



# TEST REPORT

**Report Reference No.** ..... : **TRE1708012001** R/C.....: 57660

**FCC ID** ..... : **2AHYVEPIC3**

**Applicant's name** ..... : **PEAG,LLC dba JLab Audio**

**Address** ..... : 3402 Piazza DOro Way,Suite 230,Oceanside,California,United States 92056

**Manufacturer**.....: Cosonic Intelligent Technologies Co., Ltd.

**Address**.....: 506, 1st Building,No.6, South Industry Road,Songshan Lake National High-tech Industrial Development Zone,Dongguan City, Guangdong, 523808 China

**Test item description**.....: **EPIC 3**

**Trade Mark**.....: JLab

**Model/Type reference**.....: EPIC 3

**Listed Model(s)** .....: -

**Standard** .....: **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

**Date of receipt of test sample**.....: Aug. 21, 2017

**Date of testing**.....: Aug. 22, 2017- Aug. 29, 2017

**Date of issue**.....: Sep.13, 2017

**Result** .....: **PASS**

Compiled by  
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Approved by  
(position+printedname+signature)... : RF Manager Hans Hu

**Testing Laboratory Name** ..... : **Shenzhen Huatongwei International Inspection Co., Ltd.**

**Address** ..... : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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*The test report merely corresponds to the test sample.*

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## Contents

|           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b><u>TEST STANDARDS AND TEST DESCRIPTION</u></b>     | <b>3</b>  |
| 1.1.      | Test Standards  | 3         |
| 1.2.      | Report version  | 3         |
| <b>2.</b> | <b><u>TEST DESCRIPTION</u></b>                        | <b>4</b>  |
| <b>3.</b> | <b><u>SUMMARY</u></b>                                 | <b>5</b>  |
| 3.1.      | Client Information                                    | 5         |
| 3.2.      | Product Description                                   | 5         |
| 3.3.      | Operation state                                       | 6         |
| 3.4.      | EUT configuration                                     | 6         |
| 3.5.      | Modifications   | 6         |
| <b>4.</b> | <b><u>TEST ENVIRONMENT</u></b>                        | <b>7</b>  |
| 4.1.      | Address of the test laboratory                        | 7         |
| 4.2.      | Test Facility   | 7         |
| 4.3.      | Environmental conditions                              | 8         |
| 4.4.      | Statement of the measurement uncertainty              | 8         |
| 4.5.      | Equipments Used during the Test                       | 9         |
| <b>5.</b> | <b><u>TEST CONDITIONS AND RESULTS</u></b>             | <b>10</b> |
| 5.1.      | Antenna requirement                                   | 10        |
| 5.2.      | Conducted Emission (AC Main)                          | 11        |
| 5.3.      | Conducted Peak Output Power                           | 14        |
| 5.4.      | 20dB Emission Bandwidth                               | 18        |
| 5.5.      | Carrier Frequencies Separation                        | 22        |
| 5.6.      | Hopping Channel Number                                | 24        |
| 5.7.      | Dwell Time  | 26        |
| 5.8.      | Pseudorandom Frequency Hopping Sequence               | 30        |
| 5.9.      | Restricted band (radiated)                            | 31        |
| 5.10.     | Bandedge and Spurious Emission (conducted)            | 33        |
| 5.11.     | Spurious Emission (radiated)                          | 49        |
| <b>6.</b> | <b><u>TEST SETUP PHOTOS OF THE EUT</u></b>            | <b>53</b> |
| <b>7.</b> | <b><u>EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u></b> | <b>55</b> |

# **1. TEST STANDARDS AND TEST DESCRIPTION**

## **1.1. Test Standards**

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

## **1.2. Report version**

| Version No. | Date of issue | Description |
|-------------|---------------|-------------|
| 00          | Sep. 13, 2017 | Original    |
|             |               |             |
|             |               |             |
|             |               |             |
|             |               |             |

## **2. Test Description**

| Test Item                               | Section in CFR 47 | Result |
|---|-------------------|--------|
| Antenna Requirement                     | 15.203/15.247 (c) | Pass   |
| AC Power Line Conducted Emission        | 15.207            | Pass   |
| Conducted Peak Output Power             | 15.247 (b)(1)     | Pass   |
| 20dB Occupied Bandwidth                 | 15.247 (a)(1)     | Pass   |
| Carrier Frequencies Separation          | 15.247 (a)(1)     | Pass   |
| Hopping Channel Number                  | 15.247 (a)(1)     | Pass   |
| Dwell Time                              | 15.247 (a)(1)     | Pass   |
| Pseudorandom Frequency Hopping Sequence | 15.247(b)(4)      | Pass   |
| Restricted band                         | 15.247(d)/15.205  | Pass   |
| Radiated Emission                       | 15.247(d)/15.209  | Pass   |

Note: The measurement uncertainty is not included in the test result.

