
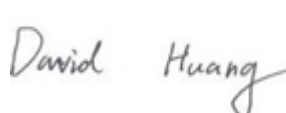



# RF TEST REPORT



Report No.: 17071294-FCC-R3

Supersede Report No.: N/A

|  |   |   |
|--|---|---|
| Applicant  | MFOURTEL MEXICO S.A. DE C.V.  |   |
| Product Name   | Smart Phone   |   |
| Model No.  | M4 B3   |   |
| Serial No.   | N/A   |   |
| Test Standard  | FCC Part 15.247: 2016, ANSI C63.10: 2013  |   |
| Test Date  | November 20 to December 05, 2017  |   |
| Issue Date   | December 06, 2017   |   |
| Test Result  | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail              |   |
| Equipment complied with the specification  | <input checked="" type="checkbox"/>   |   |
| Equipment did not comply with the specification  | <input type="checkbox"/>  |   |
|   |  |  |
| Aaron Liang<br>Test Engineer   | David Huang<br>Checked By   |   |
| This test report may be reproduced in full only<br>Test result presented in this test report is applicable to the tested sample only |   |   |

Issued by:

**SIEMIC (SHENZHEN-CHINA) LABORATORIES**

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

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## Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### Accreditations for Conformity Assessment

| Country/Region | Scope                              |
|----------------|------------------------------------|
| USA            | EMC, RF/Wireless, SAR, Telecom     |
| Canada         | EMC, RF/Wireless, SAR, Telecom     |
| Taiwan         | EMC, RF, Telecom, SAR, Safety      |
| Hong Kong      | RF/Wireless, SAR, Telecom          |
| Australia      | EMC, RF, Telecom, SAR, Safety      |
| Korea          | EMI, EMS, RF, SAR, Telecom, Safety |
| Japan          | EMI, RF/Wireless, SAR, Telecom     |
| Singapore      | EMC, RF, SAR, Telecom              |
| Europe         | EMC, RF, SAR, Telecom, Safety      |

|             |                 |
|-------------|-----------------|
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## 1. Report Revision History

| Report No.      | Report Version | Description | Issue Date        |
|-----------------|----------------|-------------|-------------------|
| 17071294-FCC-R3 | NONE           | Original    | December 06, 2017 |
|                 |                |             |                   |
|                 |                |             |                   |
|                 |                |             |                   |
|                 |                |             |                   |

## 2. Customer information

|                  |   |
|------------------|---|
| Applicant Name   | MFOURTEL MEXICO S.A. DE C.V.  |
| Applicant Add    | Av. Ejército Nacional 436 Piso 3 Chapultepec Morales Miguel Hidalgo Distrito Federal 11570. |
| Manufacturer     | CK Telecom Limited  |
| Manufacturer Add | Technology Road.High-Tech Development Zone. Heyuan, Guangdong,P.R.China.                    |

## 3. Test site information

Test Lab A:

|                      |  |
|----------------------|--|
| Lab performing tests | SIEMIC (Shenzhen-China) LABORATORIES   |
| Lab Address          | Zone A, Floor 1, Building 2 Wan Ye Long Technology Park<br>South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China<br>518108 |
| FCC Test Site No.    | 535293   |
| IC Test Site No.     | 4842E-1  |
| Test Software        | Radiated Emission Program-To Shenzhen v2.0   |

Test Lab B:

|                      |   |
|----------------------|---|
| Lab performing tests | SIEMIC (Nanjing-China) Laboratories   |
| Lab Address          | 2-1 Longcang Avenue Yuhua Economic and<br>Technology Development Park, Nanjing, China |
| FCC Test Site No.    | 694825  |
| IC Test Site No.     | 4842B-1   |
| Test Software        | EZ_EMG(ver.lcp-03A1)  |

Note: We just perform Radiated Spurious Emission above 18GHz in the test Lab. B.

## 4. Equipment under Test (EUT) Information

|                      |   |
|----------------------|---|
| Description of EUT:  | Smart Phone   |
| Main Model:          | M4 B3   |
| Serial Model:        | N/A   |
| Date EUT received:   | November 20, 2017   |
| Test Date(s):        | November 20 to December 05, 2017  |
| Equipment Category : | DSS   |
| Antenna Gain:        | GSM850: -3dBi<br>PCS1900: -1dBi<br>UMTS-FDD Band V: -3dBi<br>UMTS-FDD Band II: -1dBi<br>LTE Band II: -1dBi<br>LTE Band IV: -3dBi<br>LTE Band VII: 0 dBi<br>LTE Band XII: -4dBi<br>Bluetooth/BLE: 1dBi<br>WIFI: 1dBi<br>GPS: -1dBi |
| Antenna Type:        | PIFA Antenna  |
| Type of Modulation:  | GSM / GPRS: GMSK<br>EGPRS: GMSK,8PSK<br>UMTS-FDD: QPSK<br>LTE Band: QPSK, 16QAM<br>802.11b/g/n: DSSS, OFDM<br>Bluetooth: GFSK, $\pi$ /4DQPSK, 8DPSK<br>BLE: GFSK<br>GPS: BPSK   |

|                               |   |
|-------------------------------|---|
|                               | <p>GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz<br/> PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz<br/> UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz<br/> UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz;<br/> RX: 1932.4 ~ 1987.6 MHz<br/> LTE Band II TX: 1850.7 ~ 1909.3MHz; RX : 1930.7 ~ 1989.3 MHz<br/> LTE Band IV TX: 1710.7 ~ 1754.3 MHz; RX : 2110.7~ 2154.3 MHz<br/> LTE Band VII TX: 2502.5 ~ 2567.5 MHz; RX : 2622.5 ~ 2687.5 MHz<br/> LTE Band XII TX:699.7 ~ 715.3 MHz; RX : 729.7~ 745.3MHz<br/> WIFI: 802.11b/g/n(20M): 2412-2462 MHz<br/> WIFI: 802.11n(40M): 2422-2452 MHz<br/> Bluetooth&amp; BLE: 2402-2480 MHz<br/> GPS: 1575.42 MHz</p> |
| RF Operating Frequency (ies): |   |
| Max. Output Power:            | 6.454dBm  |
| Number of Channels:           | <p>GSM 850: 124CH<br/> PCS1900: 299CH<br/> UMTS-FDD Band V: 102CH<br/> UMTS-FDD Band II: 277CH<br/> WIFI :802.11b/g/n(20M): 11CH<br/> WIFI :802.11n(40M): 7CH<br/> Bluetooth: 79CH<br/> BLE: 40CH<br/> GPS:1CH</p>  |
| Port:                         | USB Port, Earphone Port   |
| Input Power:                  | <p>Adapter:<br/> Model: M4<br/> Input: AC100-240V~50/60Hz,150mA<br/> Output: DC 5V, 1000mA<br/> Battery:<br/> Model: M3000A<br/> Spec: 3.85V, 3000mAh, 11.55Wh</p>  |
| Trade Name :                  | M4  |
| GPRS/EGPRS Multi-slot class   | 8/10/11/12  |



|             |                 |
|-------------|-----------------|
| Test Report | 17071294-FCC-R3 |
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FCC ID:

CLNM4B3



## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

| FCC Rules                    | Description of Test                 | Result     |
|------------------------------|-------------------------------------|------------|
| §15.203                      | Antenna Requirement                 | Compliance |
| §15.247(a)(1)                | Channel Separation                  | Compliance |
| §15.247(a)(1)                | 20 dB Bandwidth                     | Compliance |
| §15.247(b)(1)                | Peak Output Power                   | Compliance |
| §15.247(a)(1)(iii)           | Number of Hopping Channel           | Compliance |
| §15.247(a)(1)(iii)           | Time of Occupancy (Dwell Time)      | Compliance |
| §15.247(d)                   | Band Edge& Restricted Band          | Compliance |
| §15.207(a)                   | AC Line Conducted Emissions         | Compliance |
| §15.205, §15.209, §15.247(d) | Radiated Emissions& Restricted Band | Compliance |

### Measurement Uncertainty

| Emissions  |   |               |
|--|---|---------------|
| Test Item  | Description   | Uncertainty   |
| Band Edge& Restricted Band and Radiated Emissions& Restricted Band | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| -  | -   | -             |

## 6. Measurements, Examination And Derived Results

### 6.1 Antenna Requirement

#### **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

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

#### **Antenna Connector Construction**

The EUT has 2 antennas:

A permanently attached PIFA antenna for Bluetooth/BLE/WIF/GPS, the gain is 1dBi for Bluetooth/BLE/WIFI, the gain is -1dBi for GPS.

A permanently attached PIFA antenna for GSM/PCS/UMTS/LTE Band II/IV/VII/XII, the gain is -3dBi for GSM850/UMTS-FDD Band V/LTE Band IV, the gain is -1dBi for PCS1900/UMTS-FDD Band II/ LTE Band II, the gain is 0dBi for UMTS-FDD Band VII, the gain is -4dBi for LTE Band XII.

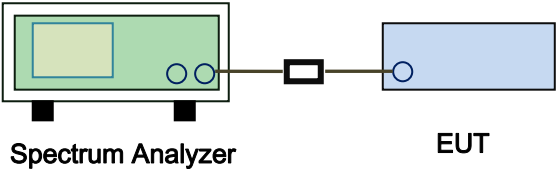
**The antenna meets up with the ANTENNA REQUIREMENT.**

**Result:** Compliance.

## 6.2 Channel Separation

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 58%               |
| Atmospheric Pressure | 1016mbar          |
| Test date :          | November 16, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec           | Item   | Requirement   | Applicable                          |
|----------------|--|---|-------------------------------------|
| § 15.247(a)(1) | a)   | Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz<br>Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW | <input checked="" type="checkbox"/> |
| Test Setup     |  <p style="text-align: center;">Spectrum Analyzer                      EUT</p>   |   |                                     |
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> <li>- The EUT must have its hopping function enabled</li> <li>- Span = wide enough to capture the peaks of two adjacent channels</li> <li>- Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span</li> <li>- Video (or Average) Bandwidth (VBW) ≥ RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.</li> </ul> |   |                                     |

|        |  |
|--------|--|
| Remark |  |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data  Yes  N/A

Test Plot  Yes (See below)  N/A

### Channel Separation measurement result

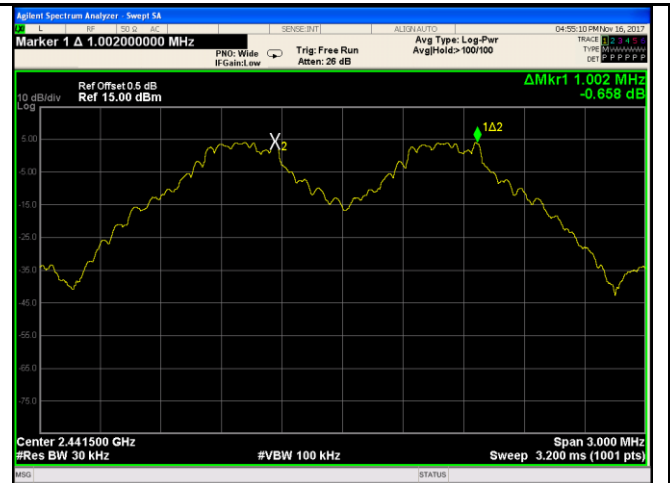
| Type/<br>Modulation            | CH                | CH<br>Frequency<br>(MHz) | CH Separation<br>(MHz) | Limit<br>(MHz) | Result |
|--------------------------------|-------------------|--------------------------|------------------------|----------------|--------|
| CH Separation<br>GFSK          | Low Channel       | 2402                     | 1.002                  | 0.690          | Pass   |
|                                | Adjacency Channel | 2403                     |                        |                |        |
|                                | Mid Channel       | 2440                     | 1.002                  | 0.685          | Pass   |
|                                | Adjacency Channel | 2441                     |                        |                |        |
|                                | High Channel      | 2480                     | 1.002                  | 0.683          | Pass   |
|                                | Adjacency Channel | 2479                     |                        |                |        |
| CH Separation<br>$\pi/4$ DQPSK | Low Channel       | 2402                     | 1.002                  | 0.860          | Pass   |
|                                | Adjacency Channel | 2403                     |                        |                |        |
|                                | Mid Channel       | 2440                     | 1.002                  | 0.879          | Pass   |
|                                | Adjacency Channel | 2441                     |                        |                |        |
|                                | High Channel      | 2480                     | 1.002                  | 0.859          | Pass   |
|                                | Adjacency Channel | 2479                     |                        |                |        |
| CH Separation<br>8DPSK         | Low Channel       | 2402                     | 1.002                  | 0.862          | Pass   |
|                                | Adjacency Channel | 2403                     |                        |                |        |
|                                | Mid Channel       | 2440                     | 1.002                  | 0.875          | Pass   |
|                                | Adjacency Channel | 2441                     |                        |                |        |
|                                | High Channel      | 2480                     | 1.002                  | 0.865          | Pass   |
|                                | Adjacency Channel | 2479                     |                        |                |        |

