0.00628 | < 1       |
|                 | DH3                            | 5.59          | 0.00362 | 8.01       | 0.00632 | < 1       |
|                 | DH5                            | 6.33          | 0.00430 | 8.03       | 0.00635 | < 1       |

| Model Number    | W01                            |               |         |            |         |           |
|-----------------|--------------------------------|---------------|---------|------------|---------|-----------|
| Test Item       | Maximum Conducted Output Power |               |         |            |         |           |
| Test Mode       | Mode 3                         |               |         |            |         |           |
| Date of Test    | 07/09/2015                     |               |         | Test Site  | TE02    |           |
| Frequency (MHz) | Packet Type                    | Average Power |         | Peak Power |         | Limit (W) |
|                 |                                | (dBm)         | (W)     | (dBm)      | (W)     |           |
| 2402            | 2DH1                           | 0.12          | 0.00103 | 6.35       | 0.00432 | < 0.125   |
|                 | 2DH3                           | 2.64          | 0.00184 | 6.36       | 0.00433 | < 0.125   |
|                 | 2DH5                           | 3.56          | 0.00227 | 6.4        | 0.00437 | < 0.125   |
| 2441            | 2DH1                           | -0.24         | 0.00095 | 6.38       | 0.00435 | < 0.125   |
|                 | 2DH3                           | 2.76          | 0.00189 | 6.43       | 0.00440 | < 0.125   |
|                 | 2DH5                           | 3.75          | 0.00237 | 6.49       | 0.00446 | < 0.125   |
| 2480            | 2DH1                           | 0.11          | 0.00103 | 7.26       | 0.00532 | < 0.125   |
|                 | 2DH3                           | 3.24          | 0.00211 | 7.29       | 0.00536 | < 0.125   |
|                 | 2DH5                           | 3.95          | 0.00248 | 7.32       | 0.00540 | < 0.125   |



| Model Number    | W01                            |               |         |            |         |           |
|-----------------|--------------------------------|---------------|---------|------------|---------|-----------|
| Test Item       | Maximum Conducted Output Power |               |         |            |         |           |
| Test Mode       | Mode 4                         |               |         |            |         |           |
| Date of Test    | 07/09/2015                     |               |         | Test Site  | TE02    |           |
| Frequency (MHz) | Packet Type                    | Average Power |         | Peak Power |         | Limit (W) |
|                 |                                | (dBm)         | (W)     | (dBm)      | (W)     |           |
| 2402            | 3DH1                           | 0.19          | 0.00104 | 6.24       | 0.00421 | < 0.125   |
|                 | 3DH3                           | 2.67          | 0.00185 | 6.23       | 0.00420 | < 0.125   |
|                 | 3DH5                           | 3.78          | 0.00239 | 6.27       | 0.00424 | < 0.125   |
| 2441            | 3DH1                           | -0.38         | 0.00092 | 6.24       | 0.00421 | < 0.125   |
|                 | 3DH3                           | 2.87          | 0.00194 | 6.29       | 0.00426 | < 0.125   |
|                 | 3DH5                           | 3.45          | 0.00221 | 6.31       | 0.00428 | < 0.125   |
| 2480            | 3DH1                           | 0.28          | 0.00107 | 7.15       | 0.00519 | < 0.125   |
|                 | 3DH3                           | 3.46          | 0.00222 | 7.17       | 0.00521 | < 0.125   |
|                 | 3DH5                           | 3.92          | 0.00247 | 7.33       | 0.00541 | < 0.125   |

## 5 Conducted Emission Measurement

### 5.1. Limit

| Frequency (MHz) | Quasi-peak | Average  |
|-----------------|------------|----------|
| 0.15 - 0.5      | 66 to 56   | 56 to 46 |
| 0.50 - 5.0      | 56         | 46       |
| 5.0 - 30.0      | 60         | 50       |

### 5.2. Test Instruments

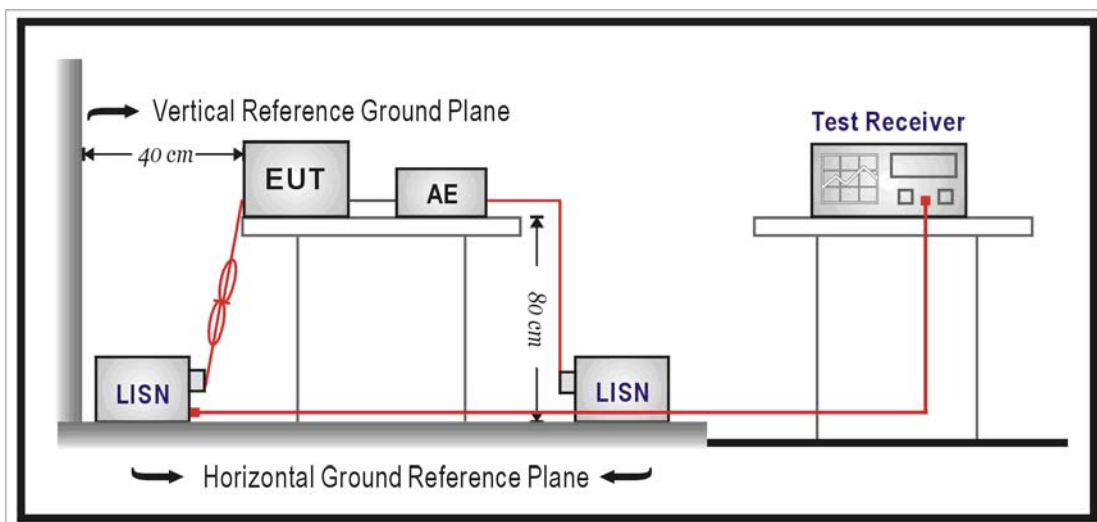
| Describe      | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|---------------|--------------|--------------|---------------|------------|--------|
| Test Receiver | R&S          | ESCI         | 100367        | 06/06/2015 | (1)    |
| LISN          | R&S          | ENV216       | 101040        | 03/07/2015 | (1)    |
| LISN          | R&S          | ENV216       | 101041        | 03/07/2015 | (1)    |
| Test Site     | ATL          | TE05         | TE05          | N.C.R.     | -----  |
| RF cable      | WOKEN        | ---          | C.10-07-04    | 10/24/2014 | (1)    |
| RF cable      | WOKEN        | ---          | C.10-07-05    | 10/24/2014 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request.

All the RF cables apply to 9 KHz to 40GHz.

### 5.3. Test Setup





## 5.4. Test Procedure

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

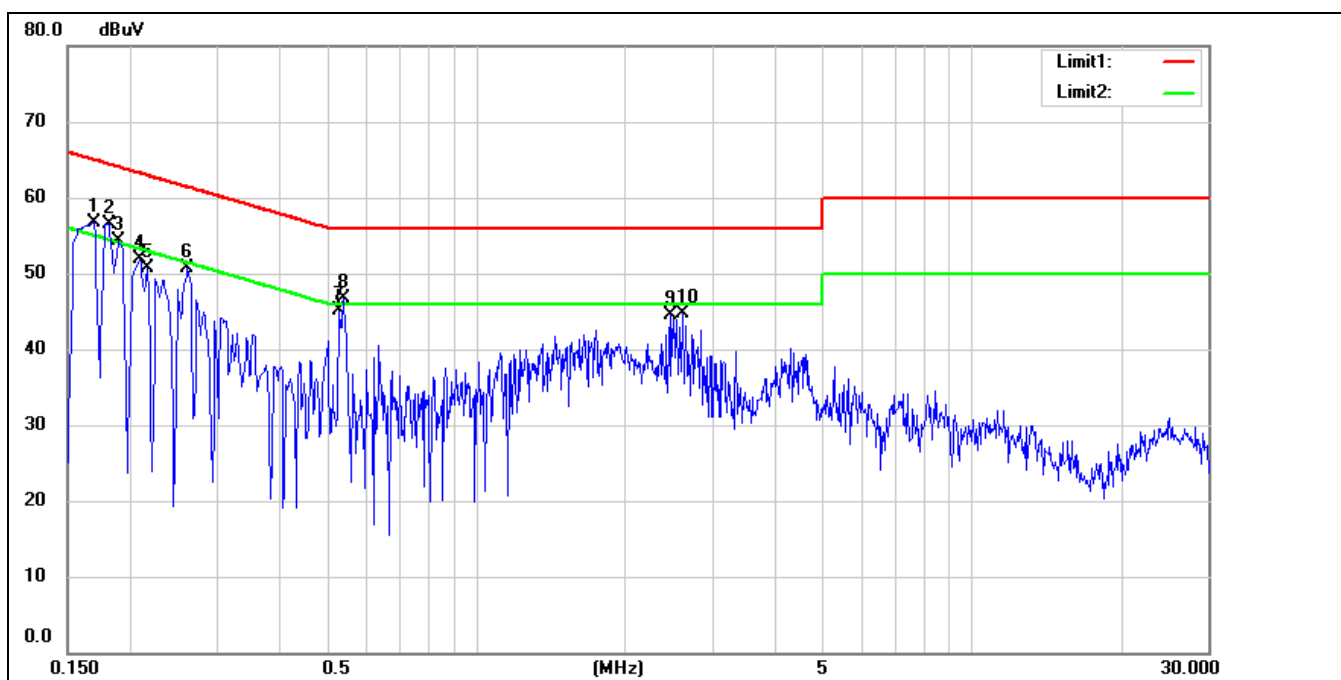
Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.



## 5.5. Test Result

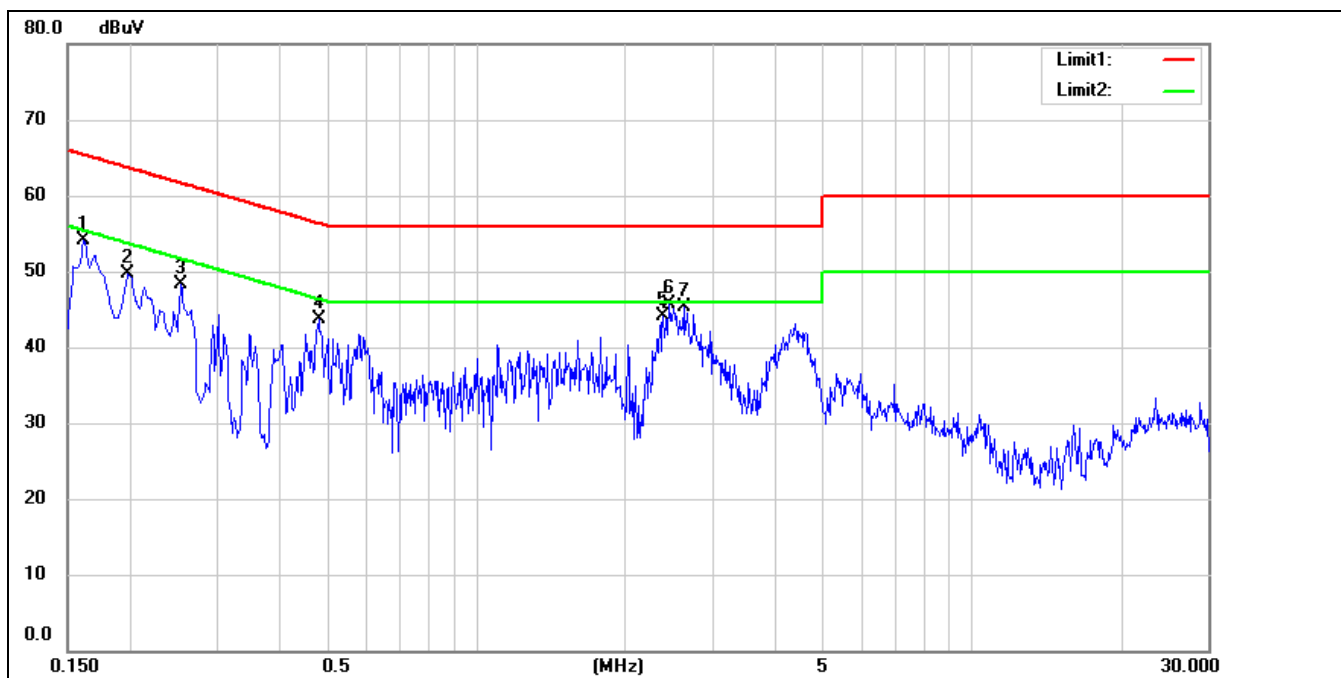
|               |                            |                      |              |
|---------------|----------------------------|----------------------|--------------|
| Standard:     | FCC Class B Conduction(QP) | Line:                | L1           |
| Test item:    | Conducted Emission         | Power:               | AC 120V/60Hz |
| Model Number: | W01                        | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | 1                          | Date:                | 2015/7/22    |
| Description:  |                            |                      |              |



| No. | Frequency<br>(MHz) | QP<br>Reading<br>(dBuV) | AVG<br>Reading<br>(dBuV) | Correction<br>Factor<br>(dB) | QP<br>Result<br>(dBuV) | AVG<br>Result<br>(dBuV) | QP<br>Limit<br>(dBuV) | AVG<br>Limit<br>(dBuV) | QP<br>Margin<br>(dB) | AVG<br>Margin<br>(dB) | Remark |
|-----|--------------------|-------------------------|--------------------------|------------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|--------|
| 1   | 0.1700             | 42.14                   | 27.36                    | 9.58                         | 51.72                  | 36.94                   | 64.96                 | 54.96                  | -13.24               | -18.02                | Pass   |
| 2   | 0.1820             | 40.77                   | 25.50                    | 9.58                         | 50.35                  | 35.08                   | 64.39                 | 54.39                  | -14.04               | -19.31                | Pass   |
| 3   | 0.1904             | 39.05                   | 23.58                    | 9.58                         | 48.63                  | 33.16                   | 64.02                 | 54.02                  | -15.39               | -20.86                | Pass   |
| 4   | 0.2100             | 35.80                   | 20.58                    | 9.58                         | 45.38                  | 30.16                   | 63.21                 | 53.21                  | -17.83               | -23.05                | Pass   |
| 5   | 0.2180             | 36.66                   | 21.40                    | 9.58                         | 46.24                  | 30.98                   | 62.89                 | 52.89                  | -16.65               | -21.91                | Pass   |
| 6   | 0.2620             | 33.33                   | 18.29                    | 9.59                         | 42.92                  | 27.88                   | 61.37                 | 51.37                  | -18.45               | -23.49                | Pass   |
| 7   | 0.5300             | 30.64                   | 15.20                    | 9.60                         | 40.24                  | 24.80                   | 56.00                 | 46.00                  | -15.76               | -21.20                | Pass   |
| 8   | 0.5420             | 30.67                   | 14.54                    | 9.60                         | 40.27                  | 24.14                   | 56.00                 | 46.00                  | -15.73               | -21.86                | Pass   |
| 9   | 2.4700             | 27.29                   | 14.84                    | 9.67                         | 36.96                  | 24.51                   | 56.00                 | 46.00                  | -19.04               | -21.49                | Pass   |
| 10  | 2.6180             | 27.35                   | 14.01                    | 9.68                         | 37.03                  | 23.69                   | 56.00                 | 46.00                  | -18.97               | -22.31                | Pass   |



|               |                            |                      |              |
|---------------|----------------------------|----------------------|--------------|
| Standard:     | FCC Class B Conduction(QP) | Line:                | N            |
| Test item:    | Conducted Emission         | Power:               | AC 120V/60Hz |
| Model Number: | W01                        | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | 1                          | Date:                | 2015/7/22    |
| Description:  |                            |                      |              |



| No. | Frequency<br>(MHz) | QP<br>Reading<br>(dBuV) | AVG<br>Reading<br>(dBuV) | Correction<br>Factor<br>(dB) | QP<br>Result<br>(dBuV) | AVG<br>Result<br>(dBuV) | QP<br>Limit<br>(dBuV) | AVG<br>Limit<br>(dBuV) | QP<br>Margin<br>(dB) | AVG<br>Margin<br>(dB) | Remark |
|-----|--------------------|-------------------------|--------------------------|------------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|--------|
| 1   | 0.1620             | 38.34                   | 25.05                    | 9.58                         | 47.92                  | 34.63                   | 65.36                 | 55.36                  | -17.44               | -20.73                | Pass   |
| 2   | 0.1980             | 34.15                   | 20.15                    | 9.58                         | 43.73                  | 29.73                   | 63.69                 | 53.69                  | -19.96               | -23.96                | Pass   |
| 3   | 0.2540             | 30.65                   | 17.39                    | 9.59                         | 40.24                  | 26.98                   | 61.63                 | 51.63                  | -21.39               | -24.65                | Pass   |
| 4   | 0.4820             | 29.66                   | 19.88                    | 9.60                         | 39.26                  | 29.48                   | 56.30                 | 46.30                  | -17.04               | -16.82                | Pass   |
| 5   | 2.3940             | 30.17                   | 19.98                    | 9.69                         | 39.86                  | 29.67                   | 56.00                 | 46.00                  | -16.14               | -16.33                | Pass   |
| 6   | 2.4580             | 30.97                   | 20.99                    | 9.69                         | 40.66                  | 30.68                   | 56.00                 | 46.00                  | -15.34               | -15.32                | Pass   |
| 7   | 2.6260             | 29.79                   | 20.10                    | 9.70                         | 39.49                  | 29.80                   | 56.00                 | 46.00                  | -16.51               | -16.20                | Pass   |

Note:1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).