### 3. SUMMARY

#### 3.1. Client Information

|               |  |
|---------------|--|
| Applicant:    | PEAG,LLC dba JLab Audio  |
| Address:      | 3402 Piazza DOro Way,Suite 230,Oceanside,California,United States 92056  |
| Manufacturer: | Cosonic Intelligent Technologies Co., Ltd.   |
| Address:      | 506, 1st Building,No.6, South Industry Road,Songshan Lake National High-tech Industrial Development Zone,Dongguan City,Guangdong, 523808 China |

#### 3.2. Product Description

|                      |                               |
|----------------------|-------------------------------|
| Name of EUT:         | EPIC 3                        |
| Trade Mark:          | JLab                          |
| Model No.:           | EPIC 3                        |
| Listed Model(s):     | -                             |
| Power supply:        | DC 3.7V From internal battery |
| Adapter information: | -                             |
| Hardware version:    | V0.1                          |
| Software version:    | A01                           |
| <b>Bluetooth</b>     |                               |
| Version:             | Supported BT4.1+EDR           |
| Modulation:          | GFSK, $\pi/4$ DQPSK, 8DPSK    |
| Operation frequency: | 2402MHz~2480MHz               |
| Channel number:      | 79                            |
| Channel separation:  | 1MHz                          |
| Antenna type:        | Chip Antenna                  |
| Antenna gain:        | 0 dBi                         |

### 3.3. Operation state

➤ **Test frequency list**

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

| Channel | Frequency (MHz) |
|---------|-----------------|
| 0       | 2402            |
| 1       | 2403            |
| :       | :               |
| 39      | 2441            |
| :       | :               |
| 77      | 2479            |
| 78      | 2480            |

➤ **Test mode**

|   |
|---|
| For RF test items   |
| The engineering test program was provided and enabled to make EUT continuous transmit (duty cycle>98%).                       |
| For AC power line conducted emissions:  |
| The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.                              |
| For RF test axis  |
| EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data Recorded in the report. |

### 3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

|  |               |   |
|--|---------------|---|
|  | Length (m):   | / |
|  | Shield:       | / |
|  | Detachable:   | / |
|  | Manufacturer: | / |
|  | Model No.:    | / |

### 3.5. Modifications

No modifications were implemented to meet testing criteria.

## **4. TEST ENVIRONMENT**

### **4.1. Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Phone: 86-755-26748019 Fax: 86-755-26748089

### **4.2. Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

#### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No.: 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235

#### **IC-Registration No.: 5377B-1**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

#### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### 4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |             |
|--------------------|-------------|
| Temperature:       | 15~35°C     |
| Relative Humidity: | 30~60 %     |
| Air Pressure:      | 950~1050mba |

### 4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

| Test Items                                 | Measurement Uncertainty | Notes |
|--|-------------------------|-------|
| Transmitter Power Conducted                | 0.57 dB                 | (1)   |
| Transmitter Power Radiated                 | 2.20 dB                 | (1)   |
| Conducted Spurious Emission 9 kHz ~ 40 GHz | 1.60 dB                 | (1)   |
| Radiated Spurious Emission 9 kHz ~ 40 GHz  | 2.20 dB                 | (1)   |
| Conducted Emission 9 kHz ~ 30 MHz          | 3.39 dB                 | (1)   |
| Radiated Emission 30 ~ 1000 MHz            | 4.24 dB                 | (1)   |
| Radiated Emission 1 ~ 18 GHz               | 5.16 dB                 | (1)   |
| Radiated Emission 18 ~ 40 GHz              | 5.54 dB                 | (1)   |
| Occupied Bandwidth                         | -----                   | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .



#### 4.5. Equipments Used during the Test

| Conducted Emission (AC Main) |                   |               |             |            |            |
|------------------------------|-------------------|---------------|-------------|------------|------------|
| Item                         | Test Equipment    | Manufacturer  | Model No.   | Serial No. | Last Cal.  |
| 1                            | Artificial Mains  | Rohde&Schwarz | ESH2-Z5     | 100028     | 2016/11/13 |
| 2                            | EMI Test Receiver | Rohde&Schwarz | ESCI3       | 100038     | 2016/11/13 |
| 3                            | Pulse Limiter     | Rohde&Schwarz | ESHSZ2      | 100044     | 2016/11/13 |
| 4                            | EMI Test Software | Rohde&Schwarz | ES-K1 V1.71 | N/A        | N/A        |

| Radiated Emission |                         |                              |                    |            |            |
|-------------------|-------------------------|------------------------------|--------------------|------------|------------|
| Item              | Test Equipment          | Manufacturer                 | Model No.          | Serial No. | Last Cal.  |
| 1                 | Ultra-Broadband Antenna | ShwarzBeck                   | VULB9163           | 538        | 2016/11/13 |
| 2                 | EMI TEST RECEIVER       | Rohde&Schwarz                | ESI 26             | 100009     | 2016/11/13 |
| 3                 | EMI TEST Software       | Audix                        | E3                 | N/A        | N/A        |
| 4                 | TURNTABLE               | ETS                          | 2088               | 2149       | N/A        |
| 5                 | ANTENNA MAST            | ETS                          | 2075               | 2346       | N/A        |
| 6                 | EMI TEST Software       | Rohde&Schwarz                | ESK1               | N/A        | N/A        |
| 7                 | HORNANTENNA             | ShwarzBeck                   | 9120D              | 1011       | 2016/11/13 |
| 8                 | Amplifer                | Sonoma                       | 310N               | E009-13    | 2016/11/13 |
| 9                 | JS amplifer             | Rohde&Schwarz                | JS4-00101800-28-5A | F201504    | 2016/11/13 |
| 10                | High pass filter        | Compliance Direction systems | BSU-6              | 34202      | 2016/11/13 |
| 11                | HORNANTENNA             | ShwarzBeck                   | 9120D              | 1012       | 2016/11/13 |
| 12                | Amplifer                | Compliance Direction systems | PAP1-4060          | 120        | 2016/11/13 |
| 13                | Loop Antenna            | Rohde&Schwarz                | HFH2-Z2            | 100020     | 2016/11/13 |
| 14                | TURNTABLE               | MATURO                       | TT2.0              | ----       | N/A        |
| 15                | ANTENNA MAST            | MATURO                       | TAM-4.0-P          | ----       | N/A        |
| 16                | Horn Antenna            | SCHWARZBECK                  | BBHA9170           | 25841      | 2016/11/13 |
| 17                | ULTRA-BROADBAND ANTENNA | Rohde&Schwarz                | HL562              | 100015     | 2016/11/13 |

| RF Conducted |                     |                      |           |              |            |
|--------------|---------------------|----------------------|-----------|--------------|------------|
| Item         | Test Equipment      | Manufacturer         | Model No. | Serial No.   | Last Cal   |
| 1            | Spectrum Analyzer   | Rohde&Schwarz        | FSP       | 1164.4391.40 | 2016/11/13 |
| 2            | MXA Signal Analyzer | Agilent Technologies | N9020A    | MY5050187    | 2016/11/13 |

The Cal.Interval was one year

## 5. TEST CONDITIONS AND RESULTS

### 5.1. Antenna requirement

#### Requirement

##### **FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

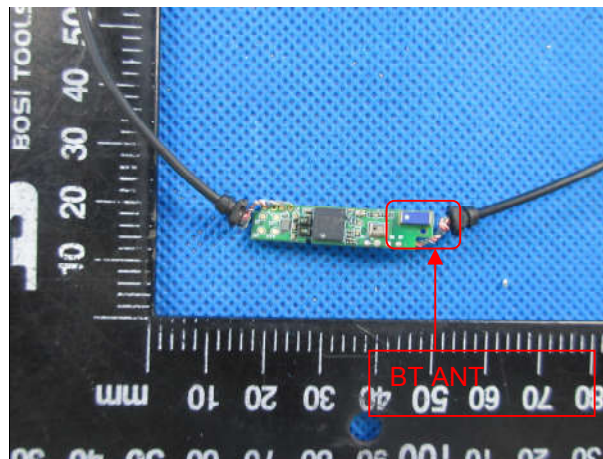
##### **FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):**