## Test Plots

### Channel Separation measurement result



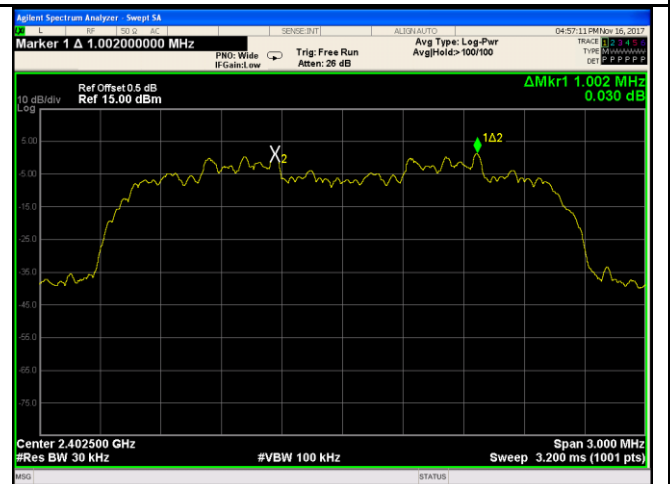
GFSK - Low Channel



GFSK - Middle Channel



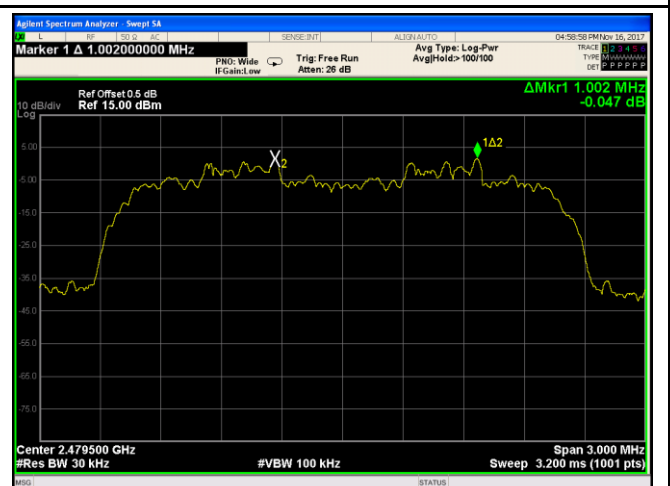
GFSK - High Channel



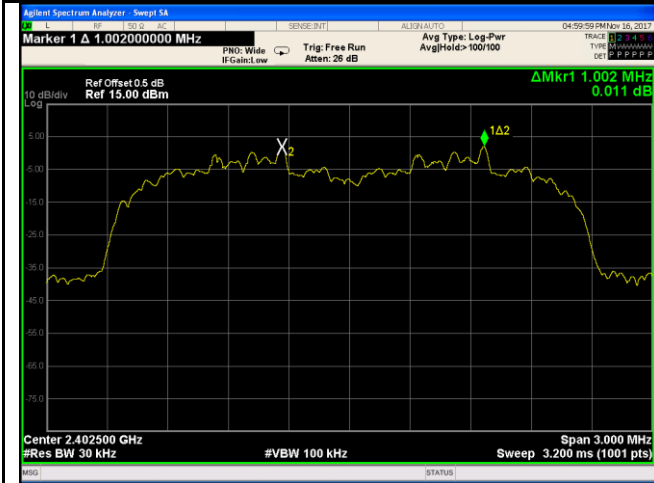
$\pi/4$  DPSK - Low Channel



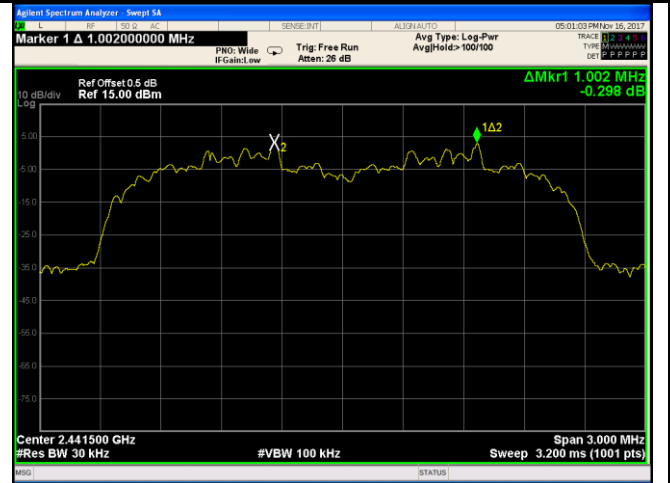
$\pi/4$  DQPSK - Middle Channel



$\pi/4$  DQPSK - High Channel



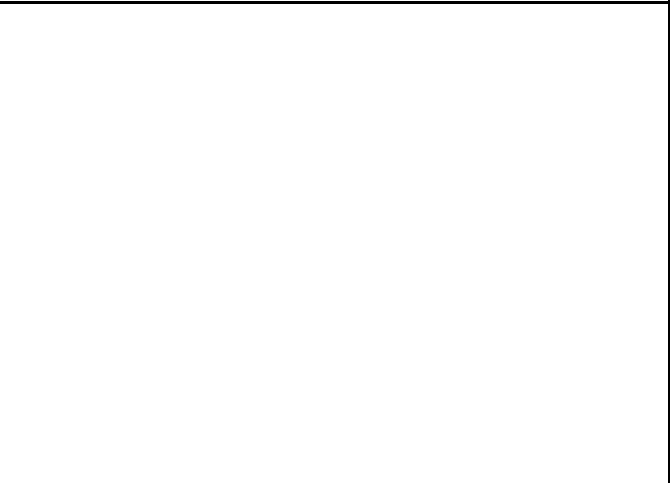
8DPSK - Low Channel



8DPSK - Middle Channel



8DPSK - High Channel

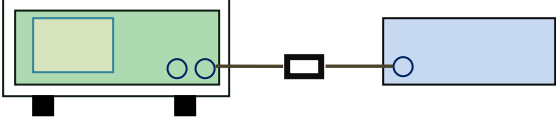


### 6.3 20dB Bandwidth

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 58%               |
| Atmospheric Pressure | 1016mbar          |
| Test date :          | November 16, 2017 |
| Tested By :          | Aaron Liang       |

#### Requirement(s):

| Spec              | Item | Requirement  | Applicable                          |
|-------------------|------|--|-------------------------------------|
| §15.247(a)<br>(1) | a)   | Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. | <input checked="" type="checkbox"/> |

|            |  |
|------------|--|
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer                      EUT</p> |
|------------|--|

|                |  |
|----------------|--|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> <li>- Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel</li> <li>- RBW <math>\geq</math> 1% of the 20 dB bandwidth</li> <li>- VBW <math>\geq</math> RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold.</li> <li>- The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference</li> </ul> |
|----------------|--|

|        |   |
|--------|---|
|        | marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). |
| Remark |   |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |

Test Data  Yes  N/A

Test Plot  Yes (See below)  N/A

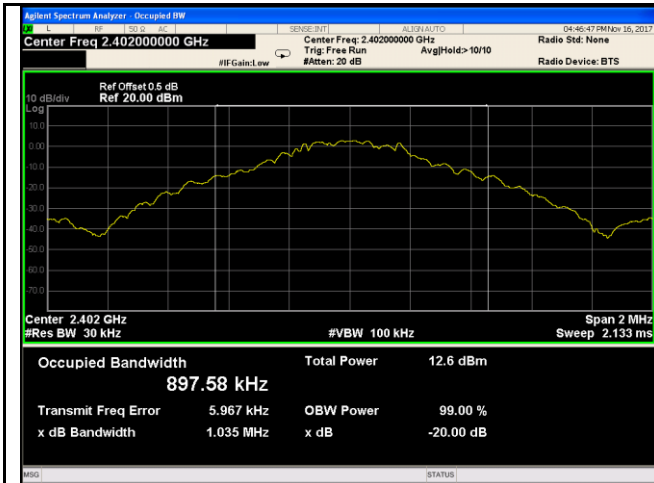
#### Measurement result

| Modulation    | CH   | CH Frequency (MHz) | 20dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---------------|------|--------------------|----------------------|------------------------------|
| GFSK          | Low  | 2402               | 1.035                | 0.8976                       |
|               | Mid  | 2441               | 1.027                | 0.8933                       |
|               | High | 2480               | 1.024                | 0.8945                       |
| $\pi/4$ DQPSK | Low  | 2402               | 1.290                | 1.1704                       |
|               | Mid  | 2441               | 1.319                | 1.1784                       |
|               | High | 2480               | 1.289                | 1.1667                       |
| 8-DPSK        | Low  | 2402               | 1.293                | 1.1786                       |
|               | Mid  | 2441               | 1.312                | 1.1990                       |
|               | High | 2480               | 1.297                | 1.1821                       |