## 6 Radiated Interference Measurement

### 6.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V/m}$ at meter) | Measurement Distance<br>(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                                |

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

### 6.2. Test Instruments

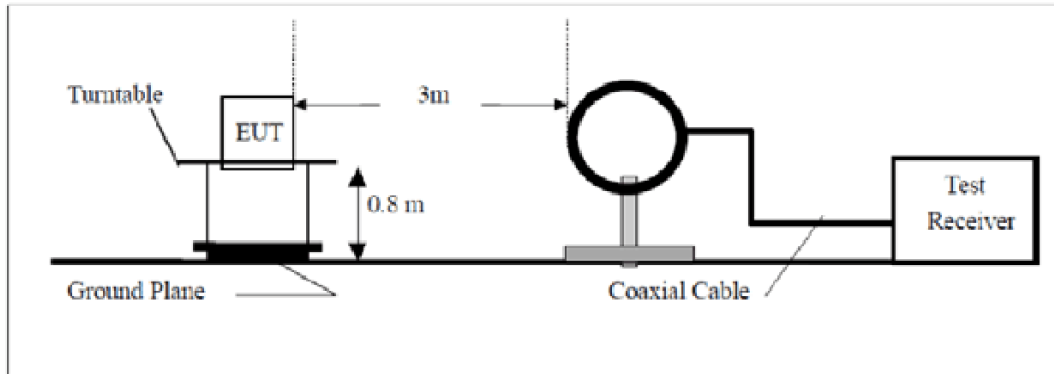
| 3 Meter Chamber                   |                                |              |               |            |        |
|-----------------------------------|--------------------------------|--------------|---------------|------------|--------|
| Equipment                         | Manufacturer                   | Model Number | Serial Number | Cal. Date  | Remark |
| RF Pre-selector                   | Agilent                        | N9039A       | MY46520256    | 01/06/2015 | (1)    |
| Spectrum Analyzer                 | Agilent                        | E4446A       | MY46180578    | 01/06/2015 | (1)    |
| Pre Amplifier                     | Agilent                        | 8449B        | 3008A02237    | 02/21/2015 | (1)    |
| Pre Amplifier                     | Agilent                        | 8447D        | 2944A10961    | 02/21/2015 | (1)    |
| Broadband Antenna<br>(30MHz~1GHz) | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163     | 9163-270      | 07/18/2015 | (1)    |
| Horn Antenna<br>(1~18GHz)         | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9120D    | 9120D-550     | 06/11/2015 | (1)    |
| Horn Antenna<br>(18~40GHz)        | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA9170     | 9170-320      | 07/02/2015 | (1)    |
| Loop Antenna                      | COM-POWER<br>CORPORATION       | AL-130       | 121014        | 08/14/2014 | (3)    |
| Test Site                         | ATL                            | TE01         | 888001        | 08/28/2014 | (1)    |
| RF cable                          | WOKEN                          | ---          | C.10-07-07    | 10/24/2014 | (1)    |
| RF cable                          | WOKEN                          | ---          | C.10-07-08    | 10/24/2014 | (1)    |
| RF cable                          | WOKEN                          | ---          | C.10-07-09    | 10/24/2014 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

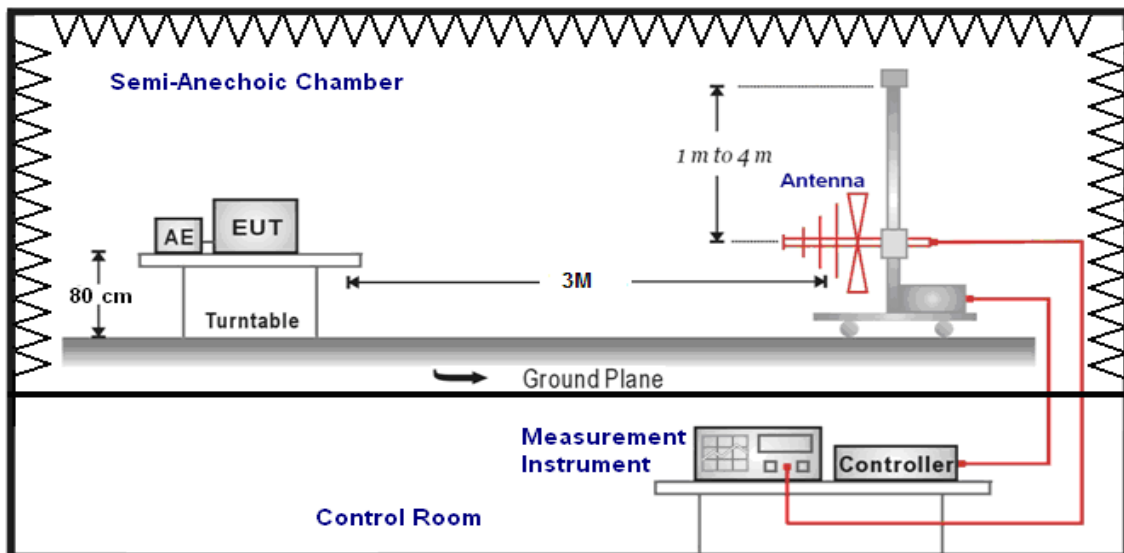
NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

## 6.3. Setup

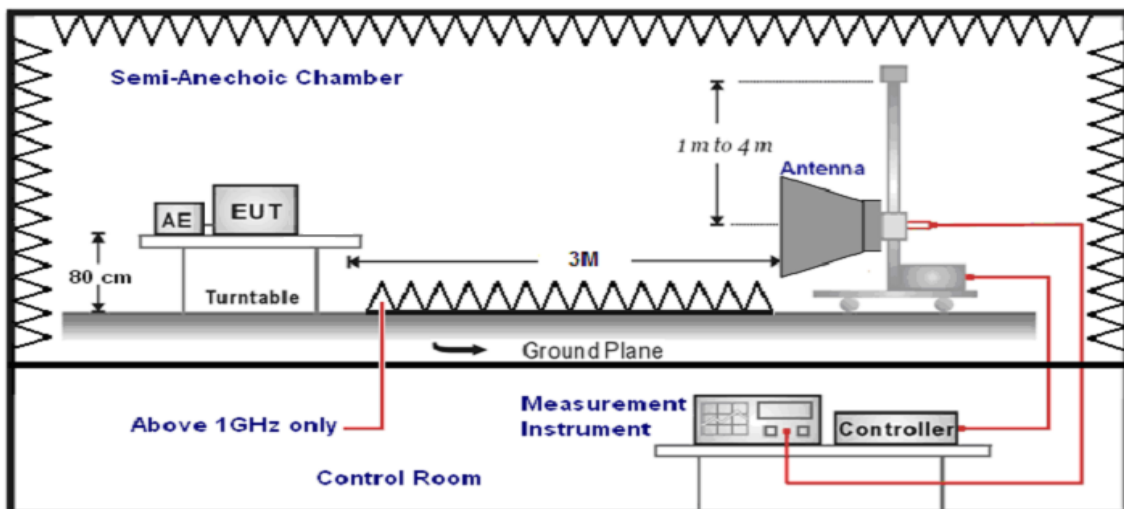
9KHz-30MHz



30MHz- 1GHz



Above 1GHz





## 6.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (model VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

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.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding



the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m) } = \text{FI (dBuV) } + \text{AF (dBuV) } + \text{CL (dBuV) } - \text{Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m) } = \text{Amplitude (dBuV) } - \text{Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



## 6.5. Test Result

### Below 1GHz

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | DC 3.7V        |        |                     |
| Model Number:      | W01               |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 2015/7/29      |        |                     |
| Frequency:         | 2402 MHz          |                          |                    | Test By:             | Louis          |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 150.5000           | 27.01             | -11.40                   | 15.61              | 43.50                | -27.89         | QP     | H                   |
| 407.5000           | 27.50             | -7.20                    | 20.30              | 46.00                | -25.70         | QP     | H                   |
| 515.5000           | 30.36             | -5.13                    | 25.23              | 46.00                | -20.77         | QP     | H                   |
| 661.5000           | 27.83             | -2.29                    | 25.54              | 46.00                | -20.46         | QP     | H                   |
| 874.0000           | 30.28             | 1.97                     | 32.25              | 46.00                | -13.75         | QP     | H                   |
| 949.0000           | 28.18             | 3.18                     | 31.36              | 46.00                | -14.64         | QP     | H                   |
| 156.0000           | 27.38             | -11.39                   | 15.99              | 43.50                | -27.51         | QP     | V                   |
| 361.0000           | 26.68             | -8.23                    | 18.45              | 46.00                | -27.55         | QP     | V                   |
| 545.5000           | 27.34             | -4.57                    | 22.77              | 46.00                | -23.23         | QP     | V                   |
| 666.5000           | 27.67             | -2.18                    | 25.49              | 46.00                | -20.51         | QP     | V                   |
| 737.5000           | 27.93             | -0.56                    | 27.37              | 46.00                | -18.63         | QP     | V                   |
| 872.0000           | 28.51             | 1.92                     | 30.43              | 46.00                | -15.57         | QP     | V                   |

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).



## Above 1GHz

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | DC 3.7V      |                     |
| Model Number:      |                   | W01                      |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 2                   |                    | Date:                |                | 2015/7/28    |                     |
| Frequency:         |                   | 2402 MHz                 |                    | Test By:             |                | Louis        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 3002.000           | 38.60             | 1.01                     | 39.61              | 74.00                | -34.39         | peak         | H                   |
| 4804.000           | 52.22             | 6.24                     | 58.46              | 74.00                | -15.54         | peak         | H                   |
| 4804.000           | 44.19             | 6.24                     | 50.43              | 54.00                | -3.57          | AVG          | H                   |
| 7206.000           | 39.09             | 12.30                    | 51.39              | 74.00                | -22.61         | peak         | H                   |
| 3086.000           | 39.02             | 1.24                     | 40.26              | 74.00                | -33.74         | peak         | V                   |
| 4804.000           | 52.91             | 6.24                     | 59.15              | 74.00                | -14.85         | peak         | V                   |
| 4804.000           | 45.04             | 6.24                     | 51.28              | 54.00                | -2.72          | AVG          | V                   |
| 7206.000           | 40.74             | 12.30                    | 53.04              | 74.00                | -20.96         | peak         | V                   |
| 7206.000           | 33.52             | 12.30                    | 45.82              | 54.00                | -8.18          | AVG          | V                   |

| Standard:          |                   | FCC Part 15C             |                    | Test Distance:       |                | 3m           |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------------|---------------------|
| Test item:         |                   | Radiated Emission        |                    | Power:               |                | DC 3.7V      |                     |
| Model Number:      |                   | W01                      |                    | Temp.(°C)/Hum.(%RH): |                | 26(°C)/60%RH |                     |
| Mode:              |                   | Mode 2                   |                    | Date:                |                | 2015/7/28    |                     |
| Frequency:         |                   | 2441 MHz                 |                    | Test By:             |                | Louis        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark       | Ant.Polar.<br>H / V |
| 3114.000           | 38.24             | 1.33                     | 39.57              | 74.00                | -34.43         | peak         | H                   |
| 4882.000           | 51.04             | 6.58                     | 57.62              | 74.00                | -16.38         | peak         | H                   |
| 4882.000           | 44.11             | 6.58                     | 50.69              | 54.00                | -3.31          | AVG          | H                   |
| 7323.000           | 42.16             | 12.73                    | 54.89              | 74.00                | -19.11         | peak         | H                   |
| 7323.000           | 36.95             | 12.73                    | 49.68              | 54.00                | -4.32          | AVG          | H                   |
| 3058.000           | 39.24             | 1.17                     | 40.41              | 74.00                | -33.59         | peak         | V                   |
| 4882.000           | 53.69             | 6.58                     | 60.27              | 74.00                | -13.73         | peak         | V                   |
| 4882.000           | 45.58             | 6.58                     | 52.16              | 54.00                | -1.84          | AVG          | V                   |
| 7323.000           | 41.27             | 12.73                    | 54.00              | 74.00                | -20.00         | peak         | V                   |
| 7323.000           | 35.29             | 12.73                    | 48.02              | 54.00                | -5.98          | AVG          | V                   |



| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | DC 3.7V        |        |                     |
| Model Number:      | W01               |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 2            |                          |                    | Date:                | 2015/7/28      |        |                     |
| Frequency:         | 2480 MHz          |                          |                    | Test By:             | Louis          |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3086.000           | 38.70             | 1.24                     | 39.94              | 74.00                | -34.06         | peak   | H                   |
| 4960.000           | 50.93             | 6.92                     | 57.85              | 74.00                | -16.15         | peak   | H                   |
| 4960.000           | 43.57             | 6.92                     | 50.49              | 54.00                | -3.51          | AVG    | H                   |
| 7440.000           | 42.91             | 13.15                    | 56.06              | 74.00                | -17.94         | peak   | H                   |
| 7440.000           | 37.84             | 13.15                    | 50.99              | 54.00                | -3.01          | AVG    | H                   |
|                    |                   |                          |                    |                      |                |        |                     |
| 3149.000           | 38.23             | 1.42                     | 39.65              | 74.00                | -34.35         | peak   | V                   |
| 4960.000           | 54.28             | 6.92                     | 61.20              | 74.00                | -12.80         | peak   | V                   |
| 4960.000           | 46.21             | 6.92                     | 53.13              | 54.00                | -0.87          | AVG    | V                   |
| 7440.000           | 45.80             | 13.15                    | 58.95              | 74.00                | -15.05         | peak   | V                   |
| 7440.000           | 39.29             | 13.15                    | 52.44              | 54.00                | -1.56          | AVG    | V                   |

| Standard:          | FCC Part 15C      |                          |                    | Test Distance:      | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|---------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:              | DC 3.7V        |        |                     |
| Model Number:      | W01               |                          |                    | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH    |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:               | 2015/7/28      |        |                     |
| Frequency:         | 2402 MHz          |                          |                    | Test By:            | Louis          |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)   | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3100.000           | 39.14             | 1.29                     | 40.43              | 74.00               | -33.57         | peak   | H                   |
| 4804.000           | 46.92             | 6.24                     | 53.16              | 74.00               | -20.84         | peak   | H                   |
| 4804.000           | 39.87             | 6.24                     | 46.11              | 54.00               | -7.89          | AVG    | H                   |
| 7206.000           | 36.44             | 12.30                    | 48.74              | 74.00               | -25.26         | peak   | H                   |
|                    |                   |                          |                    |                     |                |        |                     |
| 3093.000           | 38.67             | 1.27                     | 39.94              | 74.00               | -34.06         | peak   | V                   |
| 4804.000           | 48.64             | 6.24                     | 54.88              | 74.00               | -19.12         | peak   | V                   |
| 4804.000           | 40.55             | 6.24                     | 46.79              | 54.00               | -7.21          | AVG    | V                   |
| 7206.000           | 39.68             | 12.30                    | 51.98              | 74.00               | -22.02         | peak   | V                   |



|                    |                   |                          |                    |                     |                |        |                     |
|--------------------|-------------------|--------------------------|--------------------|---------------------|----------------|--------|---------------------|
| Standard:          | FCC Part 15C      |                          |                    | Test Distance:      | 3m             |        |                     |
| Test item:         | Radiated Emission |                          |                    | Power:              | DC 3.7V        |        |                     |
| Model Number:      | W01               |                          |                    | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH    |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:               | 2015/7/28      |        |                     |
| Frequency:         | 2441 MHz          |                          |                    | Test By:            | Louis          |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)   | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3107.000           | 38.58             | 1.31                     | 39.89              | 74.00               | -34.11         | peak   | H                   |
| 4882.000           | 46.88             | 6.58                     | 53.46              | 74.00               | -20.54         | peak   | H                   |
| 4882.000           | 39.77             | 6.58                     | 46.35              | 54.00               | -7.65          | AVG    | H                   |
| 7321.000           | 39.25             | 12.72                    | 51.97              | 74.00               | -22.03         | peak   | H                   |
|                    |                   |                          |                    |                     |                |        |                     |
| 3149.000           | 39.13             | 1.42                     | 40.55              | 74.00               | -33.45         | peak   | V                   |
| 4882.000           | 50.39             | 6.58                     | 56.97              | 74.00               | -17.03         | peak   | V                   |
| 4882.000           | 40.89             | 6.58                     | 47.47              | 54.00               | -6.53          | AVG    | V                   |
| 7323.000           | 39.24             | 12.73                    | 51.97              | 74.00               | -22.03         | peak   | V                   |

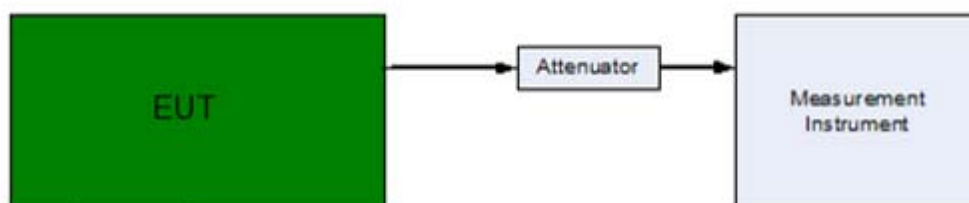
| Standard:          | FCC Part 15C      |                          |                    | Test Distance:       | 3m             |        |                     |
|--------------------|-------------------|--------------------------|--------------------|----------------------|----------------|--------|---------------------|
| Test item:         | Radiated Emission |                          |                    | Power:               | DC 3.7V        |        |                     |
| Model Number:      | W01               |                          |                    | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH   |        |                     |
| Mode:              | Mode 4            |                          |                    | Date:                | 2015/7/28      |        |                     |
| Frequency:         | 2480 MHz          |                          |                    | Test By:             | Louis          |        |                     |
| Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m)    | Margin<br>(dB) | Remark | Ant.Polar.<br>H / V |
| 3107.000           | 38.58             | 1.31                     | 39.89              | 74.00                | -34.11         | peak   | H                   |
| 4960.000           | 46.54             | 6.92                     | 53.46              | 74.00                | -20.54         | peak   | H                   |
| 4960.000           | 39.20             | 6.92                     | 46.12              | 54.00                | -7.88          | AVG    | H                   |
| 7440.000           | 38.19             | 13.15                    | 51.34              | 74.00                | -22.66         | peak   | H                   |
|                    |                   |                          |                    |                      |                |        |                     |
| 3737.000           | 35.54             | 3.16                     | 38.70              | 74.00                | -35.30         | peak   | V                   |
| 4960.000           | 48.26             | 6.92                     | 55.18              | 74.00                | -18.82         | peak   | V                   |
| 4960.000           | 38.49             | 6.92                     | 45.41              | 54.00                | -8.59          | AVG    | V                   |
| 7440.000           | 38.18             | 13.15                    | 51.33              | 74.00                | -22.67         | peak   | V                   |

## 7 20dB RF Bandwidth and 99 % Occupied Bandwidth Measurement

### 7.1. Limit

N/A

### 7.2. Test Setup



### 7.3. Test Instruments

| Equipment                   | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|-----------------------------|--------------|--------------|---------------|------------|--------|
| Spectrum Analyzer           | Agilent      | N9020A       | MY46181842    | 11/05/2014 | (1)    |
| Test Site                   | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                    | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                    | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

### 7.4. Test Procedure

#### 20dB RF Bandwidth

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

- Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
- RBW  $\geq$  1% of the 20dB span, VBW  $\geq$  RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the



emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

## 99 % Occupied Bandwidth

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.