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

#### Test Result:

**Passed**

**Not Applicable**



## 5.2. Conducted Emission (AC Main)

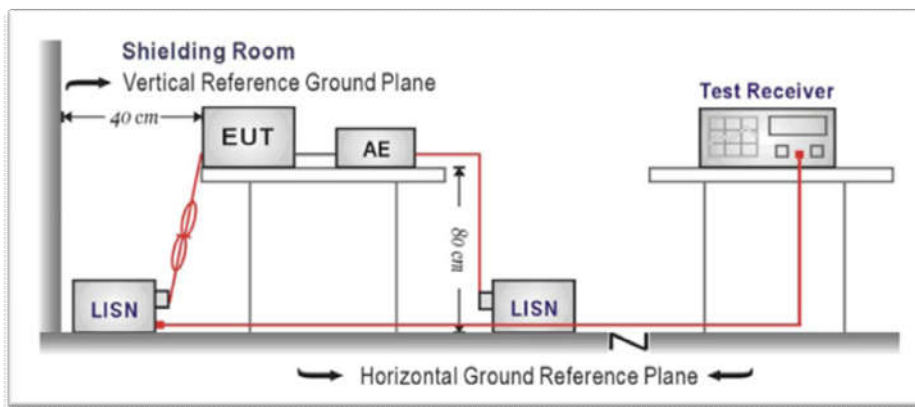
### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

| Frequency range (MHz) | Limit (dBuV) |           |
|-----------------------|--------------|-----------|
|                       | Quasi-peak   | Average   |
| 0.15-0.5              | 66 to 56*    | 56 to 46* |
| 0.5-5                 | 56           | 46        |
| 5-30                  | 60           | 50        |

\* Decreases with the logarithm of the frequency.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.
- 9.

### TEST RESULTS

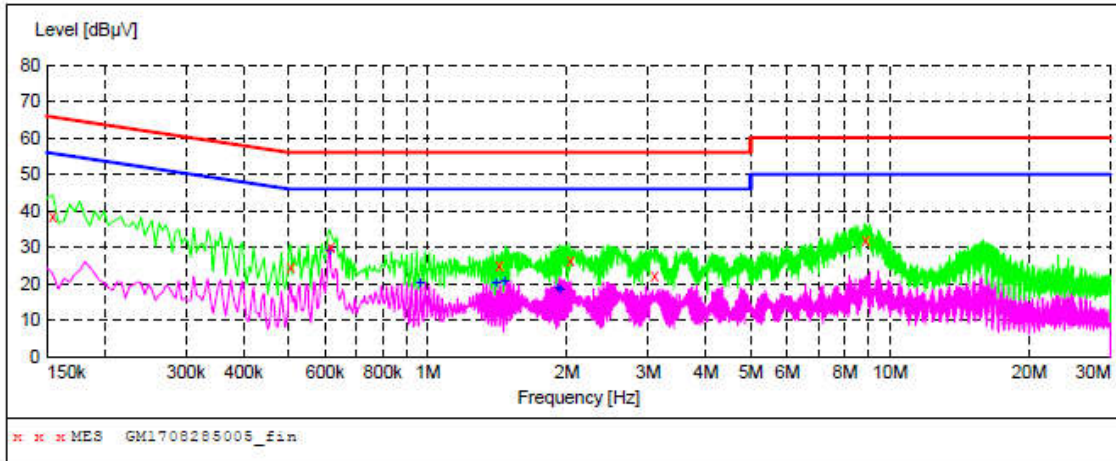
Passed       Not Applicable

Note:

- 1) Transd= Cable lose + Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin= Limit - Level

Test Line:

L



**MEASUREMENT RESULT: "GM1708285005\_fin"**

8/28/2017 10:12AM

| Frequency MHz | Level dBuV | Transd dB | Limit dBuV | Margin dB | Detector | Line | PE  |
|---------------|------------|-----------|------------|-----------|----------|------|-----|
| 0.154500      | 38.50      | 10.4      | 66         | 27.3      | QP       | L1   | GND |
| 0.505500      | 24.40      | 10.2      | 56         | 31.6      | QP       | L1   | GND |
| 0.618000      | 30.30      | 10.2      | 56         | 25.7      | QP       | L1   | GND |
| 1.428000      | 25.00      | 10.2      | 56         | 31.0      | QP       | L1   | GND |
| 2.035500      | 26.30      | 10.2      | 56         | 29.7      | QP       | L1   | GND |
| 3.097500      | 22.40      | 10.2      | 56         | 33.6      | QP       | L1   | GND |
| 8.853000      | 32.00      | 10.5      | 60         | 28.0      | QP       | L1   | GND |

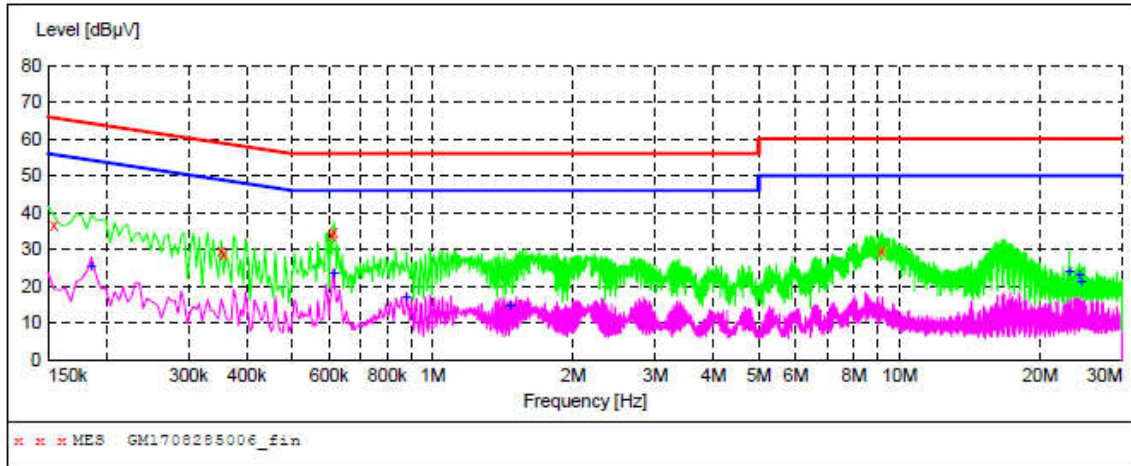
**MEASUREMENT RESULT: "GM1708285005\_fin2"**

8/28/2017 10:12AM

| Frequency MHz | Level dBuV | Transd dB | Limit dBuV | Margin dB | Detector | Line | PE  |
|---------------|------------|-----------|------------|-----------|----------|------|-----|
| 0.613500      | 29.10      | 10.2      | 46         | 16.9      | AV       | L1   | GND |
| 0.964500      | 20.30      | 10.2      | 46         | 25.7      | AV       | L1   | GND |
| 1.405500      | 20.50      | 10.2      | 46         | 25.5      | AV       | L1   | GND |
| 1.468500      | 20.60      | 10.2      | 46         | 25.4      | AV       | L1   | GND |
| 1.909500      | 18.80      | 10.2      | 46         | 27.2      | AV       | L1   | GND |
| 1.932000      | 18.50      | 10.2      | 46         | 27.5      | AV       | L1   | GND |

Test Line:

N



**MEASUREMENT RESULT: "GM1708285006\_fin"**

8/28/2017 10:15AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE  |
|---------------|------------|-----------|------------|-----------|----------|------|-----|
| 0.154500      | 36.60      | 10.4      | 66         | 29.2      | QP       | N    | GND |
| 0.352500      | 29.70      | 10.2      | 59         | 29.2      | QP       | N    | GND |
| 0.357000      | 28.90      | 10.2      | 59         | 29.9      | QP       | N    | GND |
| 0.609000      | 34.00      | 10.2      | 56         | 22.0      | QP       | N    | GND |
| 0.613500      | 34.70      | 10.2      | 56         | 21.3      | QP       | N    | GND |
| 9.150000      | 29.60      | 10.5      | 60         | 30.4      | QP       | N    | GND |