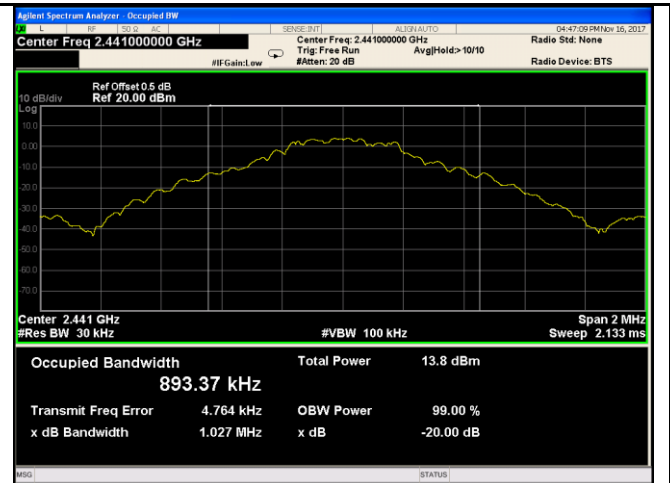


## Test Plots

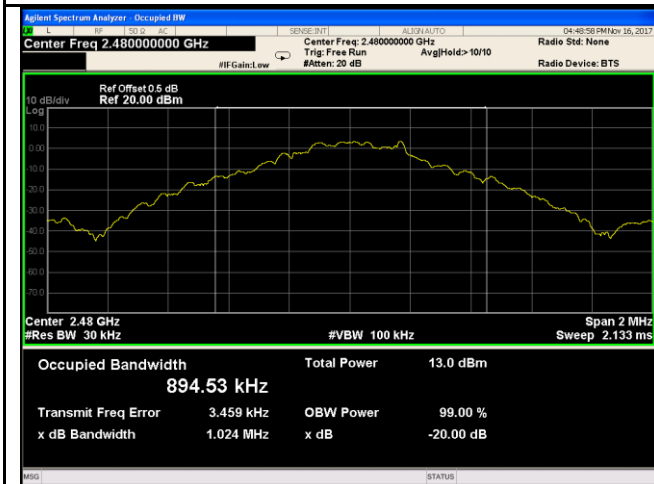
### 20dB Bandwidth measurement result



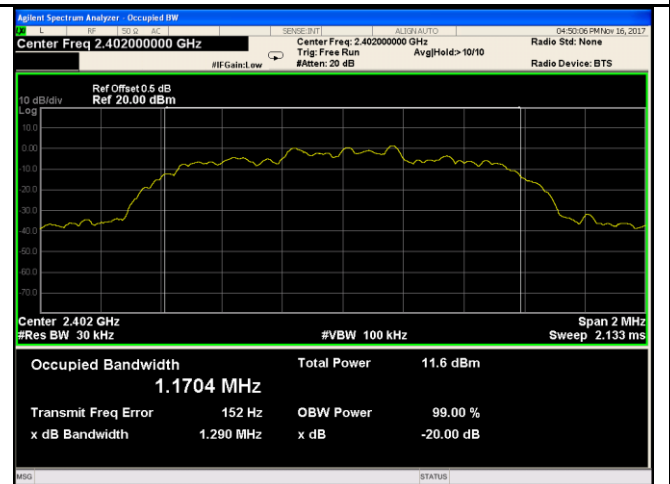
GFSK - Low Channel



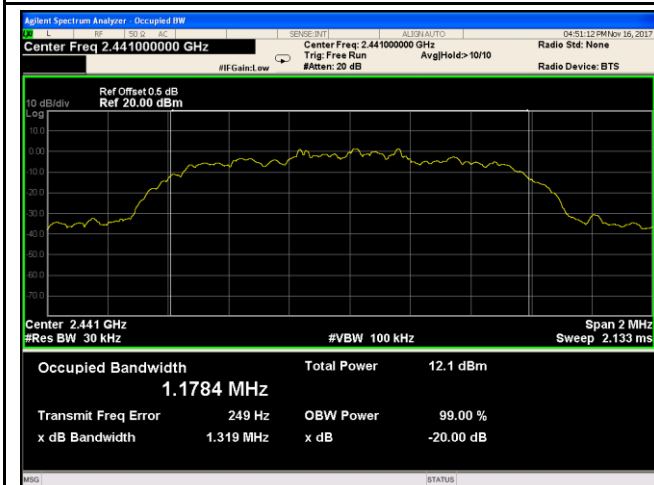
GFSK - Middle Channel



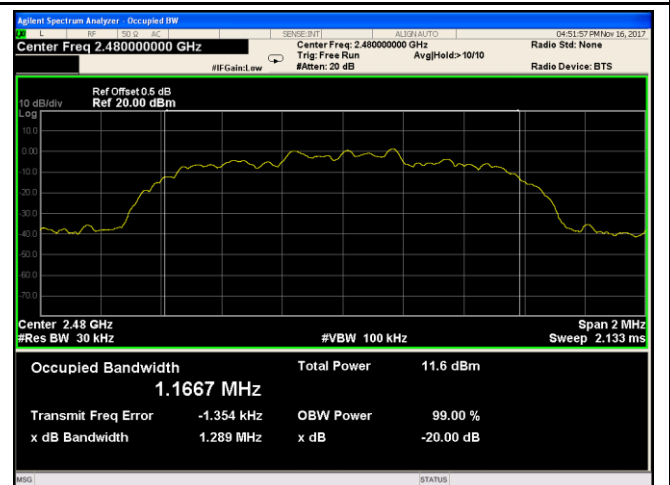
GFSK - High Channel



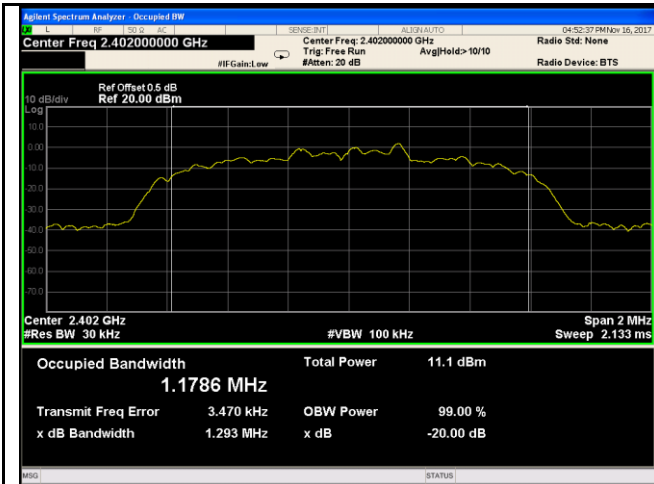
$\pi/4$  DPSK - Low Channel



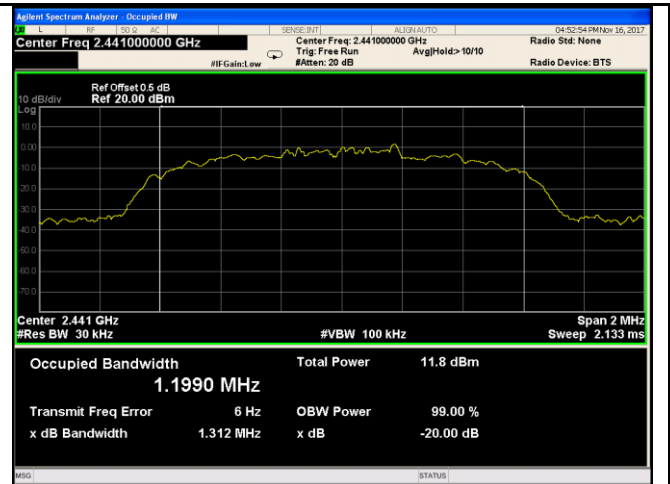
$\pi/4$  DQPSK - Middle Channel



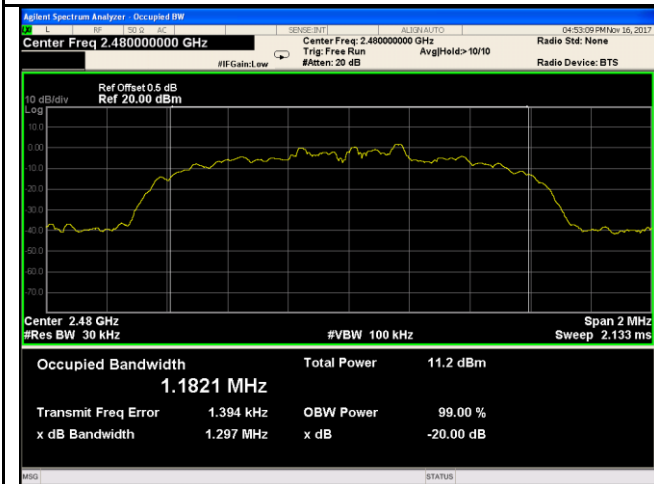
$\pi/4$  DQPSK - High Channel



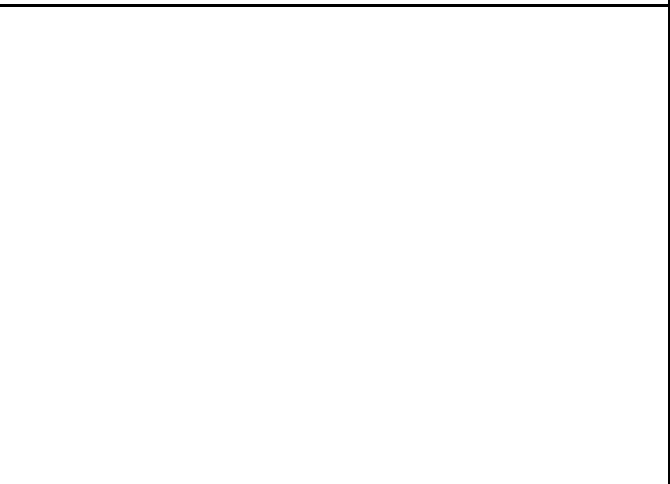
8DPSK - Low Channel



8DPSK - Middle Channel



8DPSK - High Channel

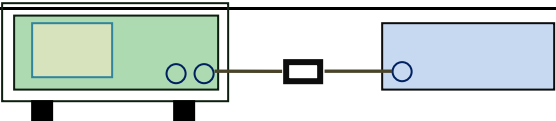


## 6.4 Peak Output Power

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 58%               |
| Atmospheric Pressure | 1016mbar          |
| Test date :          | November 16, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec              | Item | Requirement   | Applicable                          |
|-------------------|------|---|-------------------------------------|
| §15.247(b)<br>(3) | a)   | FHSS in 2400-2483.5MHz with $\geq 75$ channels: $\leq 1$ Watt         | <input checked="" type="checkbox"/> |
|                   | b)   | FHSS in 5725-5850MHz: $\leq 1$ Watt                                   | <input type="checkbox"/>            |
|                   | c)   | For all other FHSS in the 2400-2483.5MHz band: $\leq 0.125$ Watt.     | <input checked="" type="checkbox"/> |
|                   | d)   | FHSS in 902-928MHz with $\geq 50$ channels: $\leq 1$ Watt             | <input type="checkbox"/>            |
|                   | e)   | FHSS in 902-928MHz with $\geq 25$ & $< 50$ channels: $\leq 0.25$ Watt | <input type="checkbox"/>            |
|                   | f)   | DTS in 902-928MHz, 2400-2483.5MHz: $\leq 1$ Watt                      | <input type="checkbox"/>            |

|            |  |
|------------|--|
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer                      EUT</p> |
|------------|--|

|                |   |
|----------------|---|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.</p> <p><u>Use the following spectrum analyzer settings:</u></p> <ul style="list-style-type: none"> <li>- Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel</li> <li>- RBW <math>&gt;</math> the 20 dB bandwidth of the emission being measured</li> <li>- VBW <math>\geq</math> RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow the trace to stabilize.</li> </ul> |
|----------------|---|

|        |   |
|--------|---|
|        | <ul style="list-style-type: none"> <li>- Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer.</li> </ul> |
| Remark |   |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |

Test Data  Yes  N/A

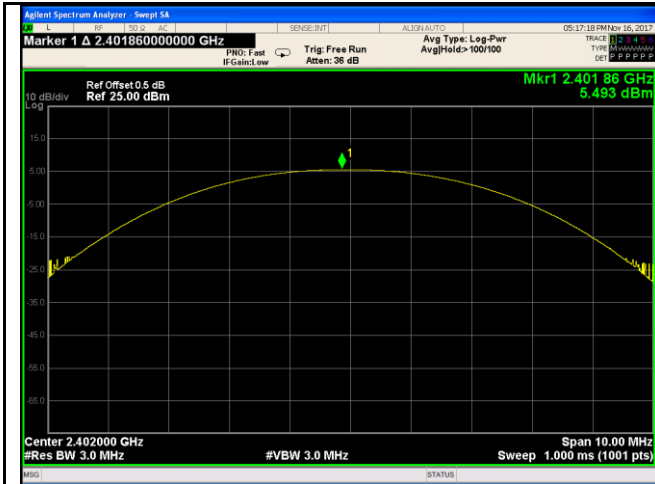
Test Plot  Yes (See below)  N/A

**Peak Output Power measurement result**

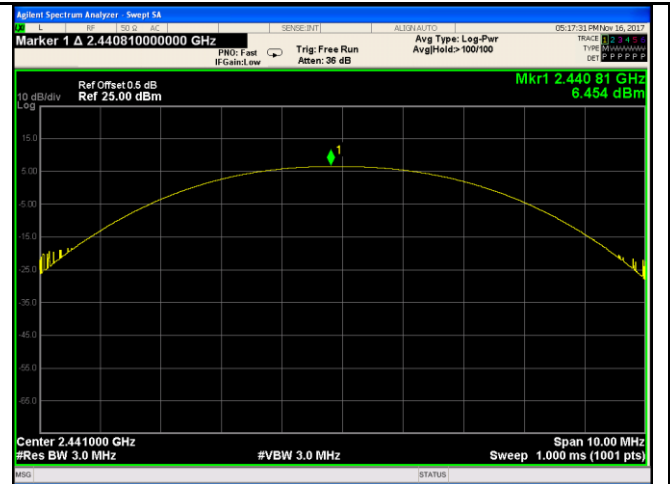
| Type         | Modulation    | CH   | Frequency (MHz) | Conducted Power (dBm) | Limit (mW) | Result |
|--------------|---------------|------|-----------------|-----------------------|------------|--------|
| Output power | GFSK          | Low  | 2402            | 5.493                 | 1000       | Pass   |
|              |               | Mid  | 2441            | <b>6.454</b>          | 125        | Pass   |
|              |               | High | 2480            | 5.989                 | 125        | Pass   |
|              | $\pi/4$ DQPSK | Low  | 2402            | 4.711                 | 125        | Pass   |
|              |               | Mid  | 2441            | 5.813                 | 125        | Pass   |
|              |               | High | 2480            | 5.173                 | 125        | Pass   |
|              | 8-DPSK        | Low  | 2402            | 4.850                 | 125        | Pass   |
|              |               | Mid  | 2441            | 5.947                 | 125        | Pass   |
|              |               | High | 2480            | 5.329                 | 125        | Pass   |