The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.

## 7.5. Test Result

| Model Number    | W01                                           |                               |             |
|-----------------|-----------------------------------------------|-------------------------------|-------------|
| Test Item       | 20dB RF Bandwidth and 99 % Occupied Bandwidth |                               |             |
| Test Mode       | Mode 2                                        |                               |             |
| Date of Test    | 07/09/2015                                    | Test Site                     | TE02        |
| Frequency (MHz) | 20dB RF Bandwidth (MHz)                       | 99 % Occupied Bandwidth (MHz) | Limit (MHz) |
| 2402            | 1.105                                         | 0.949                         | -----       |
| 2441            | 1.106                                         | 0.940                         | -----       |
| 2480            | 1.106                                         | 0.943                         | -----       |

| Model Number    | W01                                           |                               |             |
|-----------------|-----------------------------------------------|-------------------------------|-------------|
| Test Item       | 20dB RF Bandwidth and 99 % Occupied Bandwidth |                               |             |
| Test Mode       | Mode 4                                        |                               |             |
| Date of Test    | 07/09/2015                                    | Test Site                     | TE02        |
| Frequency (MHz) | 20dB RF Bandwidth (MHz)                       | 99 % Occupied Bandwidth (MHz) | Limit (MHz) |
| 2402            | 1.263                                         | 1.153                         | -----       |
| 2441            | 1.278                                         | 1.149                         | -----       |
| 2480            | 1.268                                         | 1.150                         | -----       |



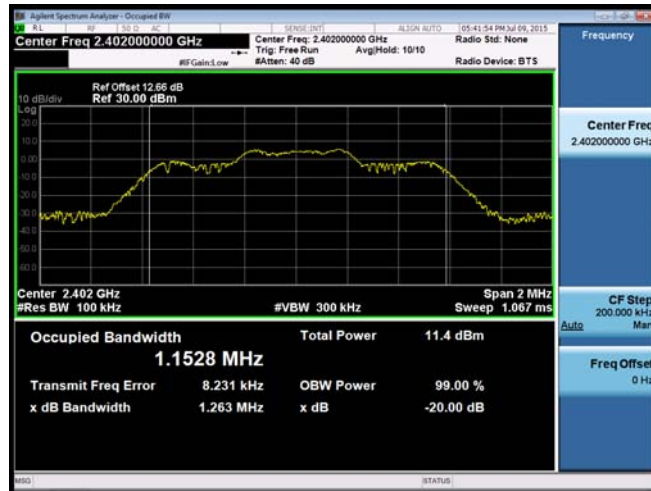
## 7.6. Test Graphs

| Mode 2: GFSK Link Mode |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2402                   |  <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.40200000 GHz</p> <p>Ref Offset 12.66 dB<br/>Ref 30.00 dBm</p> <p>Center 2.402 GHz<br/>#Res BW 100 kHz</p> <p>Span 2 MHz<br/>Sweep 1.067 ms</p> <p>Occupied Bandwidth 948.79 kHz</p> <p>Total Power 11.9 dBm</p> <p>Transmit Freq Error 1.768 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.105 MHz</p> <p>x dB -20.00 dB</p>  |
| 2441                   |  <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.44100000 GHz</p> <p>Ref Offset 12.66 dB<br/>Ref 30.00 dBm</p> <p>Center 2.441 GHz<br/>#Res BW 100 kHz</p> <p>Span 2 MHz<br/>Sweep 1.067 ms</p> <p>Occupied Bandwidth 939.96 kHz</p> <p>Total Power 12.0 dBm</p> <p>Transmit Freq Error 1.804 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.106 MHz</p> <p>x dB -20.00 dB</p> |
| 2480                   |  <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.48000000 GHz</p> <p>Ref Offset 12.66 dB<br/>Ref 30.00 dBm</p> <p>Center 2.48 GHz<br/>#Res BW 100 kHz</p> <p>Span 2 MHz<br/>Sweep 1.067 ms</p> <p>Occupied Bandwidth 943.39 kHz</p> <p>Total Power 12.9 dBm</p> <p>Transmit Freq Error 4.592 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.106 MHz</p> <p>x dB -20.00 dB</p> |

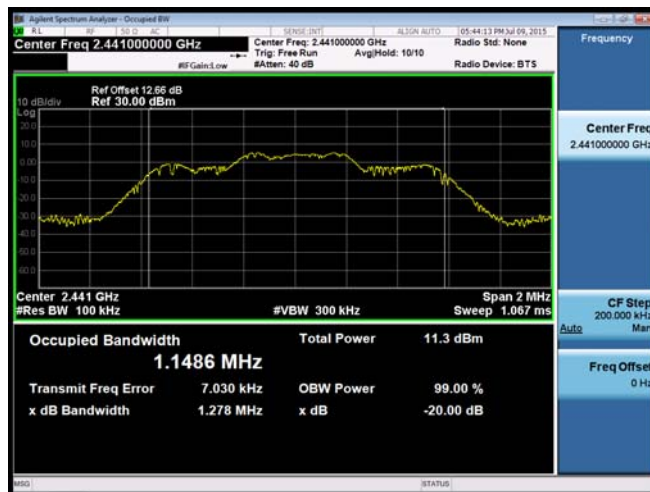


## Mode 4: 8DPSK Mode

2402



2441



2480

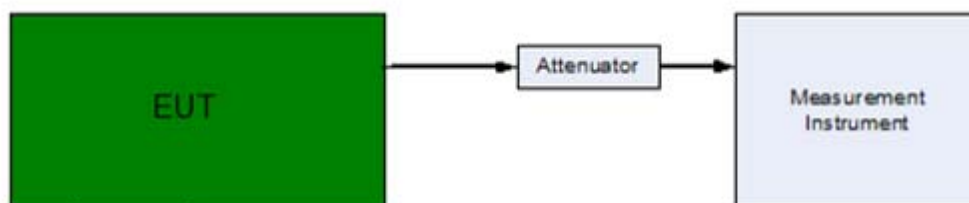


## 8 Carrier Frequency Separation Measurement

### 8.1. Limit

Title 47 of the CFR, Part 15 Subpart (c) 15.247(a)(1)(i) requires the measurement of the bandwidth of the transmission between the -20 dB points on the transmitted spectrum. The results of this test determine the limits for channel spacing. The channel spacing shall be a minimum of 25 kHz or the 20 dB bandwidth.

### 8.2. Test Setup



### 8.3. Test Instruments

| Equipment                   | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|-----------------------------|--------------|--------------|---------------|------------|--------|
| Spectrum Analyzer           | Agilent      | N9020A       | MY46181842    | 11/05/2014 | (1)    |
| Test Site                   | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                    | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                    | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request.

### 8.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth transmitter of the V6 had its hopping function enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span
3. Video (or Average) Bandwidth (VBW)  $\geq$  RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



## 8.5. Test Result

|                 |                              |             |      |
|-----------------|------------------------------|-------------|------|
| Model Number    | W01                          |             |      |
| Test Item       | Carrier Frequency Separation |             |      |
| Test Mode       | Mode 5                       |             |      |
| Date of Test    | 07/09/2015                   | Test Site   | TE02 |
| Frequency (MHz) | Measurement (MHz)            | Limit (MHz) |      |
| 2402            | 0.999                        | >0.737      |      |
| 2441            | 0.999                        | >0.737      |      |
| 2480            | 1.00                         | >0.737      |      |

|                 |                              |             |      |
|-----------------|------------------------------|-------------|------|
| Model Number    | W01                          |             |      |
| Test Item       | Carrier Frequency Separation |             |      |
| Test Mode       | Mode 7                       |             |      |
| Date of Test    | 07/09/2015                   | Test Site   | TE02 |
| Frequency (MHz) | Measurement (MHz)            | Limit (MHz) |      |
| 2402            | 1.035                        | >0.842      |      |
| 2441            | 1.297                        | >0.852      |      |
| 2480            | 1.176                        | >0.845      |      |

## 8.6. Test Graphs

Mode 5

2402

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.402500000 GHz

Ref Offset 12.66 dB  
Ref 30.00 dBm

Start 2.401500 GHz  
#Res BW 100 kHz

Stop 2.403500 GHz  
#VBW 300 kHz  
Sweep 1.067 ms (8001 pts)

Frequency

Auto Tune

Center Freq 2.402500000 GHz

Start Freq 2.401500000 GHz

Stop Freq 2.403500000 GHz

CF Step 200.000 kHz

Freq Offset 0 Hz

| Marker | F            | A         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|--------|--------------|-----------|----------|----------------|----------------|
| 1      | 2.401845 GHz | 0.137 dB  |          |                |                |
| 2      | 2.401845 GHz | 6.805 dBm |          |                |                |

2441

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.440500000 GHz

Ref Offset 12.66 dB  
Ref 30.00 dBm

Start 2.439500 GHz  
#Res BW 100 kHz

Stop 2.441500 GHz  
#VBW 300 kHz  
Sweep 1.067 ms (8001 pts)

Frequency

Auto Tune

Center Freq 2.440500000 GHz

Start Freq 2.439500000 GHz

Stop Freq 2.441500000 GHz

CF Step 200.000 kHz

Freq Offset 0 Hz

| Marker | F            | A         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|--------|--------------|-----------|----------|----------------|----------------|
| 1      | 2.439843 GHz | -0.154 dB |          |                |                |
| 2      | 2.439843 GHz | 6.856 dBm |          |                |                |

2480

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.479500000 GHz

Ref Offset 12.66 dB  
Ref 30.00 dBm

Start 2.478500 GHz  
#Res BW 100 kHz

Stop 2.480500 GHz  
#VBW 300 kHz  
Sweep 1.067 ms (8001 pts)

Frequency

Auto Tune

Center Freq 2.479500000 GHz

Start Freq 2.478500000 GHz

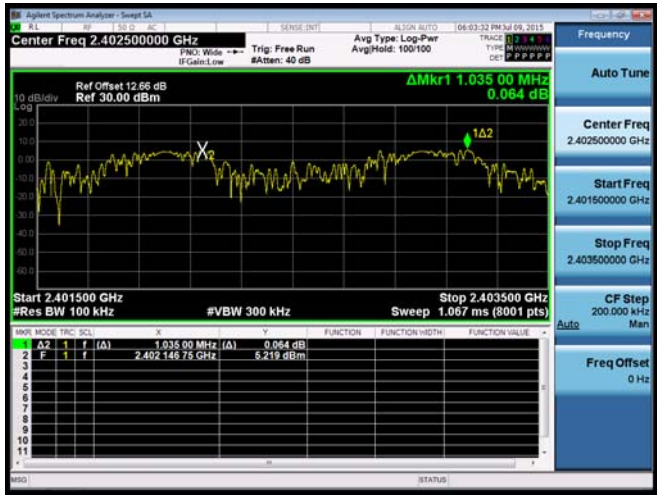
Stop Freq 2.480500000 GHz

CF Step 200.000 kHz

Freq Offset 0 Hz

| Marker | F            | A         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|--------|--------------|-----------|----------|----------------|----------------|
| 1      | 2.478842 GHz | -0.130 dB |          |                |                |
| 2      | 2.478842 GHz | 7.642 dBm |          |                |                |



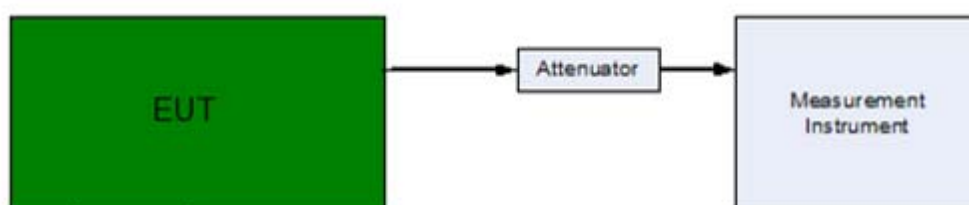
|        |                                                                                      |
|--------|--------------------------------------------------------------------------------------|
| Mode 7 |                                                                                      |
| 2402   |    |
| 2441   |   |
| 2480   |  |

## 9 Number of Hopping Measurement

### 9.1. Limit

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

### 9.2. Test Setup



### 9.3. Test Instruments

| Equipment                   | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|-----------------------------|--------------|--------------|---------------|------------|--------|
| Spectrum Analyzer           | Agilent      | N9020A       | MY46181842    | 11/05/2014 | (1)    |
| Test Site                   | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                    | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                    | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

### 9.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW  $\geq$  1% of the span
3. VBW  $\geq$  RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



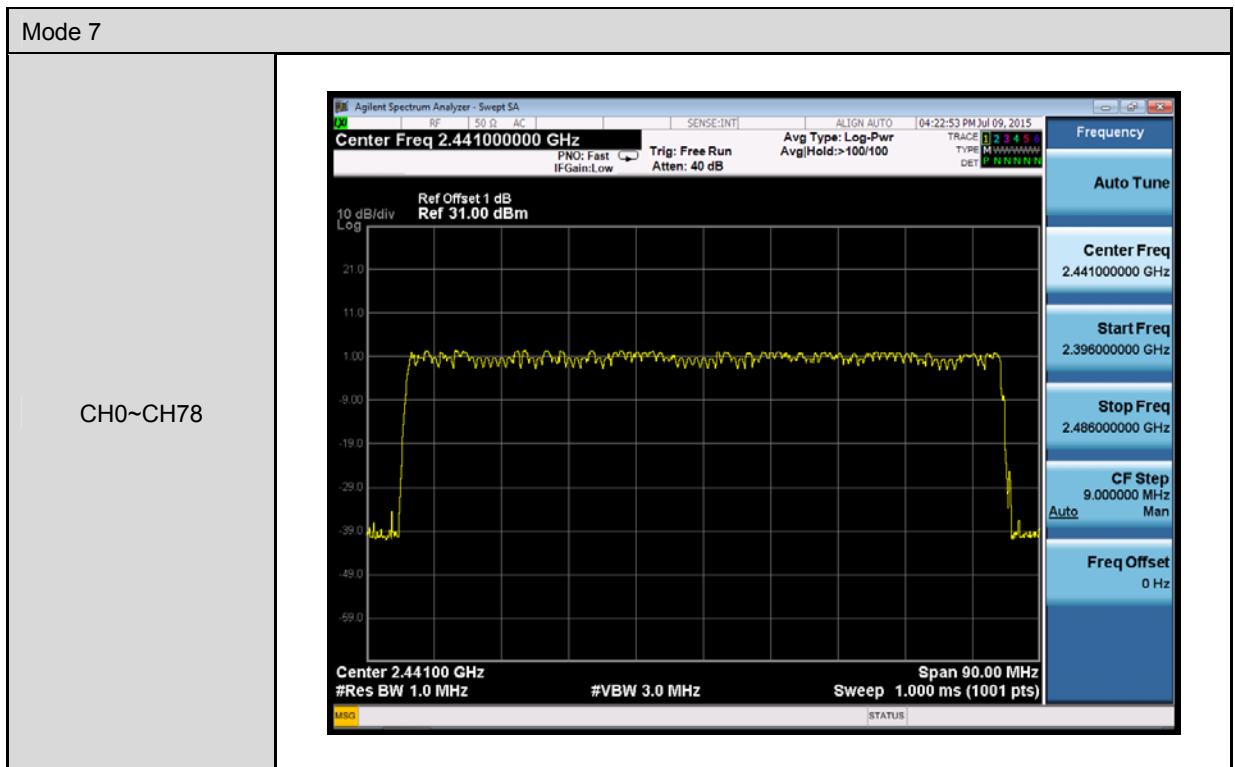
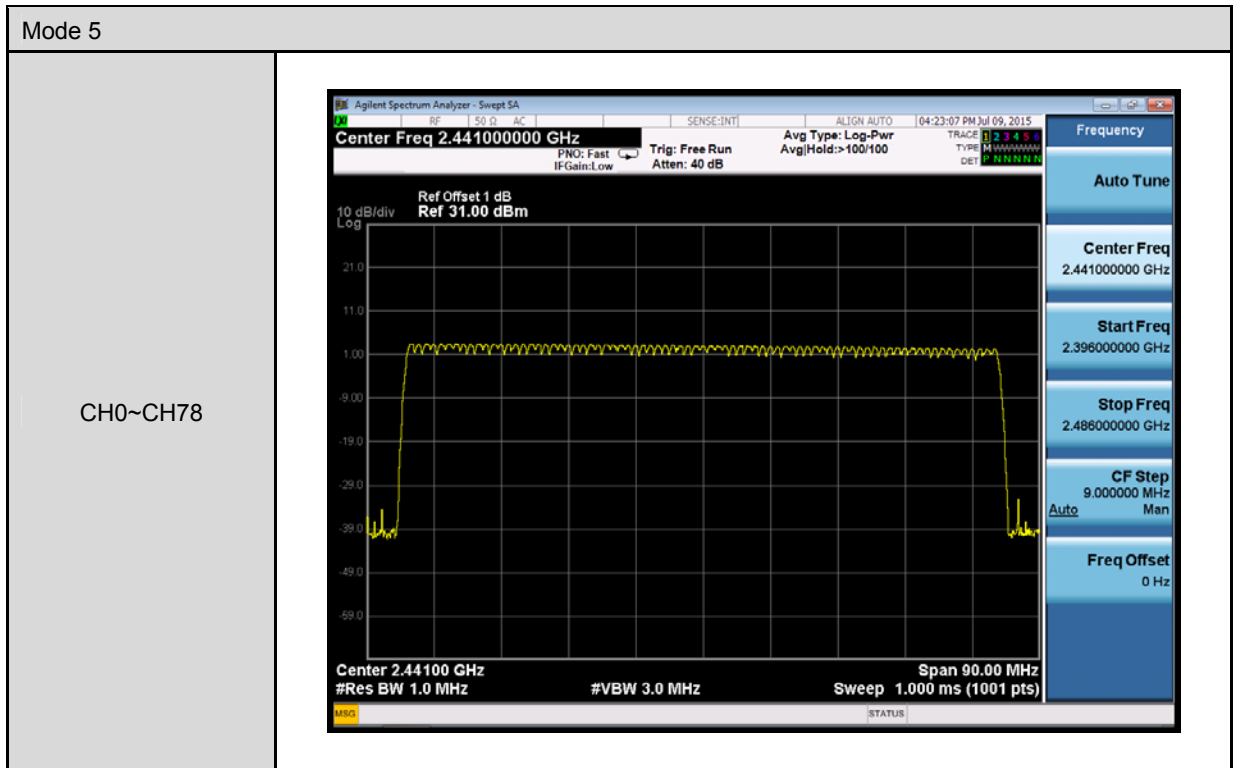
## 9.5. Test Result