**MEASUREMENT RESULT: "GM1708285006\_fin2"**

8/28/2017 10:15AM

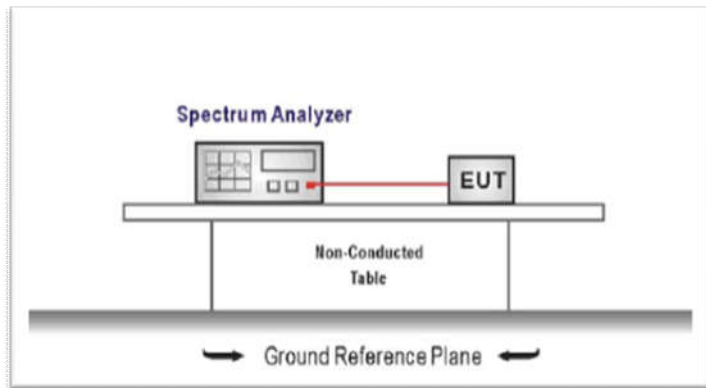
| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE  |
|---------------|------------|-----------|------------|-----------|----------|------|-----|
| 0.186000      | 25.60      | 10.3      | 54         | 28.6      | AV       | N    | GND |
| 0.613500      | 23.80      | 10.2      | 46         | 22.2      | AV       | N    | GND |
| 0.879000      | 16.90      | 10.1      | 46         | 29.1      | AV       | N    | GND |
| 1.468500      | 15.00      | 10.2      | 46         | 31.0      | AV       | N    | GND |
| 23.127000     | 24.00      | 10.7      | 50         | 26.0      | AV       | N    | GND |
| 24.346500     | 23.00      | 10.7      | 50         | 27.0      | AV       | N    | GND |
| 24.531000     | 21.10      | 10.7      | 50         | 28.9      | AV       | N    | GND |

### 5.3. Conducted Peak Output Power

#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): **30dBm**

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
 Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel  
 RBW  $\geq$  the 20 dB bandwidth of the emission being measured, VBW  $\geq$  RBW  
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

**Passed**       **Not Applicable**

| Modulation type | Channel | Output power (dBm) | Limit (dBm)  | Result |
|-----------------|---------|--------------------|--------------|--------|
| GFSK            | 00      | 5.845              | $\leq 30.00$ | Pass   |
|                 | 39      | 5.271              |              |        |
|                 | 78      | 3.175              |              |        |
| $\pi/4$ DQPSK   | 00      | 4.297              | $\leq 21.00$ | Pass   |
|                 | 39      | 4.523              |              |        |
|                 | 78      | 2.632              |              |        |
| 8DPSK           | 00      | 4.587              | $\leq 21.00$ | Pass   |
|                 | 39      | 4.637              |              |        |
|                 | 78      | 2.743              |              |        |