## Test Plots

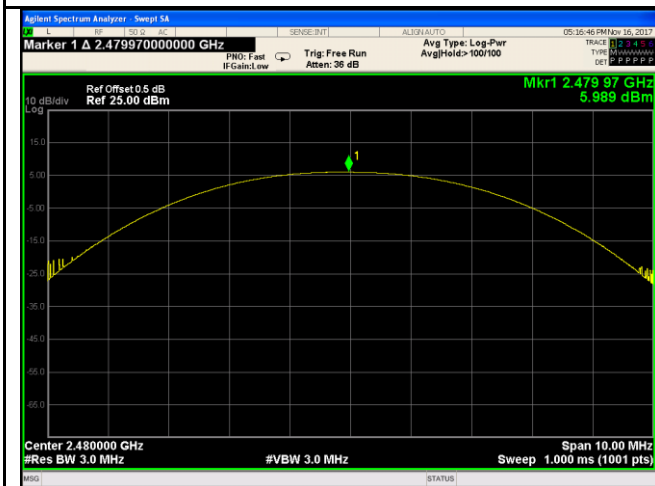
### Output Power measurement result



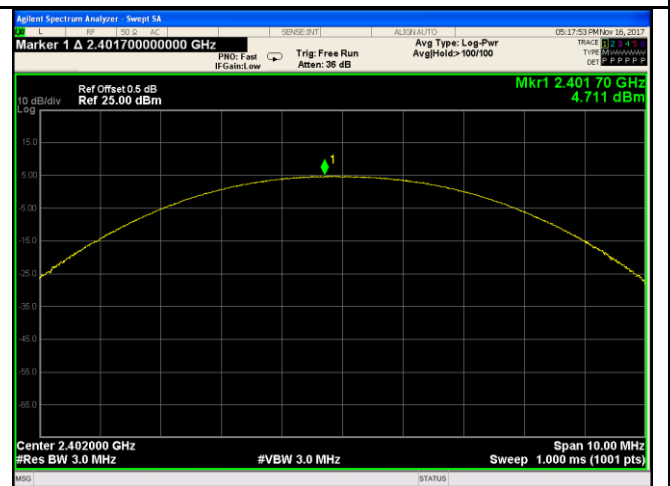
GFSK Output power - Low CH 2402



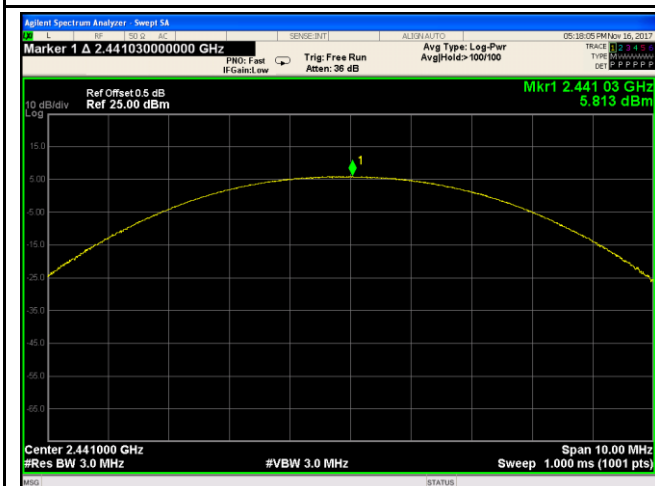
GFSK Output power - Mid CH 2441



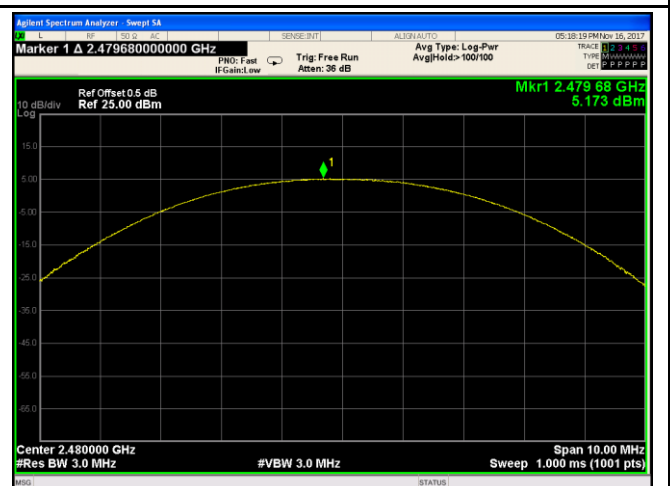
GFSK Output power - High CH 2480



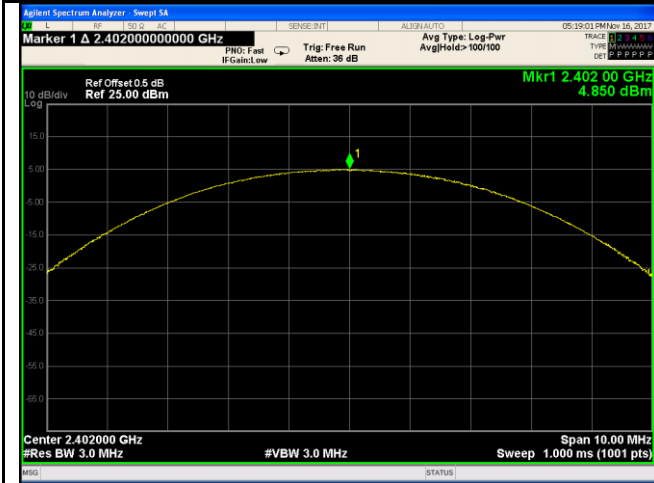
$\pi/4$  DQPSK Output power - Low CH 2402



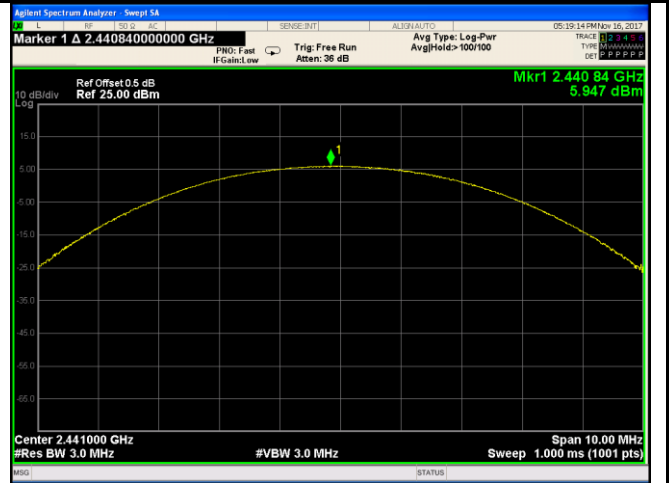
$\pi/4$  DQPSK Output power - Mid CH 2441



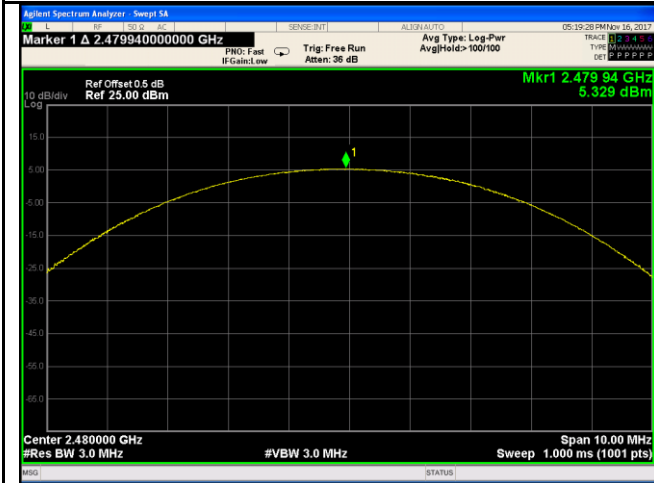
$\pi/4$  DQPSK Output power - High CH 2480



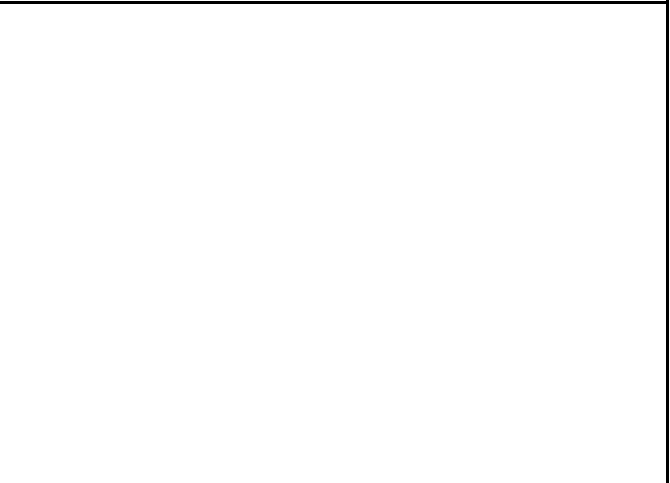
8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441



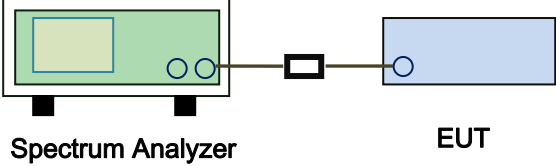
8DPSK Output power - High CH 2480



## 6.5 Number of Hopping Channel

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 58%               |
| Atmospheric Pressure | 1016mbar          |
| Test date :          | November 16, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec                   | Item  | Requirement                          | Applicable                          |
|------------------------|---|--------------------------------------|-------------------------------------|
| §15.247(a)<br>(1)(iii) | a)  | FHSS in 2400-2483.5MHz ≥ 15 channels | <input checked="" type="checkbox"/> |
| Test Setup             |  <p style="text-align: center;">Spectrum Analyzer                      EUT</p>   |                                      |                                     |
| Test Procedure         | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.<br/> <u>Use the following spectrum analyzer settings:</u><br/>           The EUT must have its hopping function enabled.</p> <ul style="list-style-type: none"> <li>- Span = the frequency band of operation</li> <li>- RBW ≥ 1% of the span</li> <li>- VBW ≥ RBW</li> <li>- Sweep = auto</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- Allow trace to fully stabilize.</li> <li>- It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).</li> </ul> |                                      |                                     |
| Remark                 |   |                                      |                                     |
| Result                 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |                                      |                                     |

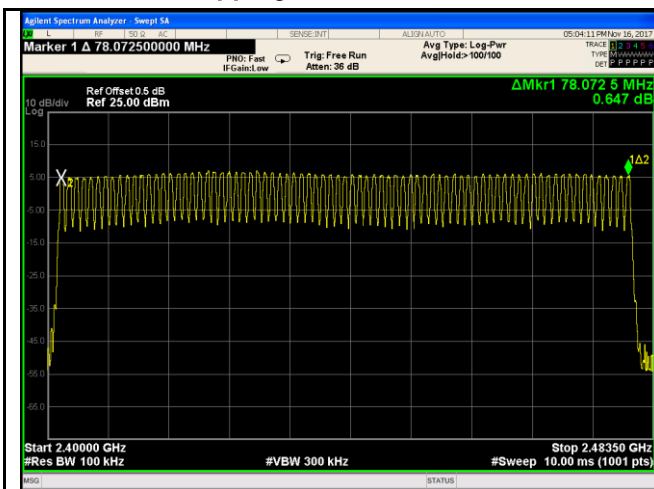
Test Data     Yes                       N/A  
 Test Plot     Yes (See below)                       N/A