|                          |                     |           |               |
|--------------------------|---------------------|-----------|---------------|
| Model Number             | W01                 |           |               |
| Test Item                | Number of Hopping   |           |               |
| Test Mode                | Mode 5-DH5          |           |               |
| Date of Test             | 07/09/2015          | Test Site | TE02          |
| Frequency Range<br>(MHz) | Measurement<br>(ch) |           | Limit<br>(ch) |
| 2402 - 2480              | 79                  |           | > 15          |

|                          |                     |           |               |
|--------------------------|---------------------|-----------|---------------|
| Model Number             | W01                 |           |               |
| Test Item                | Number of Hopping   |           |               |
| Test Mode                | Mode 7-DH5          |           |               |
| Date of Test             | 07/09/2015          | Test Site | TE02          |
| Frequency Range<br>(MHz) | Measurement<br>(ch) |           | Limit<br>(ch) |
| 2402 - 2480              | 79                  |           | > 15          |



## 9.6. Test Graphs

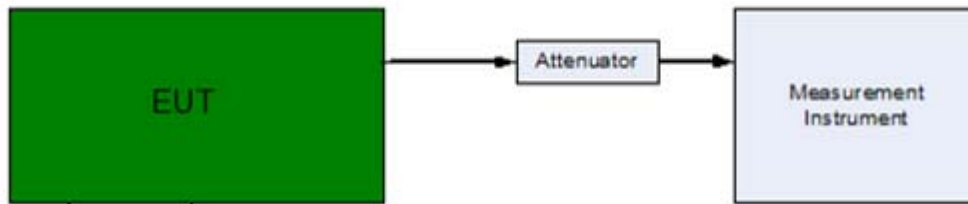


## 10 Time of Occupancy (Dwell Time) Measurement

### 10.1. 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.

### 10.2. Test Setup



### 10.3. Test Instruments

| Equipment                   | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|-----------------------------|--------------|--------------|---------------|------------|--------|
| Spectrum Analyzer           | Agilent      | N9020A       | MY46181842    | 11/05/2014 | (1)    |
| Test Site                   | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                    | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                    | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

### 10.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW  $\geq$  RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

The marker-delta function was used to determine the dwell time.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



## 10.5. Test Result

|                                      |                                |           |      |
|--------------------------------------|--------------------------------|-----------|------|
| Model Number                         | W01                            |           |      |
| Test Item                            | Time of Occupancy (Dwell Time) |           |      |
| Test Mode                            | Mode 2                         |           |      |
| Date of Test                         | 07/09/2015                     | Test Site | TE02 |
| DH1                                  |                                |           |      |
| Frequency                            | 2441 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 800/79CH = 10.13(times/sec)    |           |      |
| Each Channel Dwell Times (1)         | 0.379           ms (sec)       |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 10.13 = 320.108(times)  |           |      |
| Dwell Times on Cycle (1) * (2)       | 121.3209       ms (sec)        |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |
| DH3                                  |                                |           |      |
| Frequency                            | 2441 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 400/79CH = 5.06(times/sec)     |           |      |
| Each Channel Dwell Times (1)         | 1.635           ms (sec)       |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 5.1 = 159.896(times)    |           |      |
| Dwell Times on Cycle (1) * (2)       | 261.4300       ms (sec)        |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |
| DH5                                  |                                |           |      |
| Frequency                            | 2441 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 266.7/79CH = 3.38(times/sec)   |           |      |
| Each Channel Dwell Times (1)         | 2.887           ms (sec)       |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 3.38 = 106.808(times)   |           |      |
| Dwell Times on Cycle (1) * (2)       | 308.3547       ms (sec)        |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |



|                                      |                                |           |      |
|--------------------------------------|--------------------------------|-----------|------|
| Model Number                         | W01                            |           |      |
| Test Item                            | Time of Occupancy (Dwell Time) |           |      |
| Test Mode                            | Mode 4                         |           |      |
| Date of Test                         | 07/09/2015                     | Test Site | TE02 |
| 3DH1                                 |                                |           |      |
| Frequency                            | 2441 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 800/79CH = 10.13(times/sec)    |           |      |
| Each Channel Dwell Times (1)         | 0.386 ms (sec)                 |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 10.13 = 320.108(times)  |           |      |
| Dwell Times on Cycle (1) * (2)       | 1323.5617 ms (sec)             |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |
| 3DH3                                 |                                |           |      |
| Frequency                            | 2441 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 400/79CH = 5.06(times/sec)     |           |      |
| Each Channel Dwell Times (1)         | 1.634 ms (sec)                 |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 5.06 = 159.896(times)   |           |      |
| Dwell Times on Cycle (1) * (2)       | 261.2701 ms (sec)              |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |
| 3DH5                                 |                                |           |      |
| Frequency                            | 2480 MHz                       |           |      |
| Cycle Calculate                      | 79CH * 0.4 = 31.6 (sec)        |           |      |
| The EUT Hopping Number per Sec       | 1600 times/sec                 |           |      |
| Each Channel Dwell Times per Sec     | 266.7/79CH = 3.38(times/sec)   |           |      |
| Each Channel Dwell Times (1)         | 2.888 ms (sec)                 |           |      |
| Each Channel Dwell Times on Cycle(2) | 31.6 * 3.38 = 106.808(times)   |           |      |
| Dwell Times on Cycle (1) * (2)       | 308.4615 ms (sec)              |           |      |
| LIMIT(msec)                          | < = 400                        |           |      |

## 10.6. Test Graphs

# Mode 2: GFSK Link Mode

DH1

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.441000000 GHz

Ref 10.00 dBm

Mkr3 2.338 ms -18.14 dBm

Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 10.13 ms (8001 pts)

Span 0 Hz

| MARK | MODE | TRIG | SCL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|------|------|------|-----|-----|----------|----------|----------------|----------------|
| 1    | A2   | 1    | t   | (A) | 378.7 ms | (A)      | -8.26 dB       |                |
| 2    | F    | 1    | t   | (A) | 1.088 ms | (A)      | -14.90 dBm     |                |
| 3    | N    | 1    | t   | (A) | 2.338 ms | (A)      | -18.14 dBm     |                |

DH3

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.441000000 GHz

Ref 10.00 dBm

Mkr3 2.839 ms -15.54 dBm

Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 10.13 ms (8001 pts)

Span 0 Hz

| MARK | MODE | TRIG | SCL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|------|------|------|-----|-----|----------|----------|----------------|----------------|
| 1    | A2   | 1    | t   | (A) | 1.636 ms | (A)      | -6.01 dB       |                |
| 2    | F    | 1    | t   | (A) | 338.2 us | (A)      | -16.47 dBm     |                |
| 3    | N    | 1    | t   | (A) | 2.839 ms | (A)      | -15.54 dBm     |                |

DH5

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.441000000 GHz

Ref 10.00 dBm

Mkr3 6.371 ms -14.42 dBm

Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 10.13 ms (8001 pts)

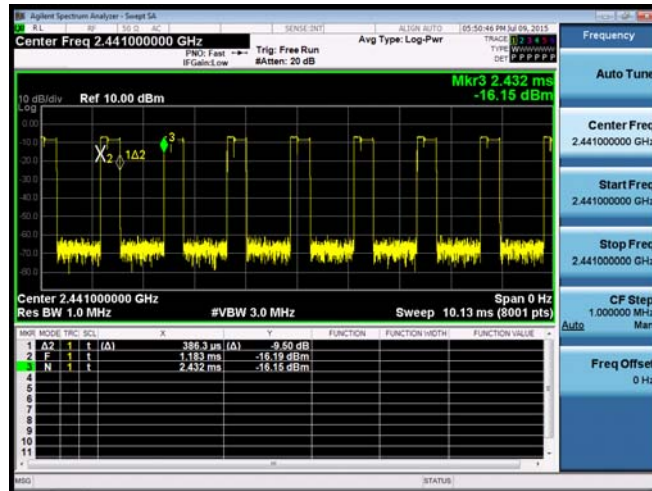
Span 0 Hz

| MARK | MODE | TRIG | SCL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|------|------|------|-----|-----|----------|----------|----------------|----------------|
| 1    | A2   | 1    | t   | (A) | 2.887 ms | (A)      | -8.63 dB       |                |
| 2    | F    | 1    | t   | (A) | 2.622 ms | (A)      | -16.77 dBm     |                |
| 3    | N    | 1    | t   | (A) | 6.371 ms | (A)      | -14.42 dBm     |                |

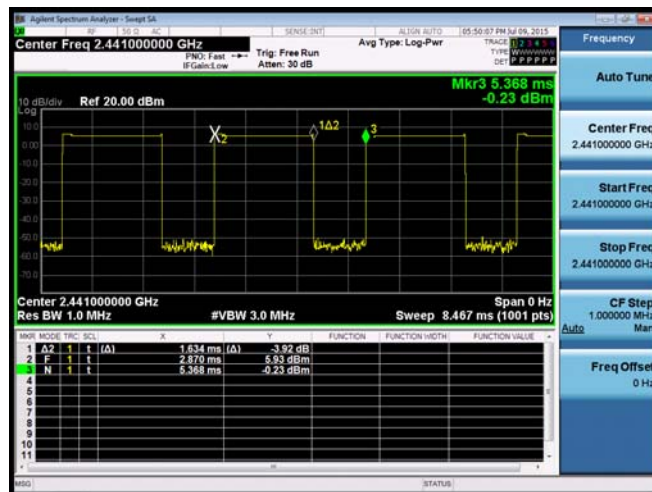


## Mode 4: 8DPSK Mode

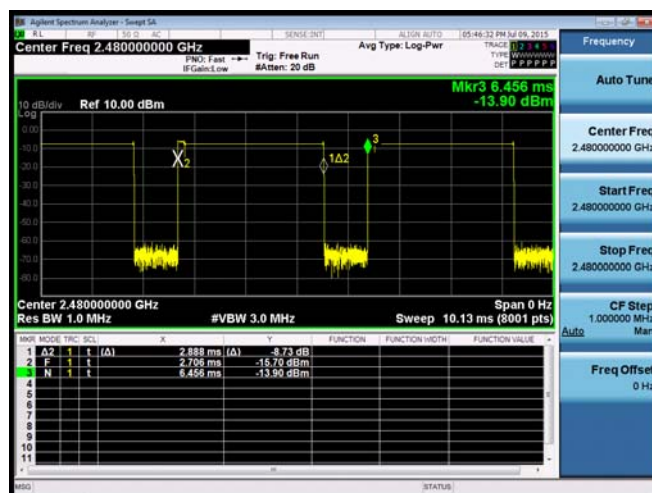
3DH1



3DH3



3DH5

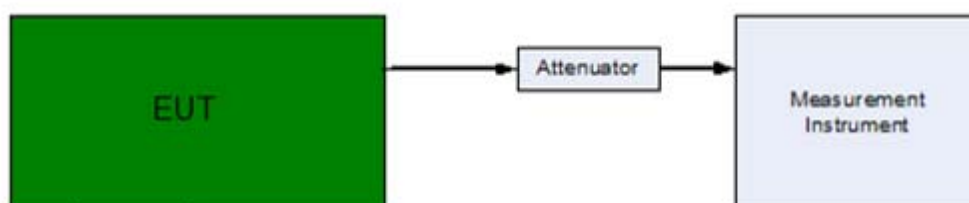


## 11 Out of Band Conducted Emissions Measurement

### 11.1. Limit

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

### 11.2. Test Setup



### 11.3. Test Instruments

| Equipment                   | Manufacturer | Model Number | Serial Number | Cal. Date  | Remark |
|-----------------------------|--------------|--------------|---------------|------------|--------|
| Spectrum Analyzer           | Agilent      | N9020A       | MY46181842    | 11/05/2014 | (1)    |
| Test Site                   | ATL          | TE02         | TE02          | N.C.R.     | -----  |
| RF cable                    | WOKEN        | ---          | C.10-07-02    | 10/24/2014 | (1)    |
| RF cable                    | WOKEN        | ---          | C.10-07-03    | 10/24/2014 | (1)    |
| Temporary antenna connector | ---          | ---          | A01-224       | 05/24/2015 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

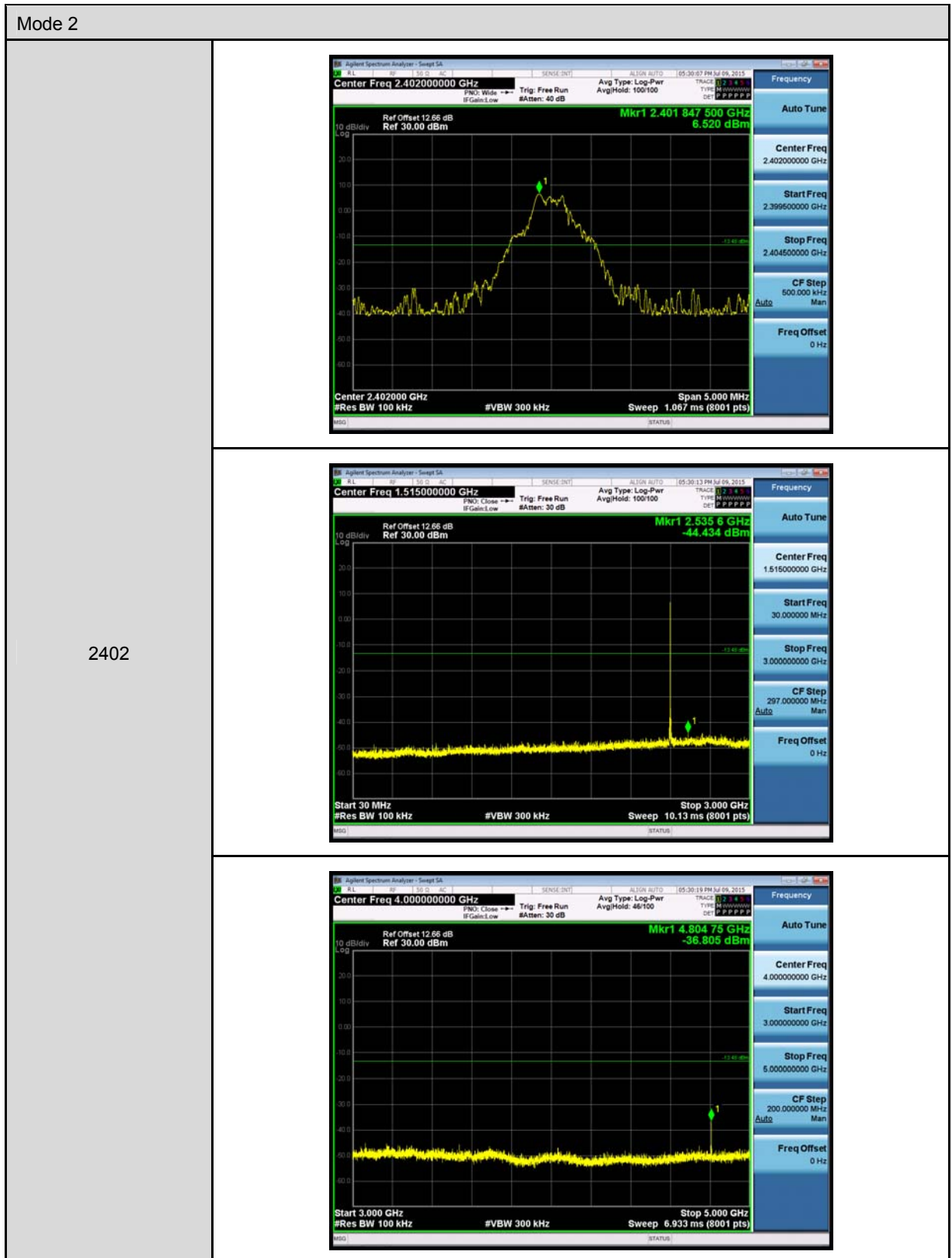
### 11.4. Test Procedure

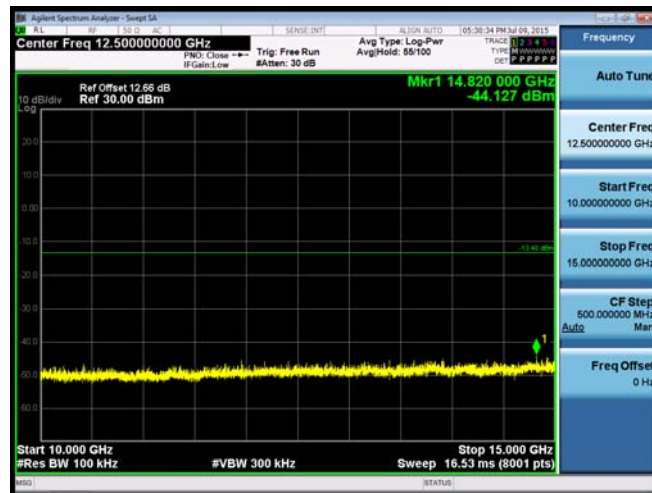
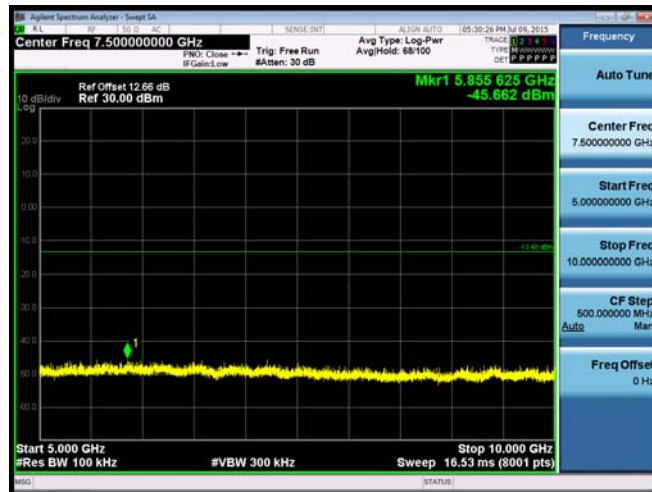
Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function. All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels (Channel 0, 39, 78), and the setting value of instrument are as below:  
 Decetor=Peak, RBW=100kHz, VBW=300kHz