### Number of Hopping Channel measurement result

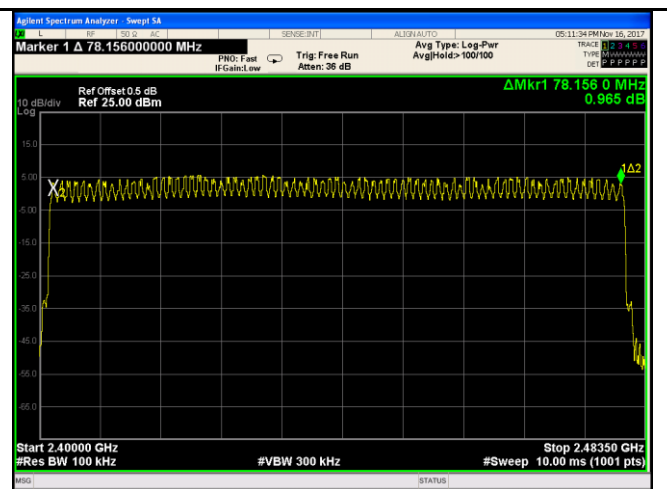
| Type                      | Modulation    | Frequency Range | Number of Hopping Channel | Limit |
|---------------------------|---------------|-----------------|---------------------------|-------|
| Number of Hopping Channel | GFSK          | 2400-2483.5     | 79                        | 15    |
|                           | $\pi/4$ DQPSK | 2400-2483.5     | 79                        | 15    |
|                           | 8-DPSK        | 2400-2483.5     | 79                        | 15    |

### Test Plots

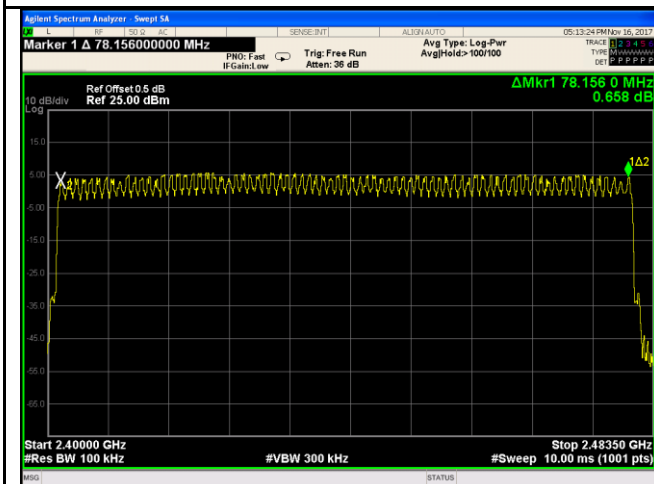
#### Number of Hopping Channels measurement result



GFSK



$\pi/4$ DQPSK



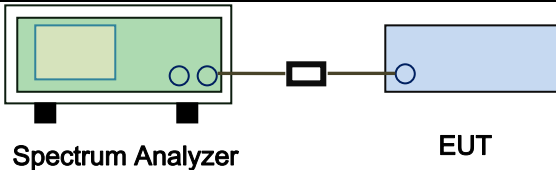
8DPSK



## 6.6 Time of Occupancy (Dwell Time)

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 58%               |
| Atmospheric Pressure | 1016mbar          |
| Test date :          | November 16, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec                   | Item  | Requirement       | Applicable                          |
|------------------------|---|-------------------|-------------------------------------|
| §15.247(a)<br>(1)(iii) | a)  | Dwell Time < 0.4s | <input checked="" type="checkbox"/> |
| Test Setup             |  <p style="text-align: center;">Spectrum Analyzer                      EUT</p>   |                   |                                     |
| Test Procedure         | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines.<br/> <u>Use the following spectrum analyzer</u></p> <ul style="list-style-type: none"> <li>- Span = zero span, centered on a hopping channel</li> <li>- RBW = 1 MHz</li> <li>- VBW ≥ RBW</li> <li>- Sweep = as necessary to capture the entire dwell time per hopping channel</li> <li>- Detector function = peak</li> <li>- Trace = max hold</li> <li>- use the marker-delta function to determine the dwell time</li> </ul> |                   |                                     |
| Remark                 |   |                   |                                     |
| Result                 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail  |                   |                                     |

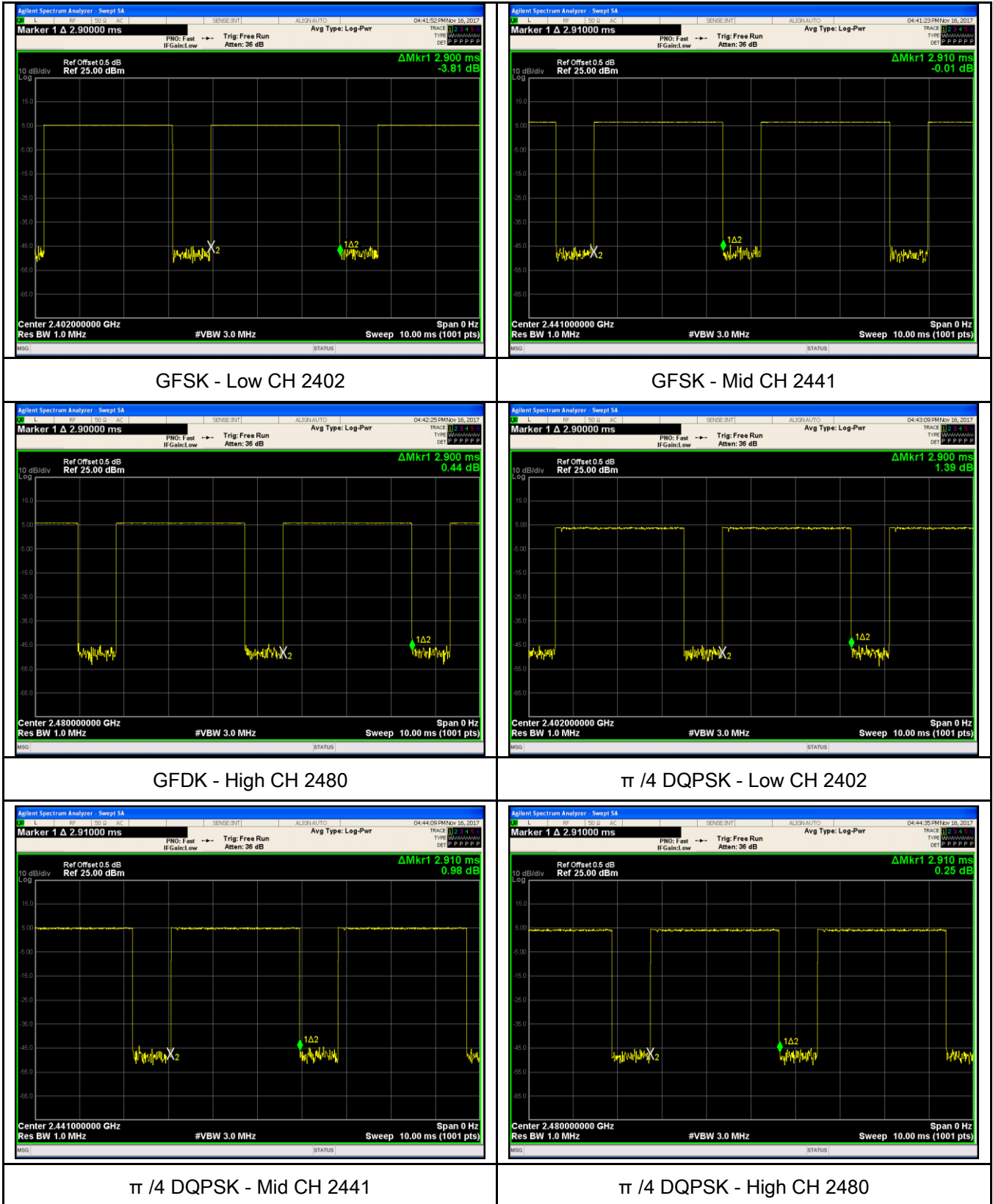
Test Data     Yes                       N/A  
 Test Plot     Yes (See below)                       N/A

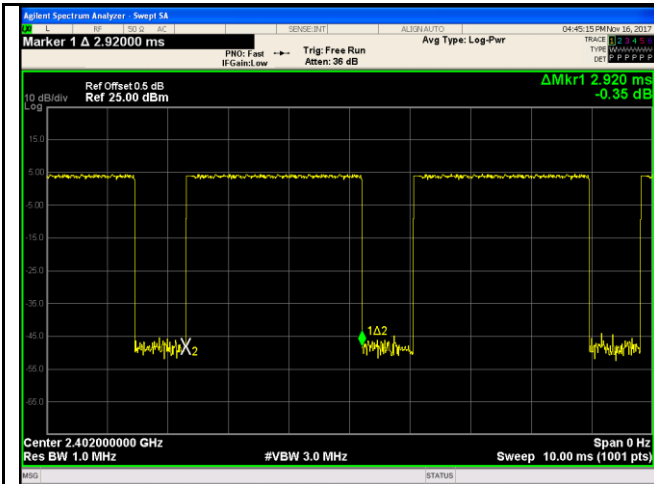
**Dwell Time measurement result**

| Type   | Modulation | CH   | Pulse Width (ms) | Dwell Time (ms) | Limit (ms) | Result |
|--|------------|------|------------------|-----------------|------------|--------|
| Dwell Time   | GFSK       | Low  | 2.90             | 309.333         | 400        | Pass   |
|  |            | Mid  | 2.91             | 310.400         | 400        | Pass   |
|  |            | High | 2.90             | 309.333         | 400        | Pass   |
|  | π /4 DQPSK | Low  | 2.90             | 309.333         | 400        | Pass   |
|  |            | Mid  | 2.91             | 310.400         | 400        | Pass   |
|  |            | High | 2.91             | 310.400         | 400        | Pass   |
|  | 8-DPSK     | Low  | 2.92             | 311.467         | 400        | Pass   |
|  |            | Mid  | 2.91             | 310.400         | 400        | Pass   |
|  |            | High | 2.91             | 310.400         | 400        | Pass   |
| Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 |            |      |                  |                 |            |        |