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



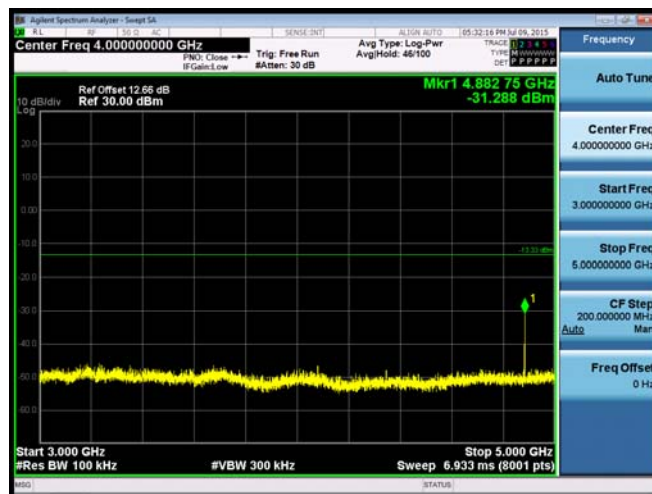
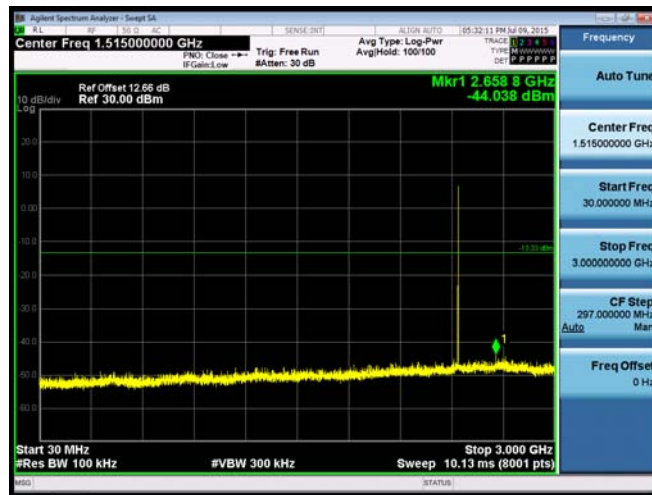
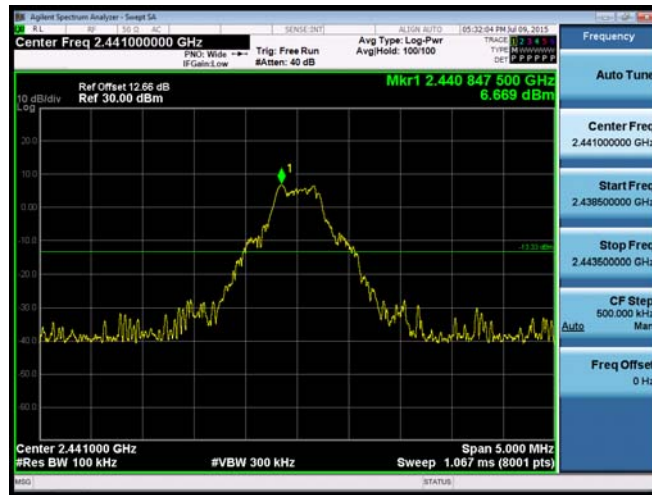
## 11.5. Test Graphs

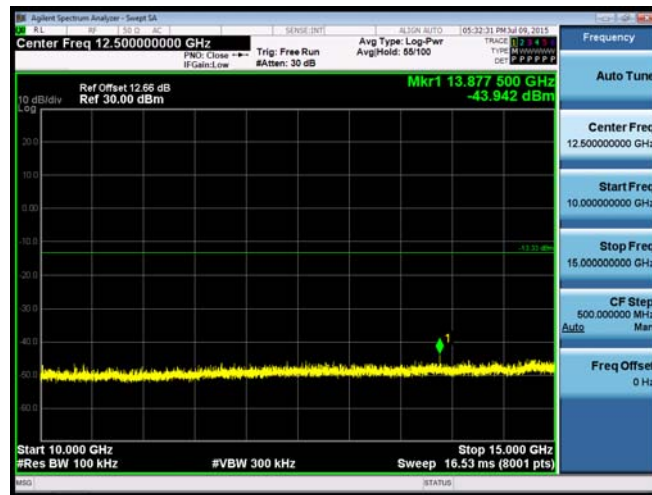
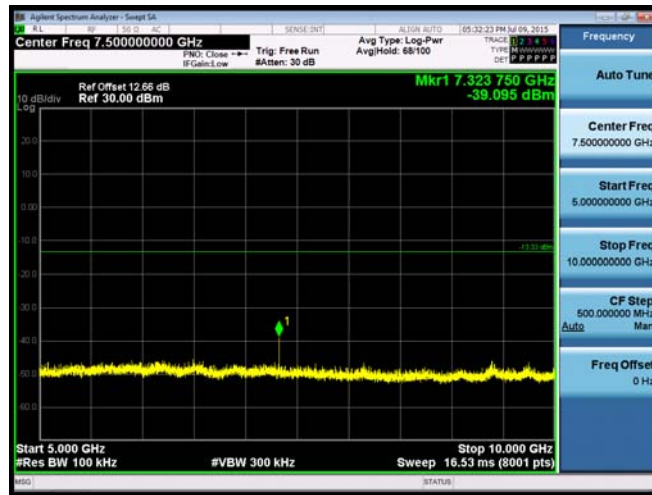






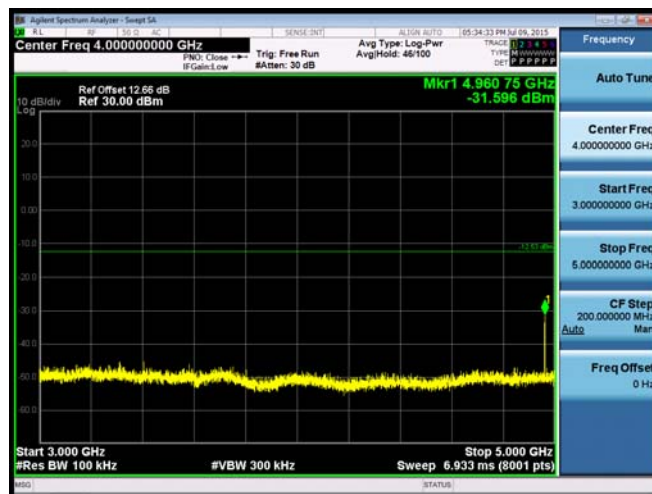
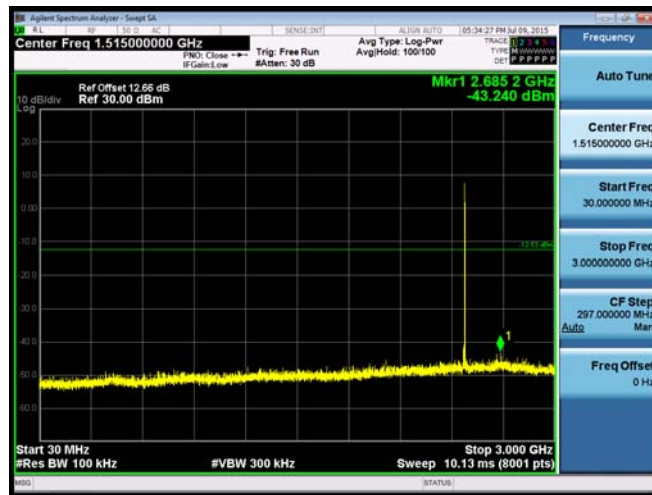
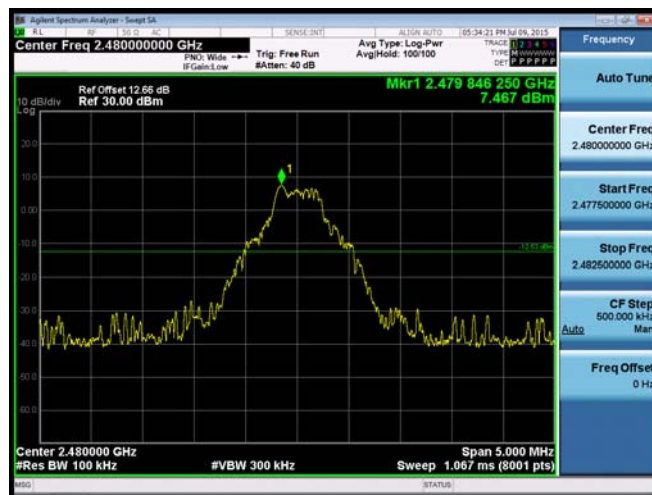
2441

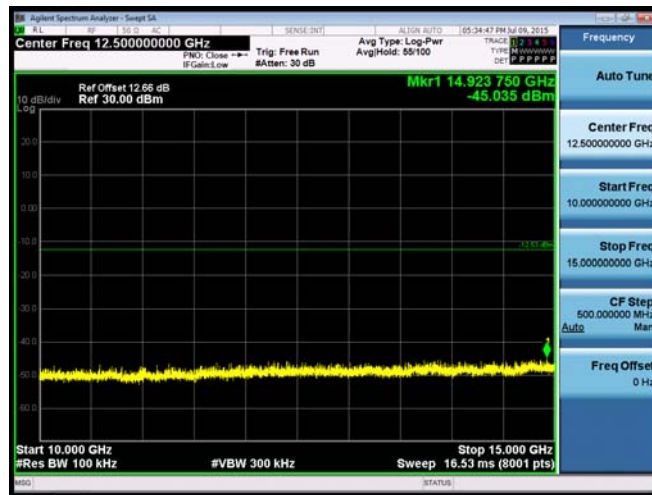
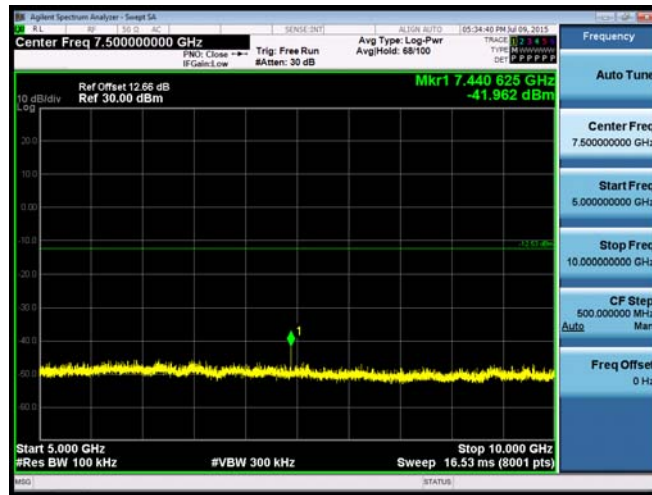






2480

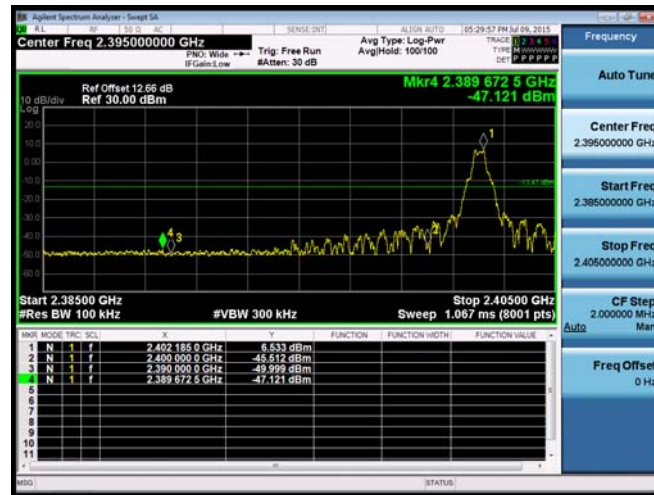




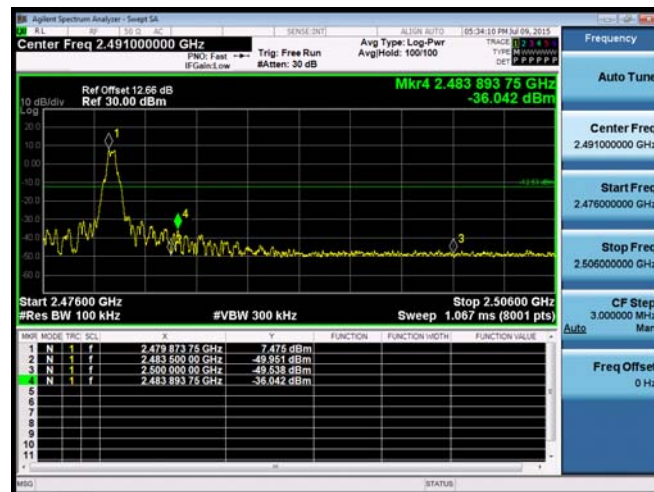
Note: No emissions were found between 9 kHz to 30 MHz.