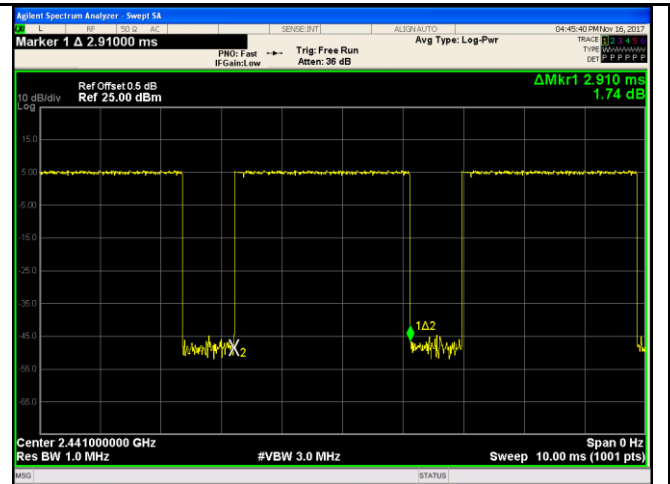
### Test Plots

#### Dwell Time measurement result

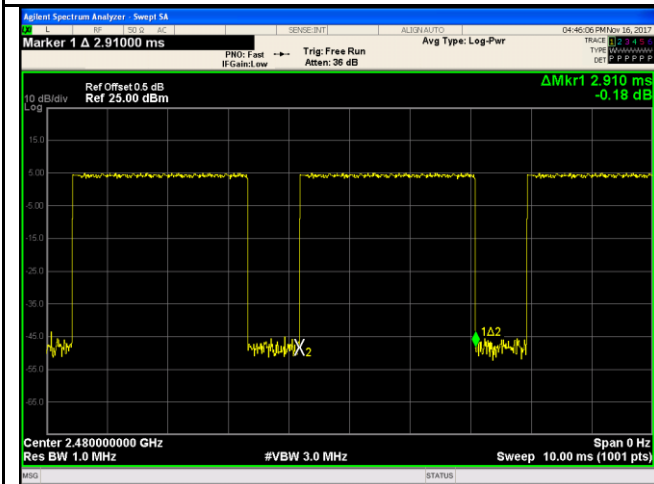




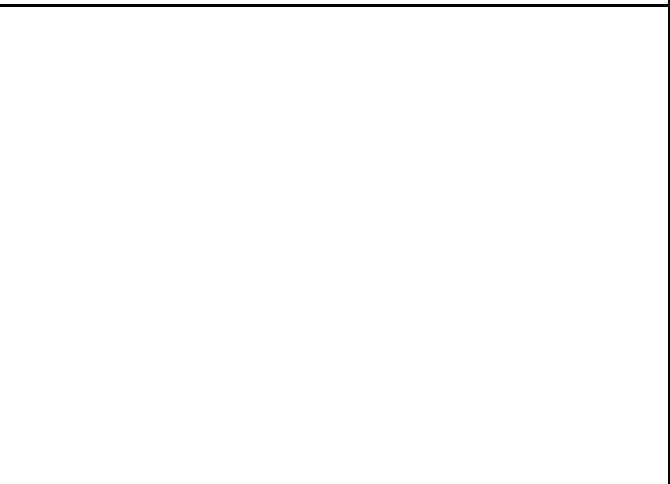
8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480

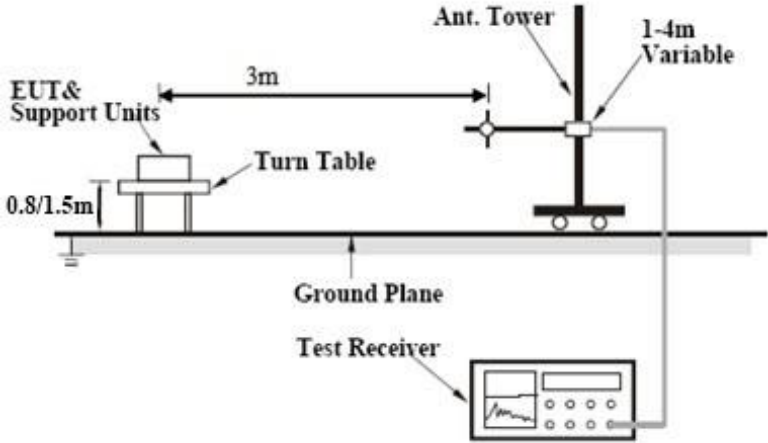


## 6.7 Band Edge & Restricted Band

|                      |                   |
|----------------------|-------------------|
| Temperature          | 23 °C             |
| Relative Humidity    | 51%               |
| Atmospheric Pressure | 1020mbar          |
| Test date :          | November 30, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec                   | Item | Requirement   | Applicable                          |
|------------------------|------|---|-------------------------------------|
| §15.247(a)<br>(1)(iii) | a)   | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. □ | <input checked="" type="checkbox"/> |

|            |  |
|------------|--|
| Test Setup |  |
|------------|--|

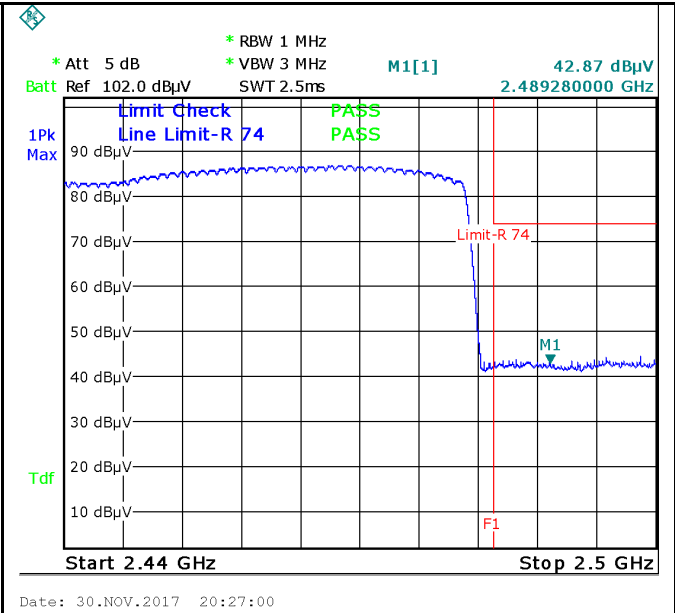
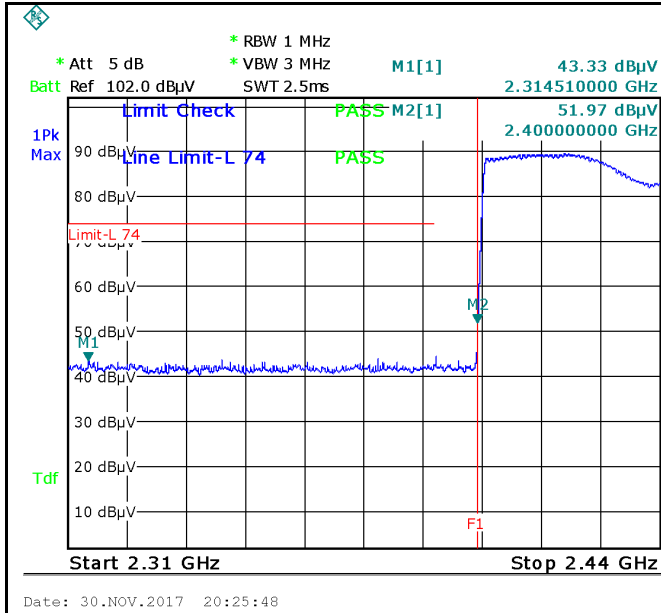
|                |  |
|----------------|--|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only</p> <ul style="list-style-type: none"> <li>- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.</li> <li>- 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range,</li> </ul> |
|----------------|--|

|        |  |
|--------|--|
|        | <p>and make sure the instrument is operated in its linear range.</p> <ul style="list-style-type: none"> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: <ul style="list-style-type: none"> <li>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</li> <li>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</li> </ul> </li> <li>- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.</li> <li>- 5. Repeat above procedures until all measured frequencies were complete.</li> </ul> |
| Remark |  |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail   |

**Test Data**     Yes                       N/A  
**Test Plot**     Yes (See below)       N/A

### Test Plots

#### GFSK Mode:



GFSK-Hopping Left Side-PK

Note: F1 is frequency 2400MHz

GFSK-Hopping Right Side-PK

Note: F1 is frequency 2483.5MHz

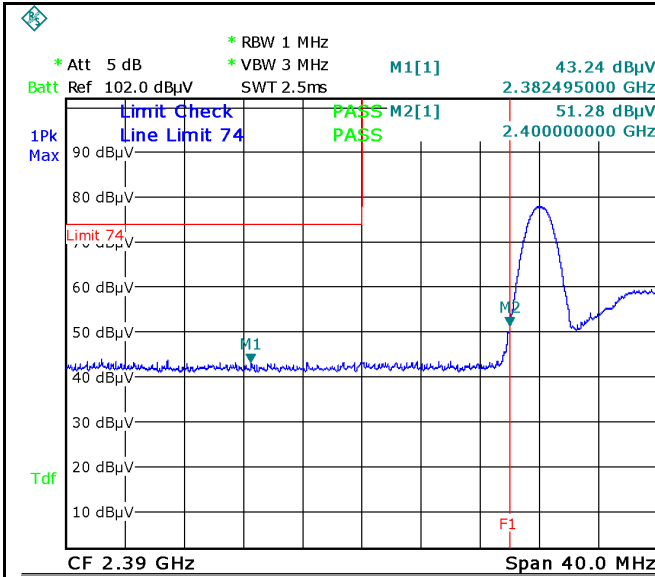
Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

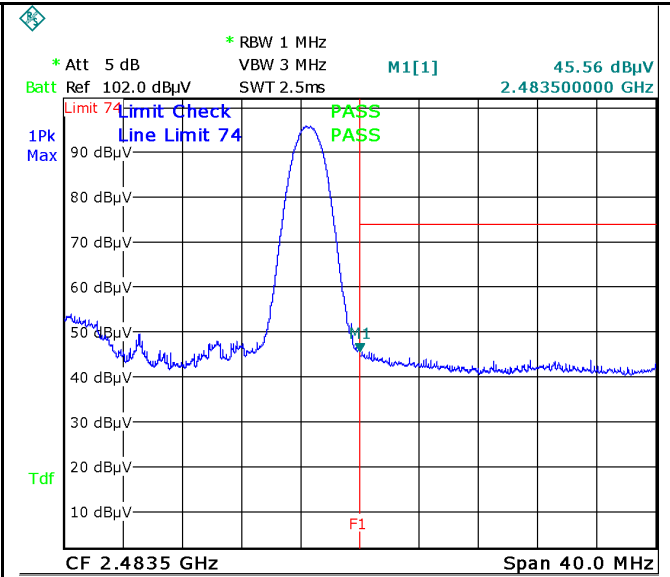
GFSK-Hopping Left Side-AV

GFSK-Hopping Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.



Date: 30.NOV.2017 20:19:16



Date: 27.NOV.2017 10:50:54

GFSK-Left Side-PK

Note: F1 is frequency 2400MHz

GFSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

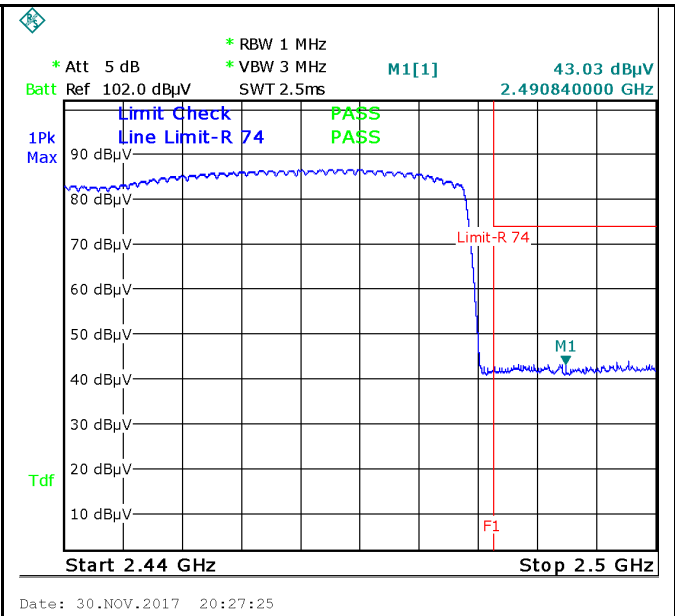
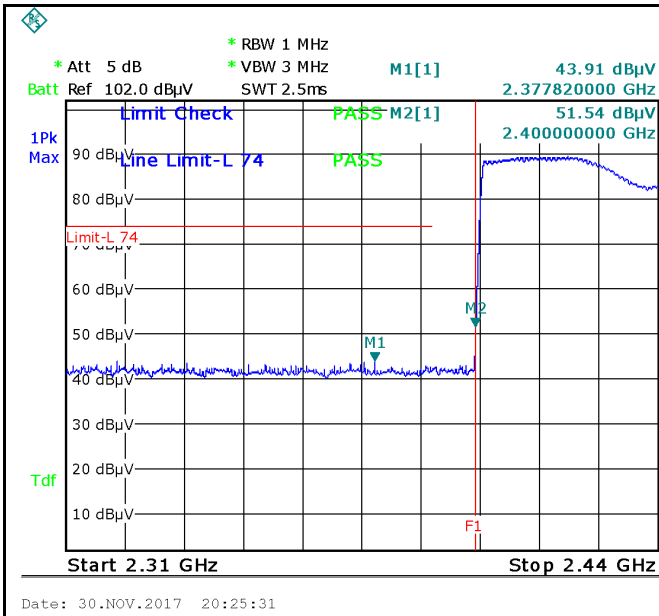
GFSK-Left Side-AV

GFSK-Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.



$\pi/4$  DQPSK Mode:



$\pi/4$  DQPSK-Hopping Left Side-PK  
Note: F1 is frequency 2400MHz

$\pi/4$  DQPSK-Hopping Right Side-PK  
Note: F1 is frequency 2483.5MHz

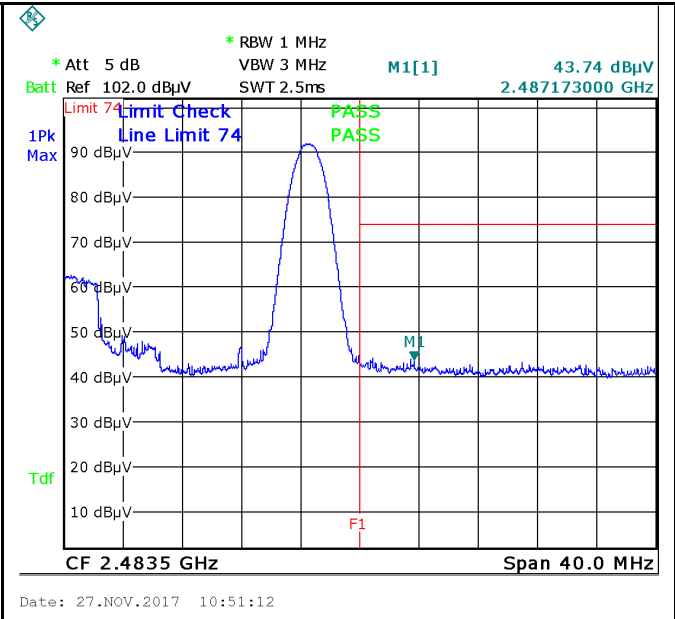
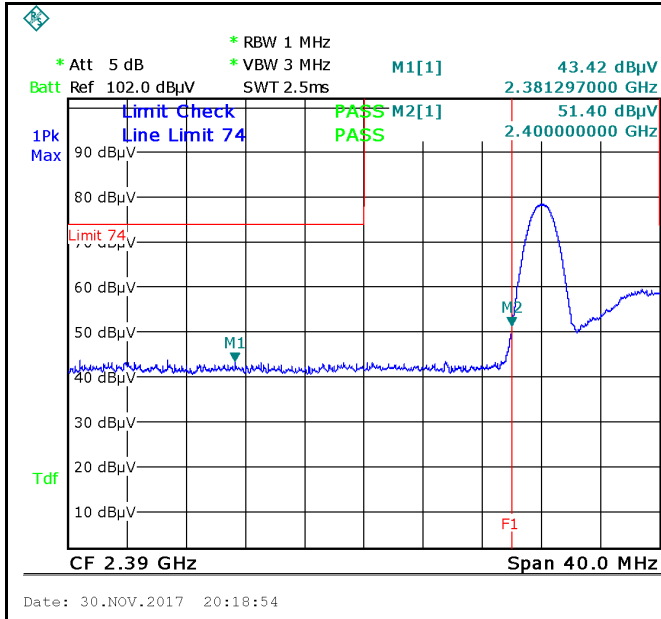
Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

$\pi/4$  DQPSK-Hopping Left-AV

$\pi/4$  DQPSK-Hopping Right-AV

Note: Both Horizontal and vertical polarities were investigated.



$\pi$  /4 DQPSK-Left Side-PK  
 Note: F1 is frequency 2400MHz

$\pi$  /4 DQPSK-Right Side-PK  
 Note: F1 is frequency 2483.5MHz

Note: (no need if PK value less than the AV limit)

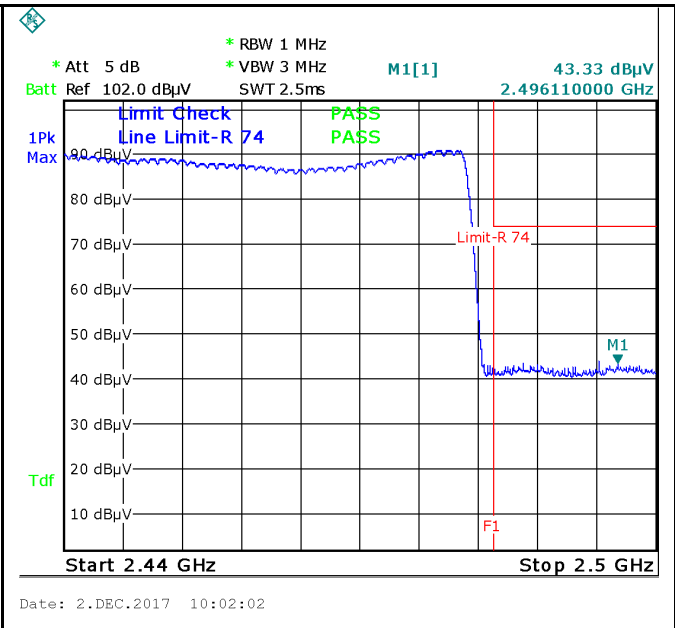
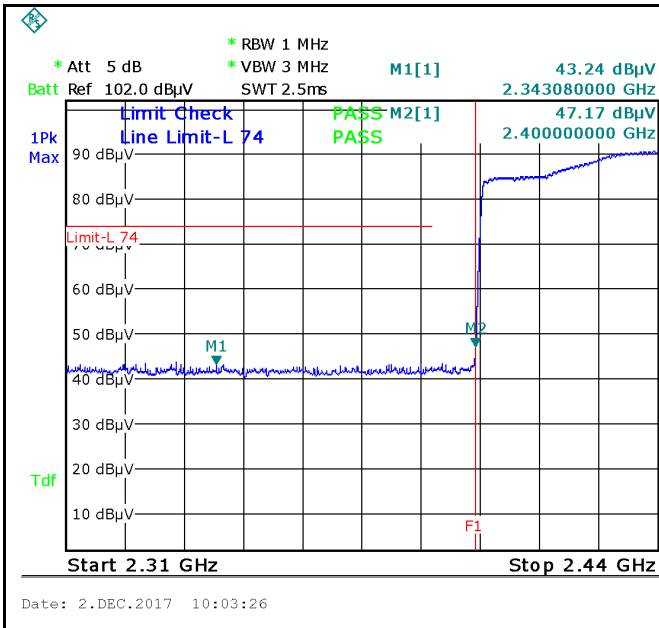
Note: (no need if PK value less than the AV limit)

$\pi$  /4 DQPSK-Left Side-AV

$\pi$  /4 DQPSK-Right Side-AV

Note: Both Horizontal and vertical polarities were investigated.

**8-DPSK Mode:**



**8DPSK-Hopping Left Side-PK**  
**Note: F1 is frequency 2400MHz**

**8DPSK-Hopping Right Side-PK**  
**Note: F1 is frequency 2483.5MHz**

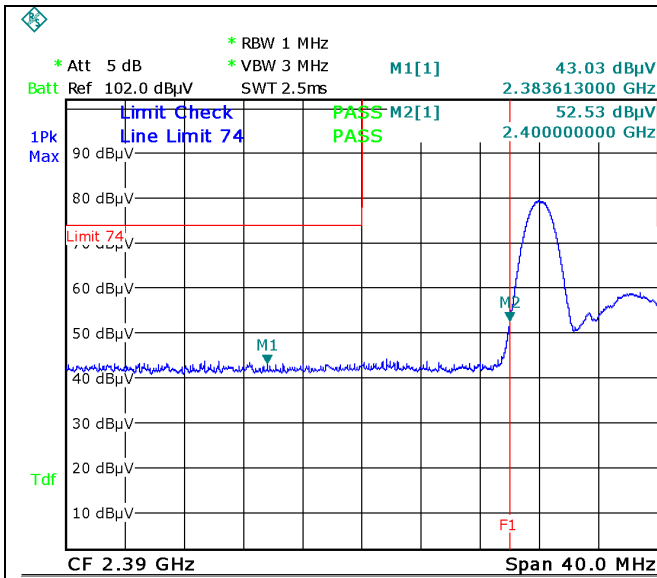
Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

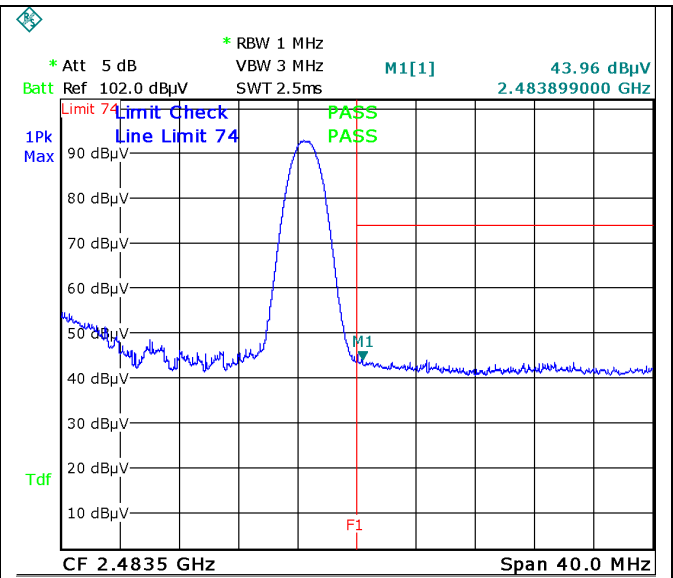
**8DPSK-Hopping Left-AV**

**8DPSK-Hopping Right-AV**

Note: Both Horizontal and vertical polarities were investigated.



Date: 30.NOV.2017 20:18:31



Date: 27.NOV.2017 10:53:12

8DPSK-Left Side-PK

Note: F1 is frequency 2400MHz

8DPSK-Right Side-PK

Note: F1 is frequency 2483.5MHz

Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

8DPSK-Left Side-AV

8DPSK-Right Side-AV

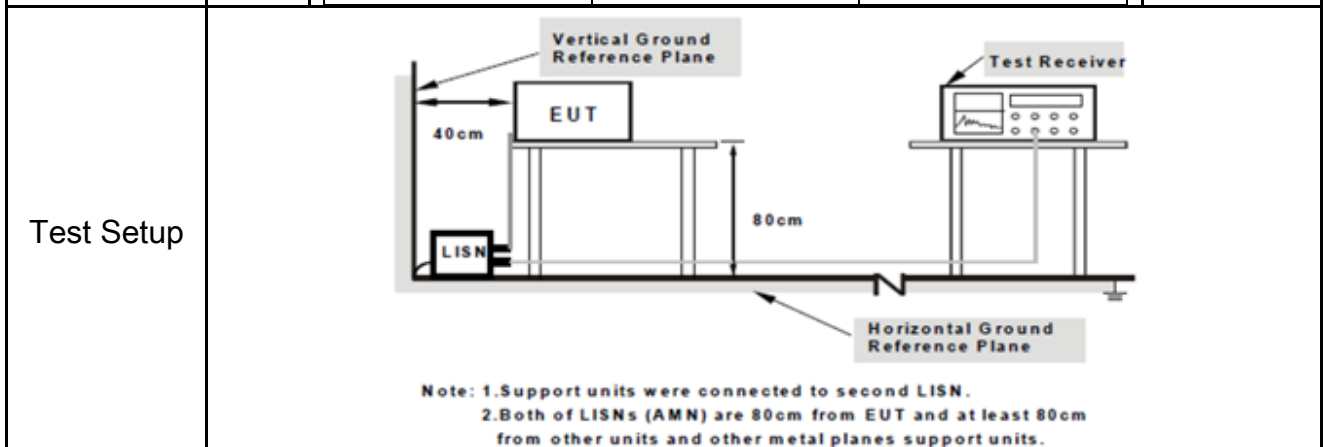
Note: Both Horizontal and vertical polarities were investigated.