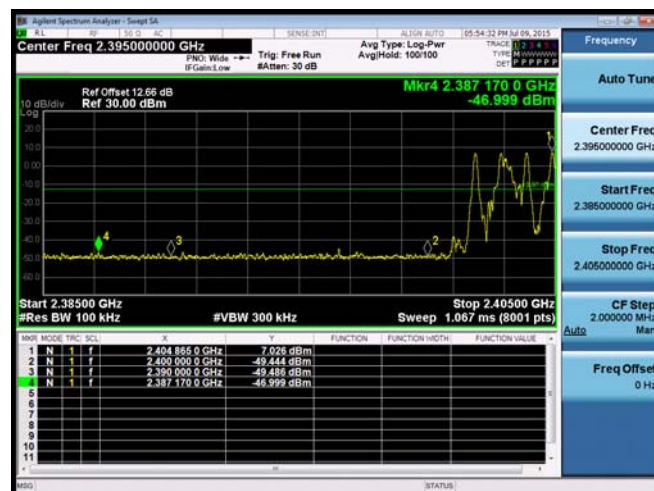
Mode 2/2402



Mode 2/2480

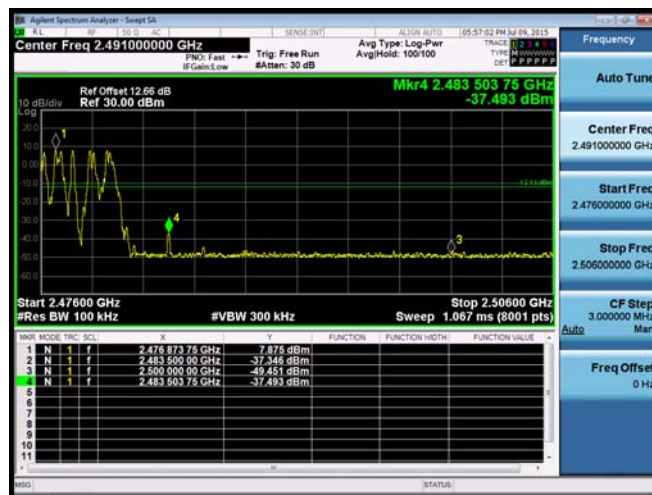


Mode 5/Hopping-2402



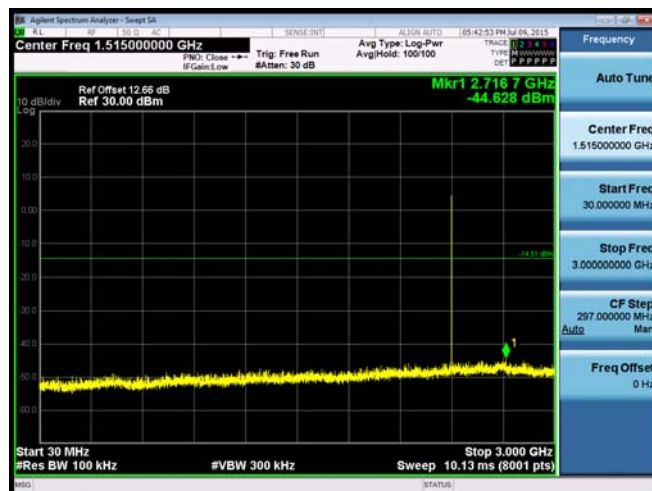
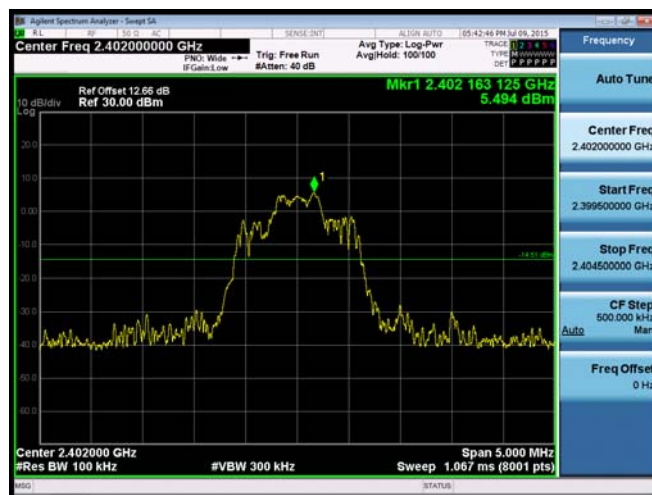


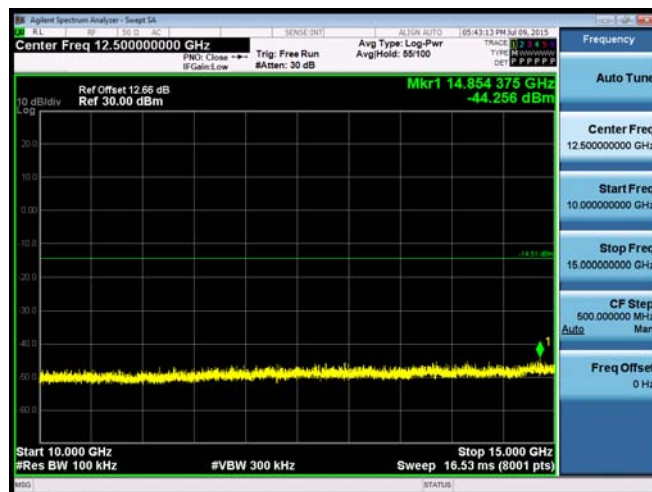
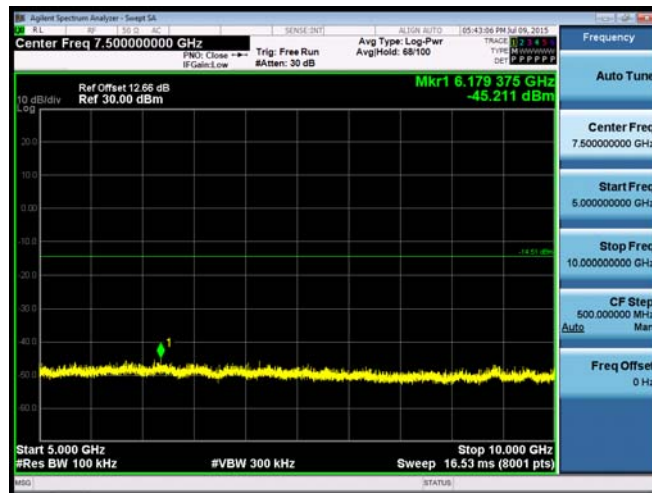
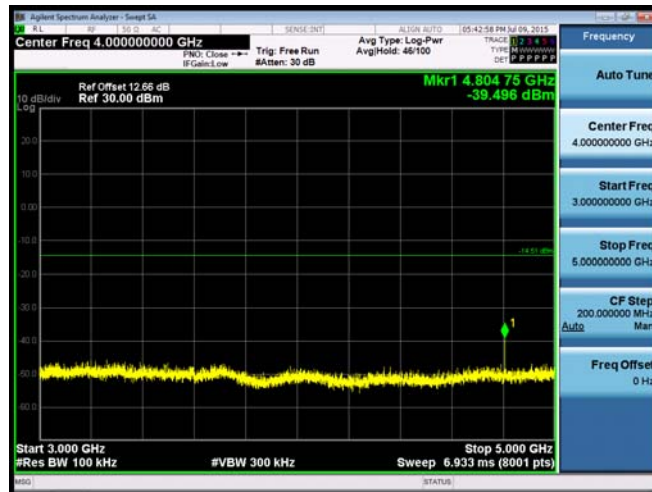
Mode 5/Hopping-2480



Mode 4: 8DPSK Mode

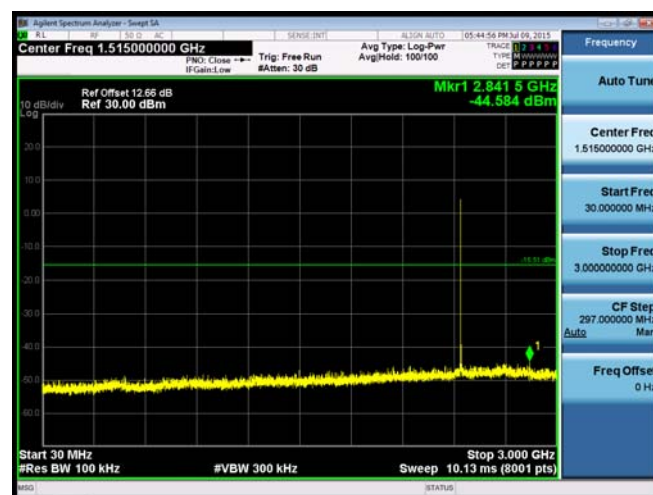
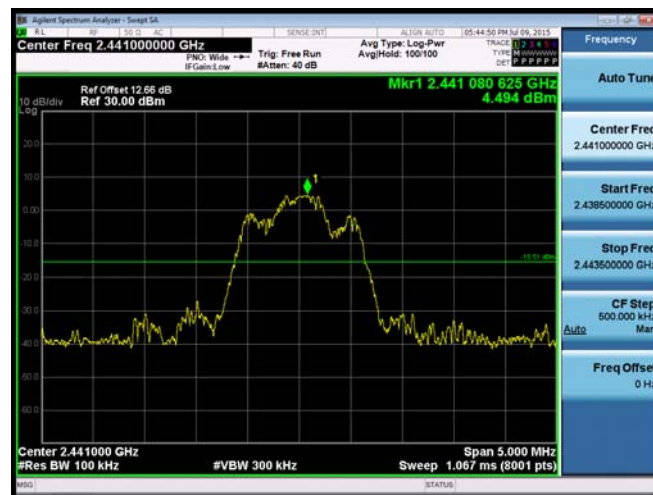
2402

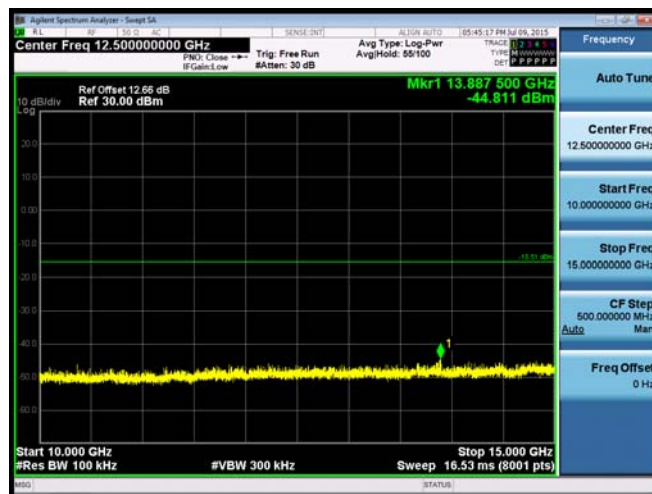
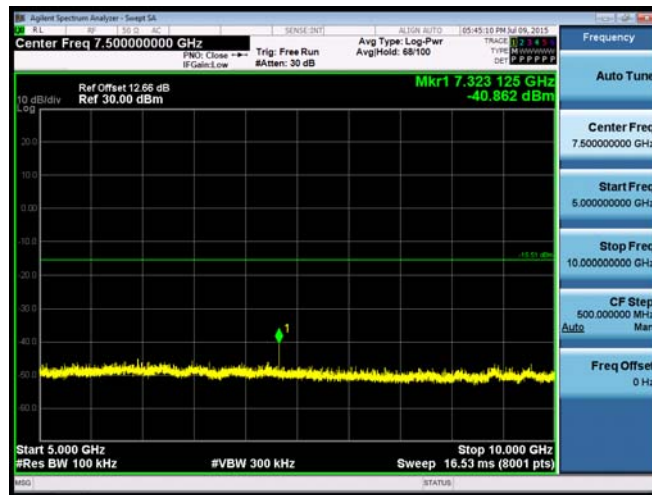
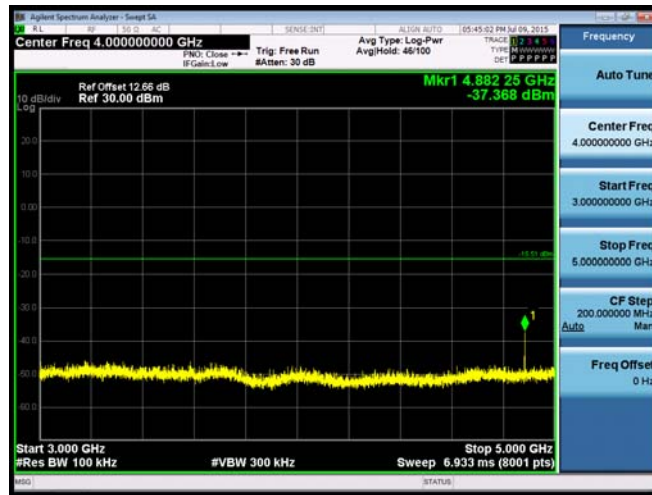






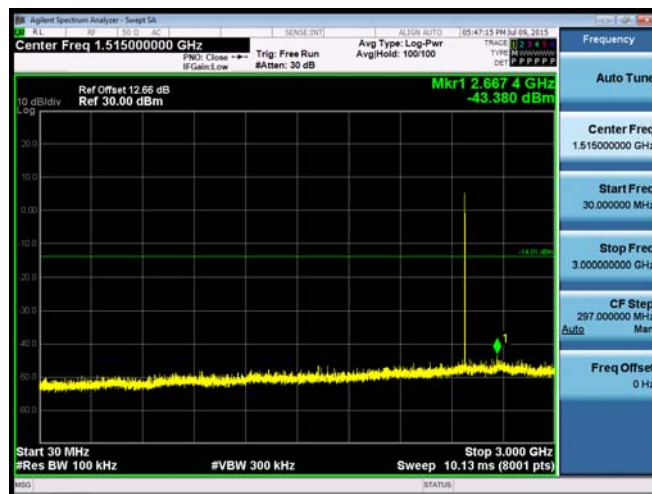
2441

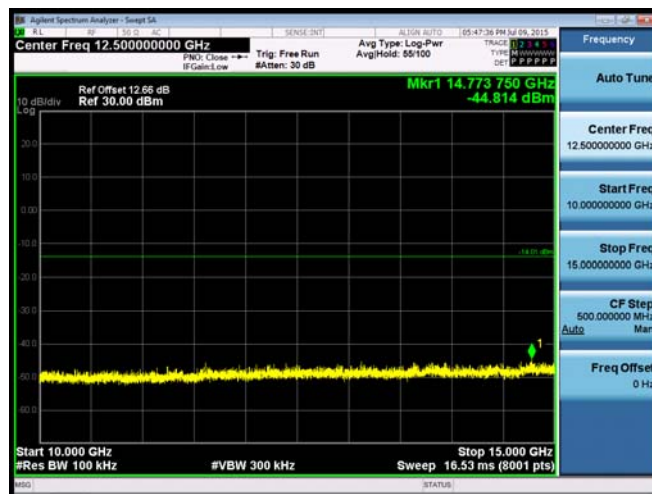
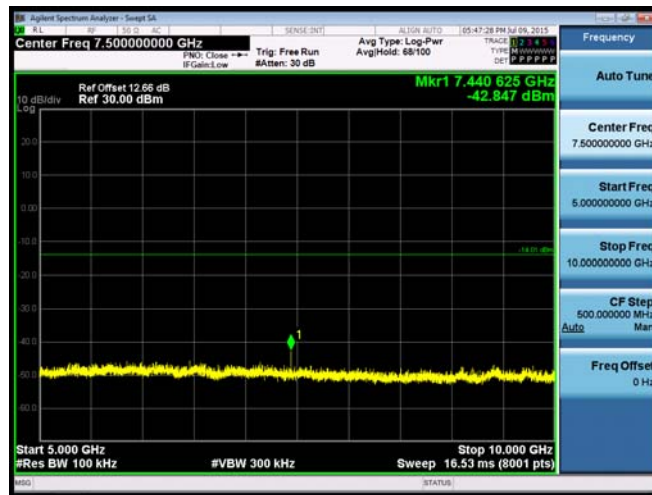
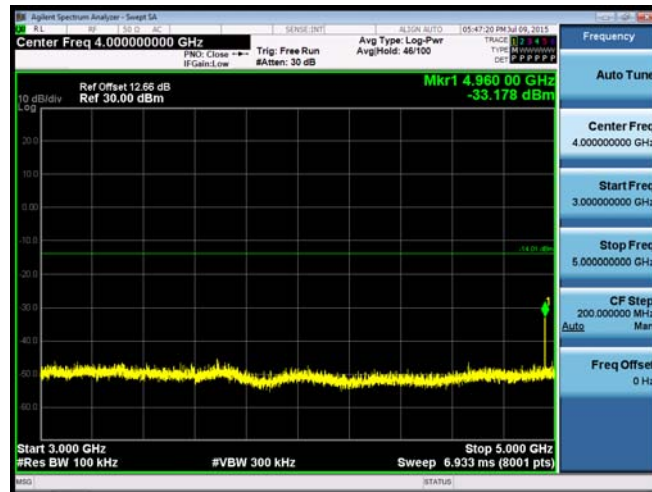


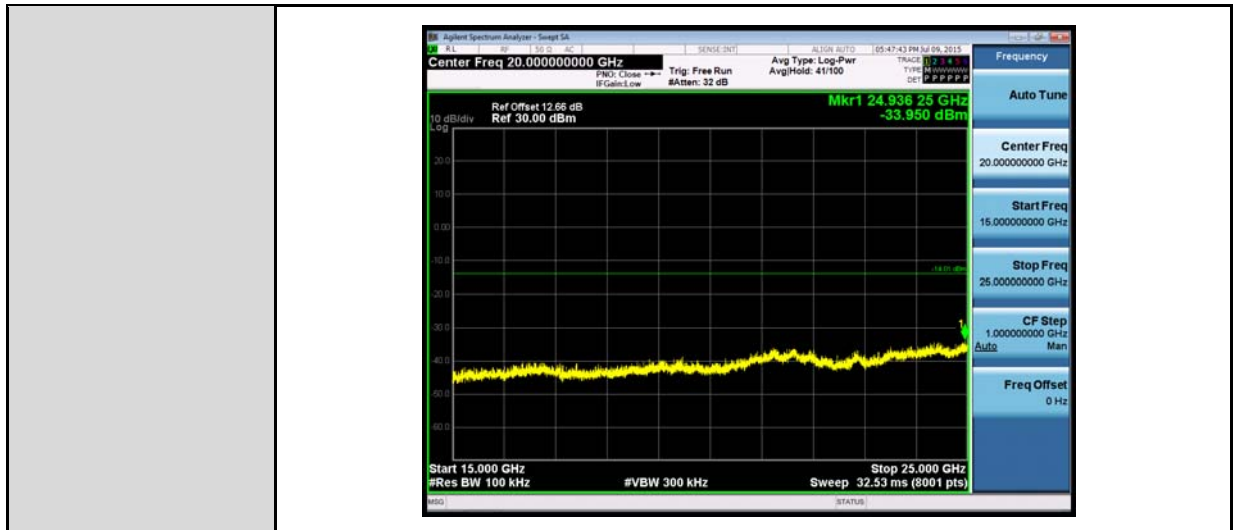




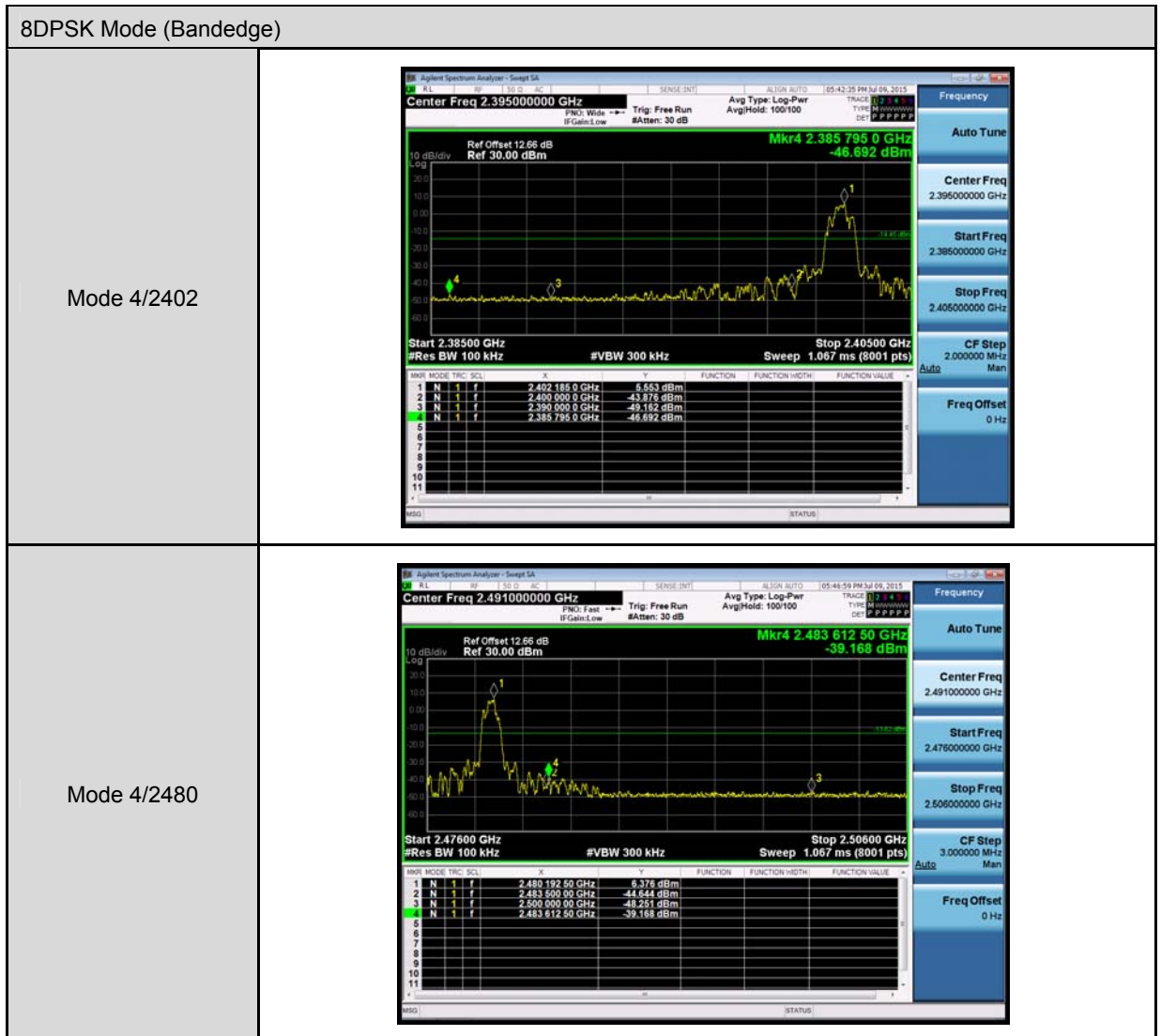
2480





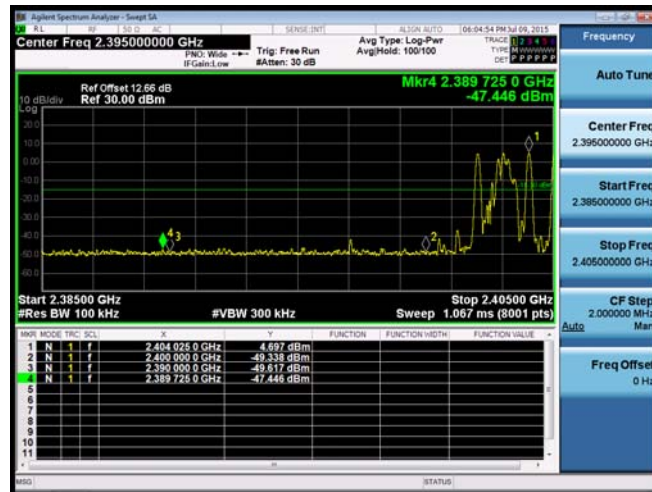


Note: No emissions were found between 9 kHz to 30 MHz.

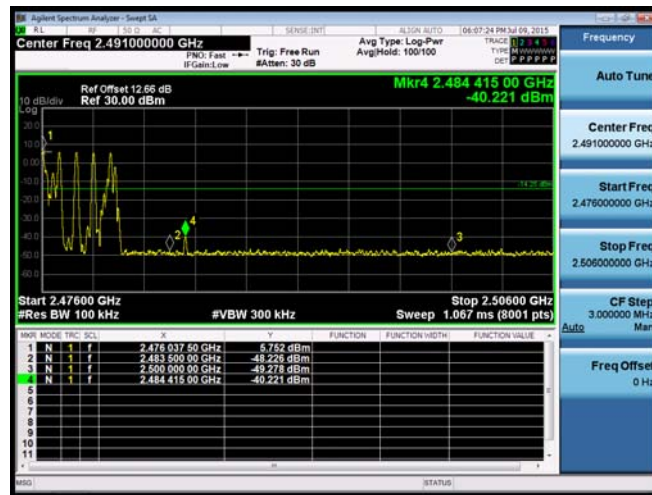




Mode 7/Hopping-2402



Mode 7/Hopping-2480

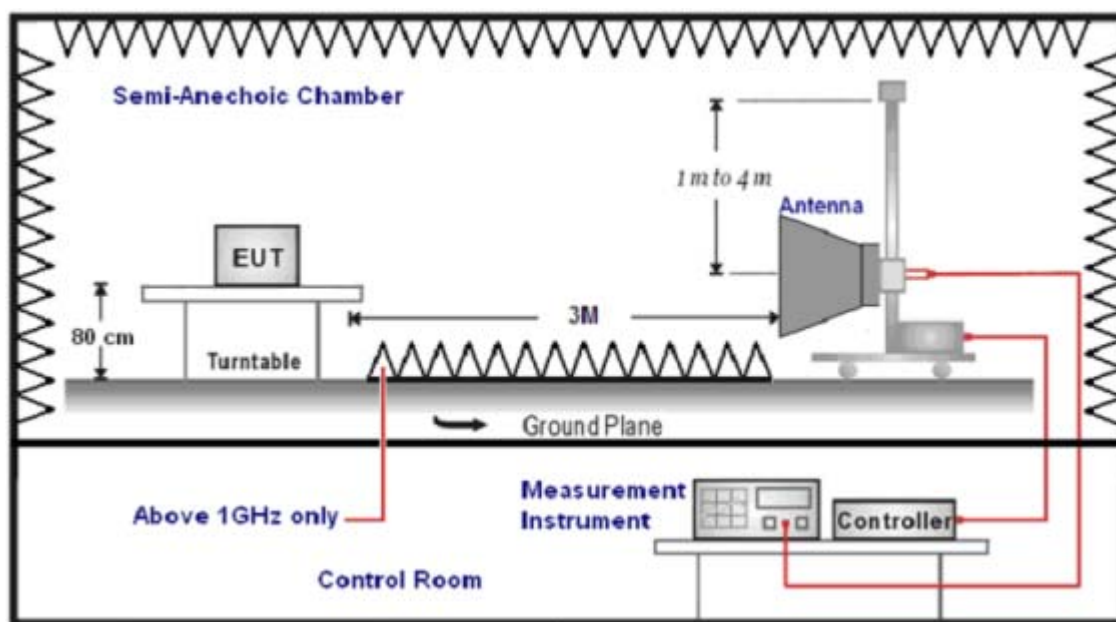


## 12 Band Edges Measurement

### 12.1. Limit

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

### 12.2. Test Setup



### 12.3. Test Instruments

| Equipment         | Manufacturer                   | Model Number | Serial Number | Cal. Date  | Remark |
|-------------------|--------------------------------|--------------|---------------|------------|--------|
| Spectrum Analyzer | Agilent                        | E4408B       | MY45107753    | 07/14/2015 | (1)    |
| Pre Amplifier     | Agilent                        | 8449B        | 3008A02237    | 02/21/2015 | (1)    |
| Horn Antenna      | SCHWARZBECK<br>MESS-ELEKTRONIK | 9120D        | 9120D-550     | 06/11/2015 | (1)    |
| Test Site         | ATL                            | TE01         | 888001        | 08/28/2014 | (1)    |
| RF cable          | WOKEN                          | ---          | C.10-07-07    | 10/24/2014 | (1)    |
| RF cable          | WOKEN                          | ---          | C.10-07-08    | 10/24/2014 | (1)    |
| RF cable          | WOKEN                          | ---          | C.10-07-09    | 10/24/2014 | (1)    |

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.



## 12.4. Test Procedure

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

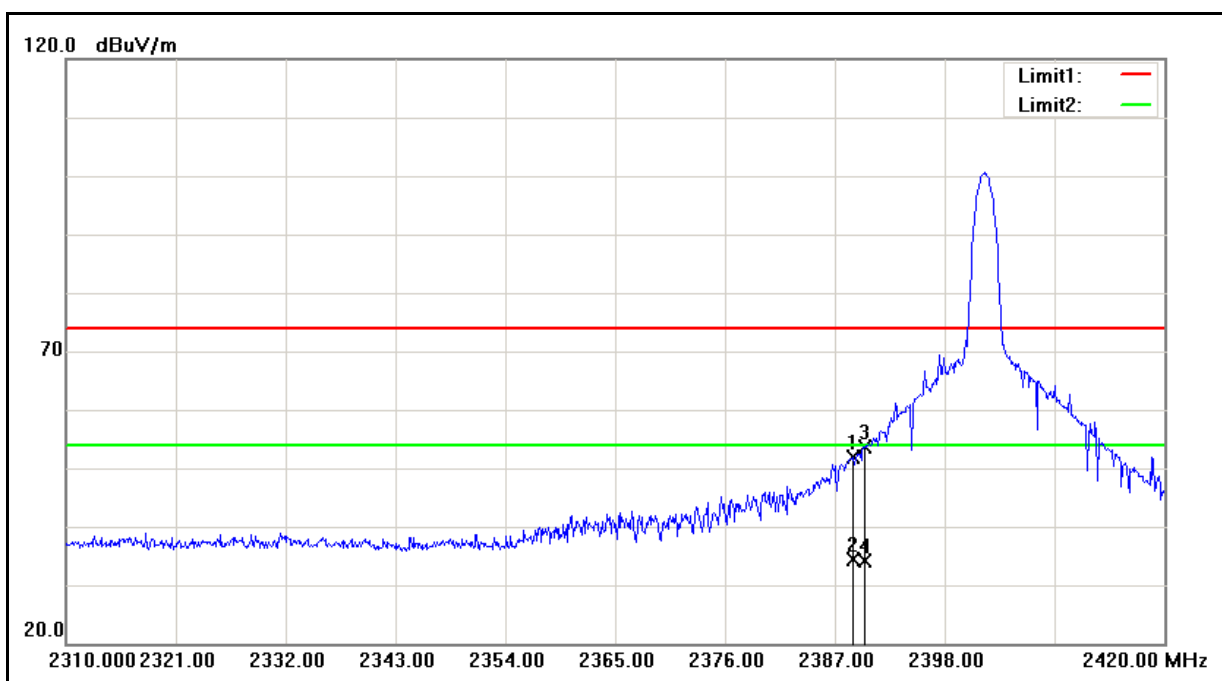
Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.



## 12.5. Test Result

Note: We have test both un-hopping and hopping mode for the radiated bandedge test, and the un-hopping mode is worse case.

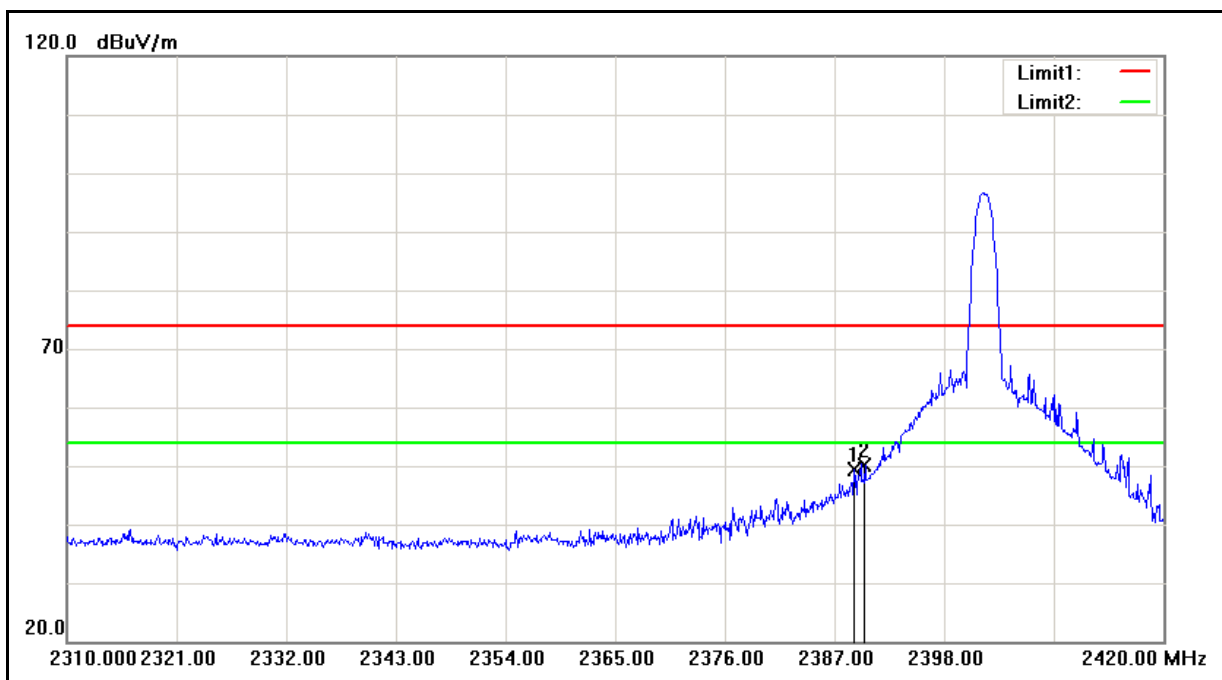
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 2            | Date:                | 2015/7/24    |
| Frequency:    | 2402 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Horizontal        |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2388.760        | 53.27          | -1.33                 | 51.94           | 74.00          | -22.06      | peak   |
| 2   | 2388.760        | 35.79          | -1.33                 | 34.46           | 54.00          | -19.54      | AVG    |
| 3   | 2390.000        | 54.97          | -1.32                 | 53.65           | 74.00          | -20.35      | peak   |
| 4   | 2390.000        | 35.52          | -1.32                 | 34.20           | 54.00          | -19.80      | AVG    |



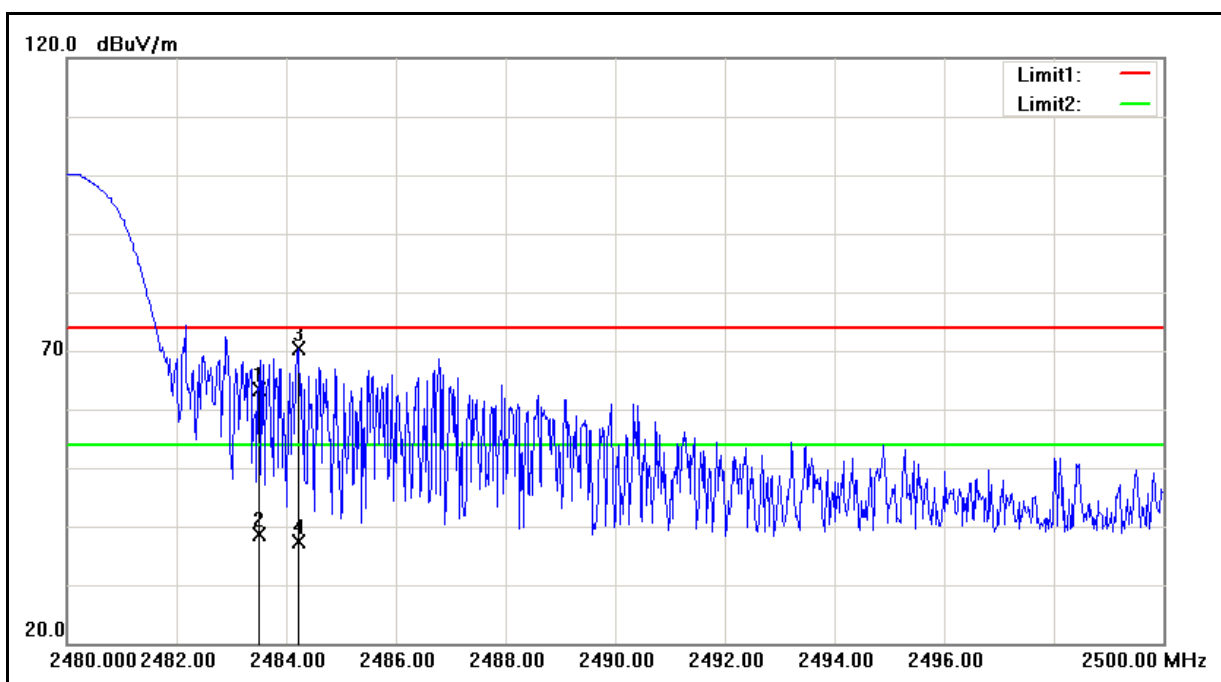
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 2            | Date:                | 2015/7/24    |
| Frequency:    | 2402 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Vertical          |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2388.980        | 50.72          | -1.33                 | 49.39           | 74.00          | -24.61      | peak   |
| 2   | 2390.000        | 51.41          | -1.32                 | 50.09           | 74.00          | -23.91      | peak   |