## 6.8 AC Power Line Conducted Emissions

|                      |                   |
|----------------------|-------------------|
| Temperature          | 25 °C             |
| Relative Humidity    | 57%               |
| Atmospheric Pressure | 1024mbar          |
| Test date :          | November 24, 2017 |
| Tested By :          | Aaron Liang       |

### Requirement(s):

| Spec                        | Item    | Requirement   | Applicable                          |                        |              |  |    |         |            |         |         |         |    |    |        |    |    |
|-----------------------------|---------|---|-------------------------------------|------------------------|--------------|--|----|---------|------------|---------|---------|---------|----|----|--------|----|----|
| 47CFR§15.207, RSS210 (A8.1) | a)      | For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges. | <input checked="" type="checkbox"/> |                        |              |  |    |         |            |         |         |         |    |    |        |    |    |
|                             |         | <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBµV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>  |                                     | Frequency ranges (MHz) | Limit (dBµV) |  | QP | Average | 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | 0.5 ~ 5 | 56 | 46 | 5 ~ 30 | 60 | 50 |
|                             |         | Frequency ranges (MHz)  |                                     |                        | Limit (dBµV) |  |    |         |            |         |         |         |    |    |        |    |    |
|                             |         |   |                                     | QP                     | Average      |  |    |         |            |         |         |         |    |    |        |    |    |
| 0.15 ~ 0.5                  | 66 – 56 | 56 – 46   |                                     |                        |              |  |    |         |            |         |         |         |    |    |        |    |    |
| 0.5 ~ 5                     | 56      | 46  |                                     |                        |              |  |    |         |            |         |         |         |    |    |        |    |    |
| 5 ~ 30                      | 60      | 50  |                                     |                        |              |  |    |         |            |         |         |         |    |    |        |    |    |



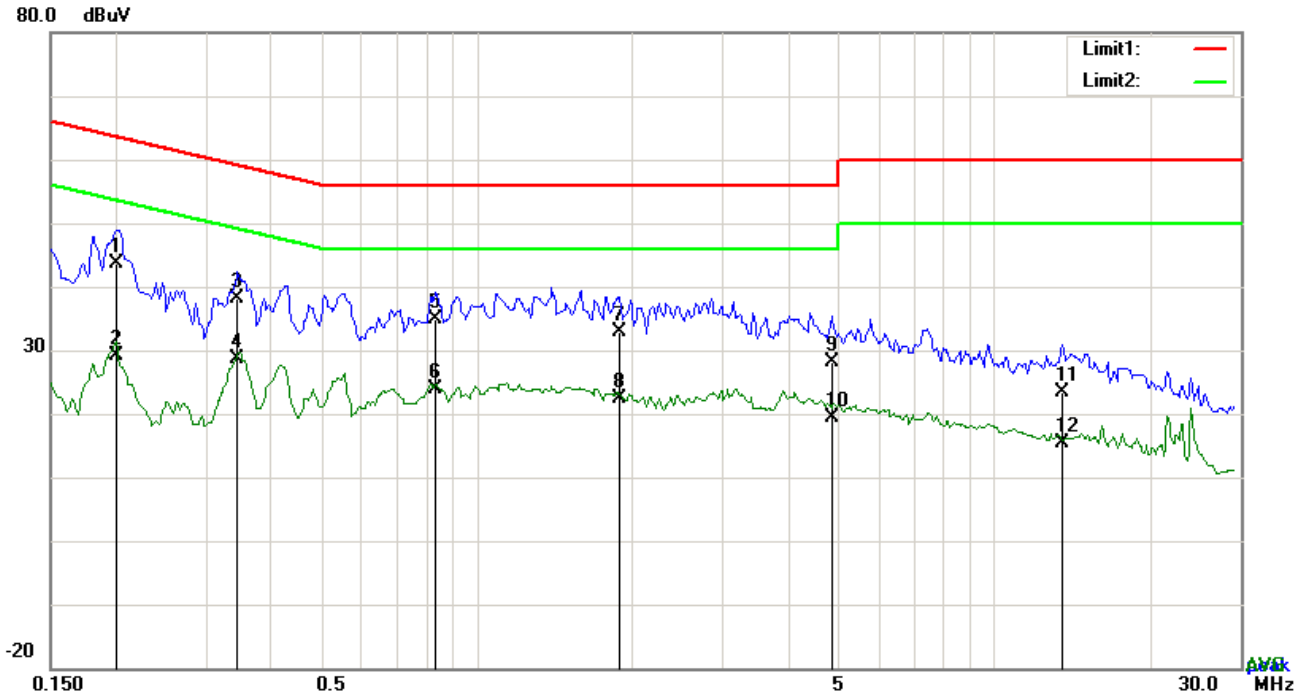
|           |   |
|-----------|---|
| Procedure | <ol style="list-style-type: none"> <li>The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.</li> <li>The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</li> <li>The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</li> </ol> |
|-----------|---|

|        |  |
|--------|--|
|        | <p>coaxial cable.</p> <ol style="list-style-type: none"> <li>4. All other supporting equipment were powered separately from another main supply.</li> <li>5. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.</li> <li>7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.</li> <li>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).</li> </ol> |
| Remark |  |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail   |

Test Data     Yes                       N/A

Test Plot     Yes (See below)             N/A

|                   |                       |
|-------------------|-----------------------|
| <b>Test Mode:</b> | <b>Bluetooth Mode</b> |
|-------------------|-----------------------|

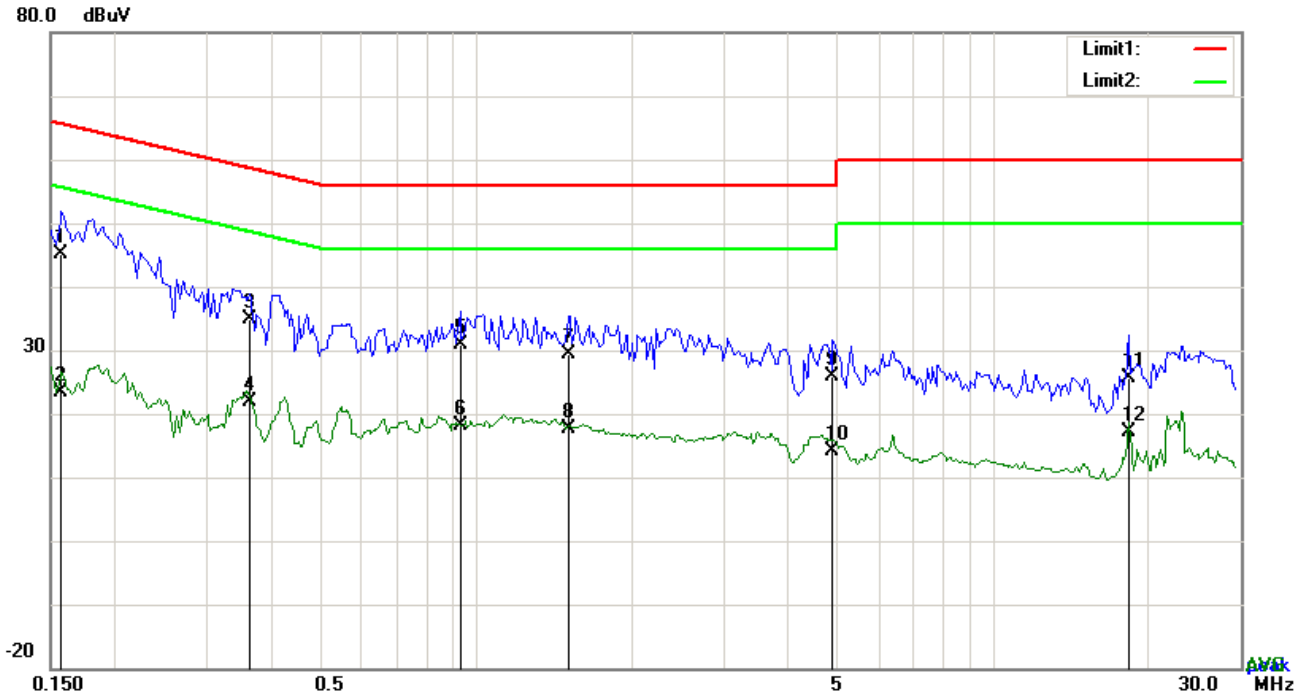


**Test Data**

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

| No. | P/L | Frequency | Reading | Detector | Corrected | Result | Limit  | Margin |
|-----|-----|-----------|---------|----------|-----------|--------|--------|--------|
|     |     | (MHz)     | (dBuV)  |          | (dB)      | (dBuV) | (dBuV) | (dB)   |
| 1   | L1  | 0.2007    | 33.72   | QP       | 10.02     | 43.74  | 63.58  | -19.84 |
| 2   | L1  | 0.2007    | 19.03   | AVG      | 10.02     | 29.05  | 53.58  | -24.53 |
| 3   | L1  | 0.3450    | 28.09   | QP       | 10.02     | 38.11  | 59.08  | -20.97 |
| 4   | L1  | 0.3450    | 18.70   | AVG      | 10.02     | 28.72  | 49.08  | -20.36 |
| 5   | L1  | 0.8325    | 24.96   | QP       | 10.03     | 34.99  | 56.00  | -21.01 |
| 6   | L1  | 0.8325    | 13.91   | AVG      | 10.03     | 23.94  | 46.00  | -22.06 |
| 7   | L1  | 1.8894    | 22.83   | QP       | 10.04     | 32.87  | 56.00  | -23.13 |
| 8   | L1  | 1.8894    | 12.31   | AVG      | 10.04     | 22.35  | 46.00  | -23.65 |
| 9   | L1  | 4.8720    | 17.95   | QP       | 10.07     | 28.02  | 56.00  | -27.98 |
| 10  | L1  | 4.8720    | 9.22    | AVG      | 10.07     | 19.29  | 46.00  | -26.71 |
| 11  | L1  | 13.6041   | 13.26   | QP       | 10.18     | 23.44  | 60.00  | -36.56 |
| 12  | L1  | 13.6041   | 5.14    | AVG      | 10.18     | 15.32  | 50.00  | -34.68 |

|                   |                       |
|-------------------|-----------------------|
| <b>Test Mode:</b> | <b>Bluetooth Mode</b> |
|-------------------|-----------------------|



**Test Data**

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

| No. | P/L | Frequency | Reading | Detector | Corrected | Result | Limit  | Margin |
|-----|-----|-----------|---------|----------|-----------|--------|--------|--------|
|     |     | (MHz)     | (dBuV)  |          | (dB)      | (dBuV) | (dBuV) | (dB)   |
| 1   | N   | 0.1578    | 35.13   | QP       | 10.02     | 45.15  | 65.58  | -20.43 |
| 2   | N   | 0.1578    | 13.35   | AVG      | 10.02     | 23.37  | 55.58  | -32.21 |
| 3   | N   | 0.3645    | 24.84   | QP       | 10.02     | 34.86  | 58.63  | -23.77 |
| 4   | N   | 0.3645    | 11.83   | AVG      | 10.02     | 21.85  | 48.63  | -26.78 |
| 5   | N   | 0.9300    | 20.73   | QP       | 10.03     | 30.76  | 56.00  | -25.24 |
| 6   | N   | 0.9300    | 8.14    | AVG      | 10.03     | 18.17  | 46.00  | -27.83 |
| 7   | N   | 1.5111    | 19.28   | QP       | 10.04     | 29.32  | 56.00  | -26.68 |
| 8   | N   | 1.5111    | 7.71    | AVG      | 10.04     | 17.75  | 46.00  | -28.25 |
| 9   | N   | 4.8954    | 15.87   | QP       | 10.07     | 25.94  | 56.00  | -30.06 |
| 10  | N   | 4.8954    | 3.98    | AVG      | 10.07     | 14.05  | 46.00  | -31.95 |
| 11  | N   | 18.2451   | 15.35   | QP       | 10.24     | 25.59  | 60.00  | -34.41 |
| 12  | N   | 18.2451   | 6.99    | AVG      | 10.24     | 17.23  | 50.00  | -32.77 |