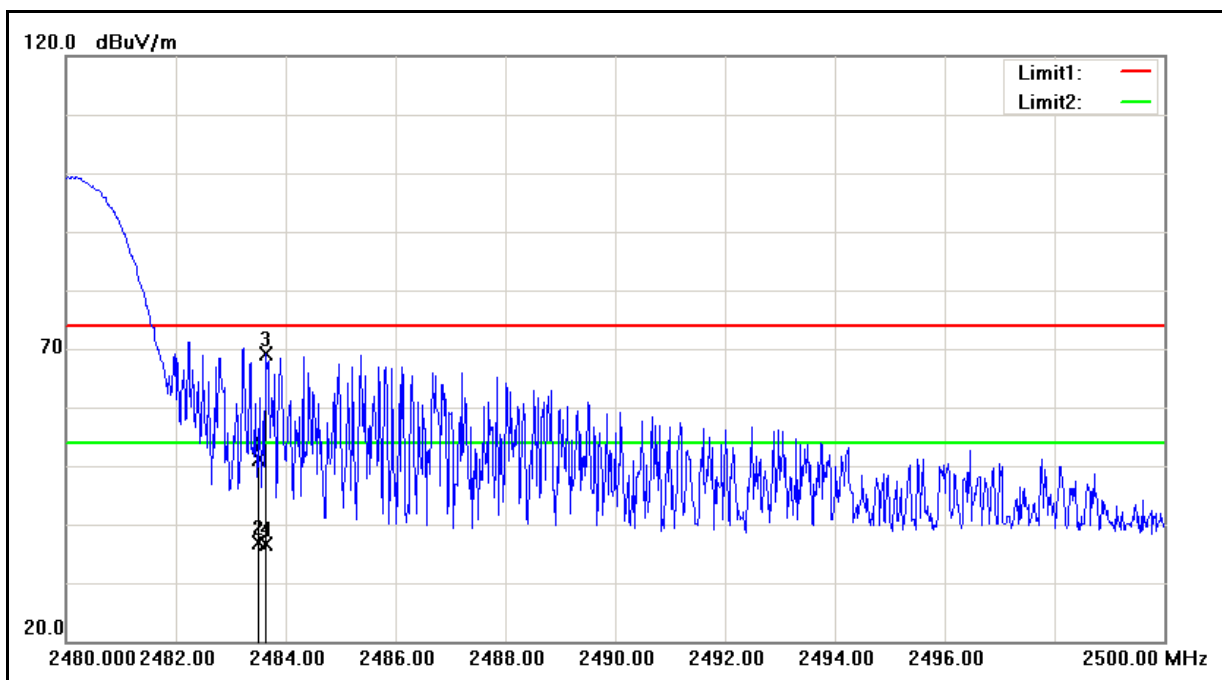
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 2            | Date:                | 2015/7/24    |
| Frequency:    | 2480 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Horizontal        |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2483.500        | 64.23          | -0.92                 | 63.31           | 74.00          | -10.69      | peak   |
| 2   | 2483.500        | 39.53          | -0.92                 | 38.61           | 54.00          | -15.39      | AVG    |
| 3   | 2484.220        | 71.36          | -0.92                 | 70.44           | 74.00          | -3.56       | peak   |
| 4   | 2484.220        | 38.39          | -0.92                 | 37.47           | 54.00          | -16.53      | AVG    |



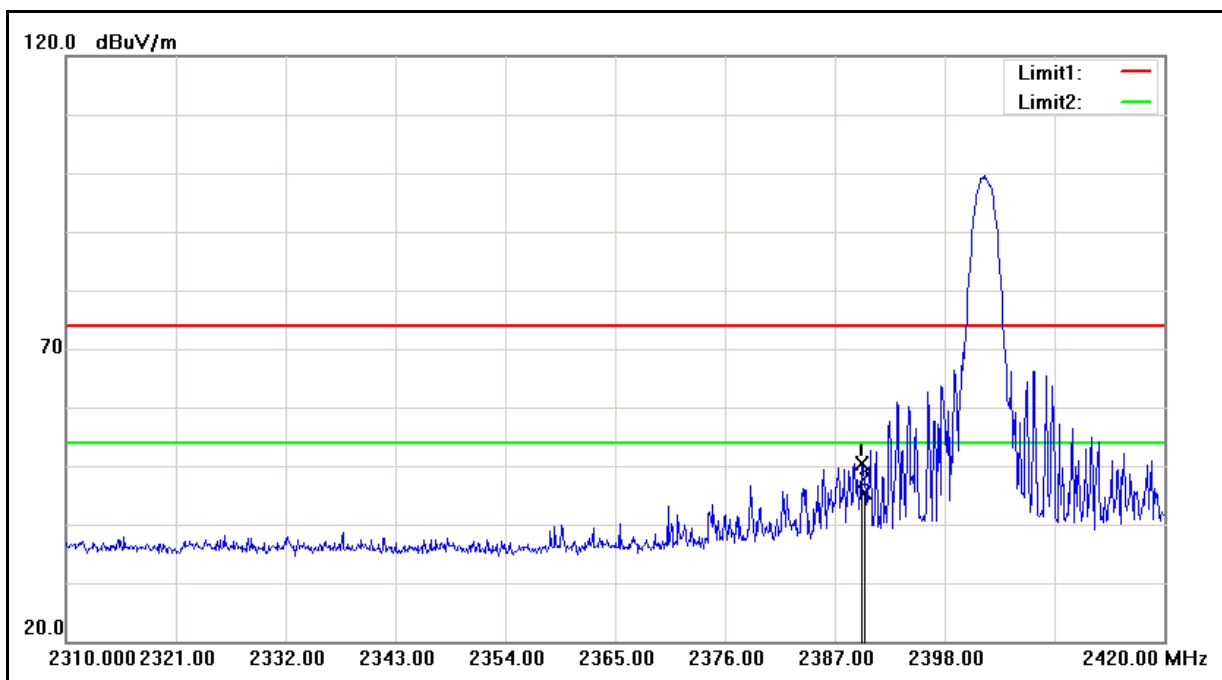
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 2            | Date:                | 2015/7/24    |
| Frequency:    | 2480 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Vertical          |                      |              |



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct Factor<br>(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|--------------------------|--------------------|-------------------|----------------|--------|
| 1   | 2483.500           | 52.17             | -0.92                    | 51.25              | 74.00             | -22.75         | peak   |
| 2   | 2483.500           | 37.73             | -0.92                    | 36.81              | 54.00             | -17.19         | AVG    |
| 3   | 2483.640           | 69.98             | -0.92                    | 69.06              | 74.00             | -4.94          | Peak   |
| 4   | 2483.640           | 37.56             | -0.92                    | 36.64              | 54.00             | -17.36         | AVG    |



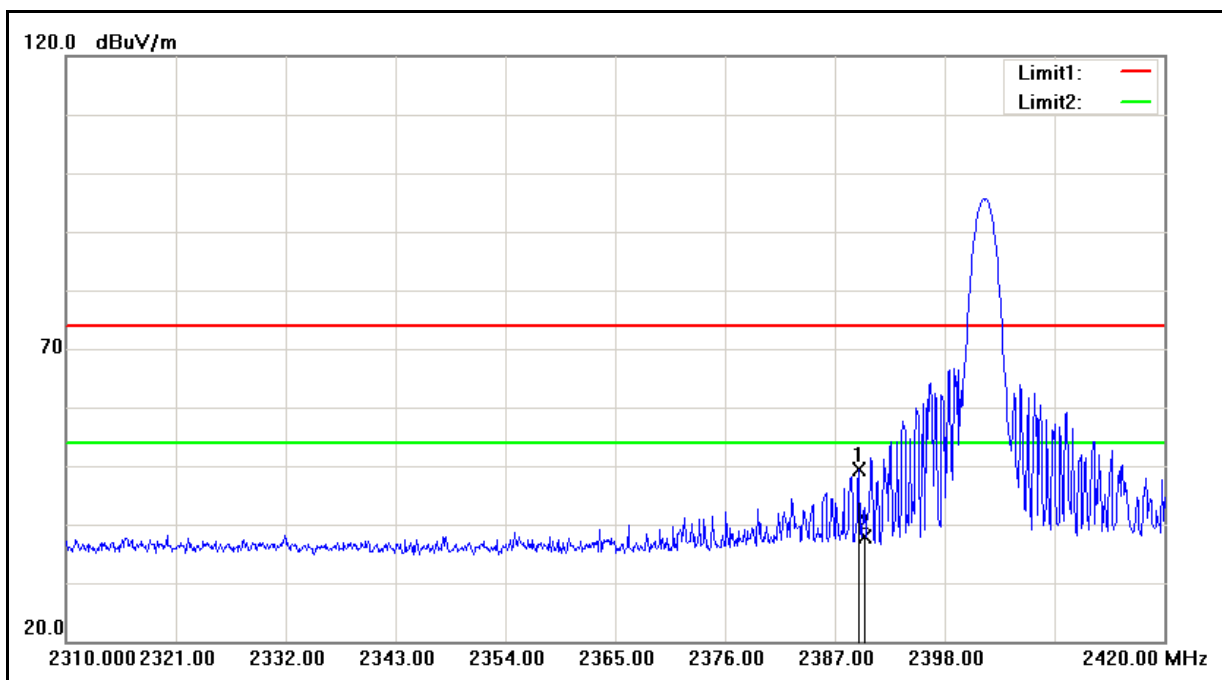
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 4            | Date:                | 2015/7/24    |
| Frequency:    | 2402 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Horizontal        |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2389.750        | 51.79          | -1.32                 | 50.47           | 74.00          | -23.53      | peak   |
| 2   | 2390.000        | 46.63          | -1.32                 | 45.31           | 74.00          | -28.69      | peak   |



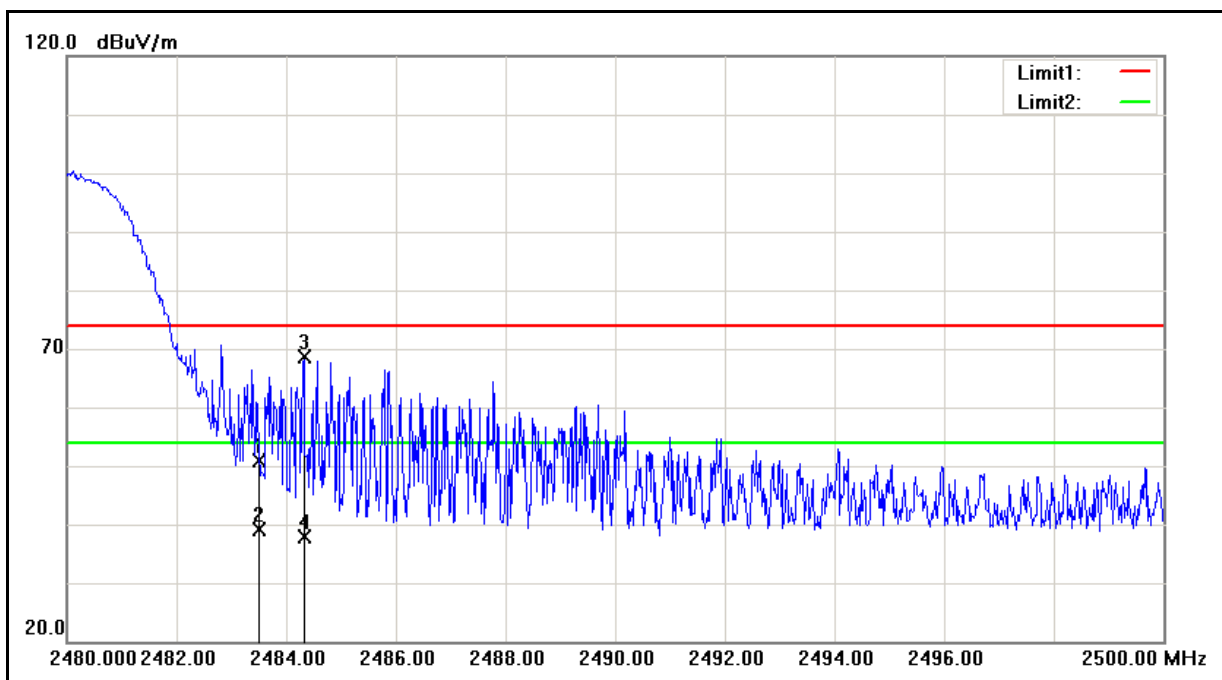
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 4            | Date:                | 2015/7/24    |
| Frequency:    | 2402 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Vertical          |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2389.420        | 50.66          | -1.33                 | 49.33           | 74.00          | -24.67      | peak   |
| 2   | 2390.000        | 39.29          | -1.32                 | 37.97           | 74.00          | -36.03      | peak   |



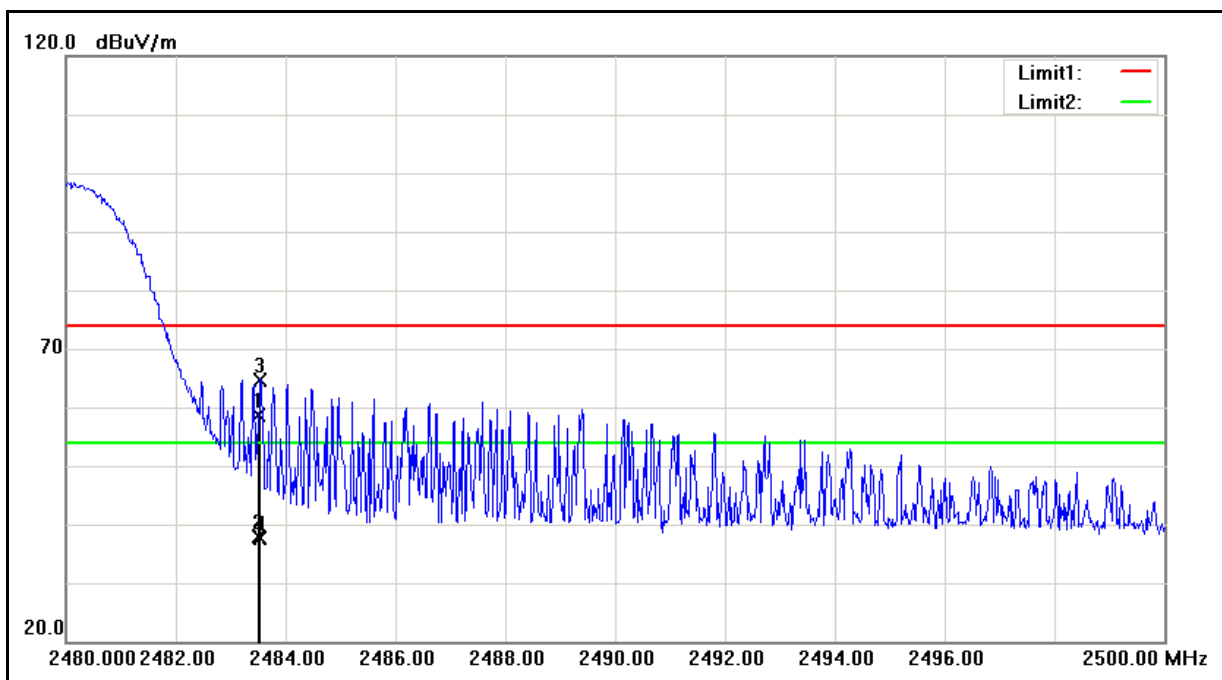
|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 4            | Date:                | 2015/7/24    |
| Frequency:    | 2480 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Horizontal        |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2483.500        | 51.73          | -0.92                 | 50.81           | 74.00          | -23.19      | peak   |
| 2   | 2483.500        | 40.05          | -0.92                 | 39.13           | 54.00          | -14.87      | AVG    |
| 3   | 2484.320        | 69.55          | -0.92                 | 68.63           | 74.00          | -5.37       | peak   |
| 4   | 2484.320        | 38.72          | -0.92                 | 37.80           | 54.00          | -16.20      | AVG    |



|               |                   |                      |              |
|---------------|-------------------|----------------------|--------------|
| Standard:     | FCC Part 15C      | Test Distance:       | 3m           |
| Test item:    | Radiated Emission | Power:               | DC 3.7V      |
| Model Number: | W01               | Temp.(°C)/Hum.(%RH): | 26(°C)/60%RH |
| Mode:         | Mode 4            | Date:                | 2015/7/24    |
| Frequency:    | 2480 MHz          | Test By:             | Louis        |
| Ant.Polar.:   | Vertical          |                      |              |



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|-----------------------|-----------------|----------------|-------------|--------|
| 1   | 2483.500        | 59.61          | -0.92                 | 58.69           | 74.00          | -15.31      | Peak   |
| 2   | 2483.500        | 38.91          | -0.92                 | 37.99           | 54.00          | -16.01      | AVG    |
| 3   | 2483.540        | 65.67          | -0.92                 | 64.75           | 74.00          | -9.25       | peak   |
| 4   | 2483.540        | 38.62          | -0.92                 | 37.70           | 54.00          | -16.30      | AVG    |

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).



## 13 Antenna Measurement

### 13.1. Limit

For intentional device, 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.

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

### 13.2. Antenna Connector Construction

The antenna used in this product is internal antenna. And the maximum Gain of this antenna is only 1.0 dBi.

### 13.3. Antenna Gain

| Mode 2: DH5             | Low channel                                | Middle channel | High channel |
|-------------------------|--------------------------------------------|----------------|--------------|
| Conducted power (dBm)   | 7.11                                       | 7.22           | 8.03         |
| Radiated Power (dBm)    | 7.90                                       | 8.22           | 8.90         |
| Gain (dBi)              | 0.79                                       | 1.00           | 0.87         |
| Measurement uncertainty | $\pm 1.5\text{dB(Cond.)}/3\text{dB(Rad.)}$ |                |              |

--END OF REPORT--