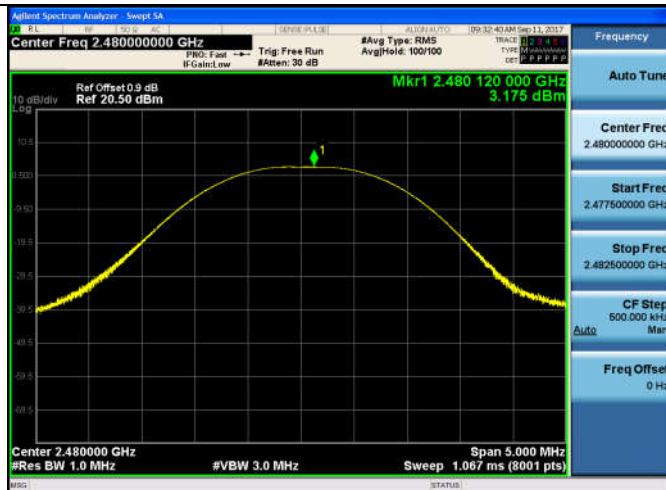
### GFSK



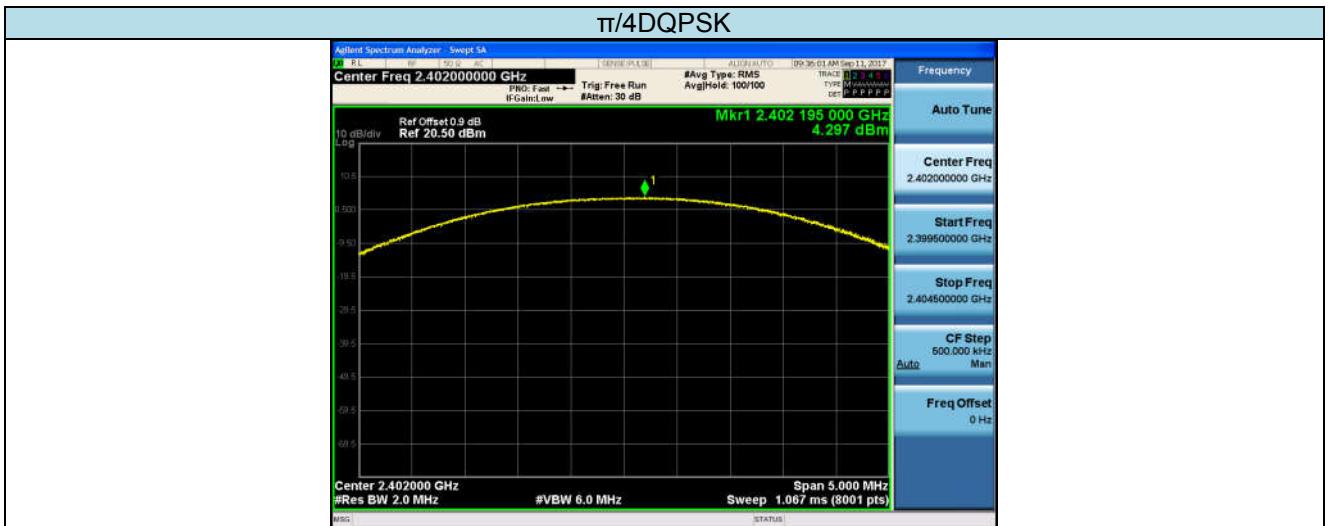
### CH00



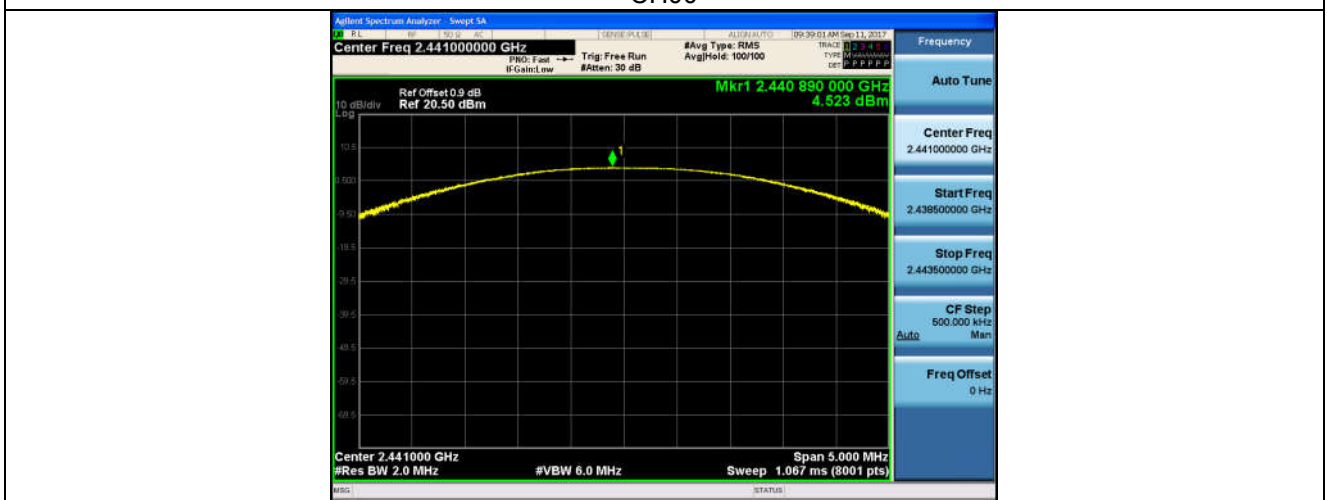
### CH39



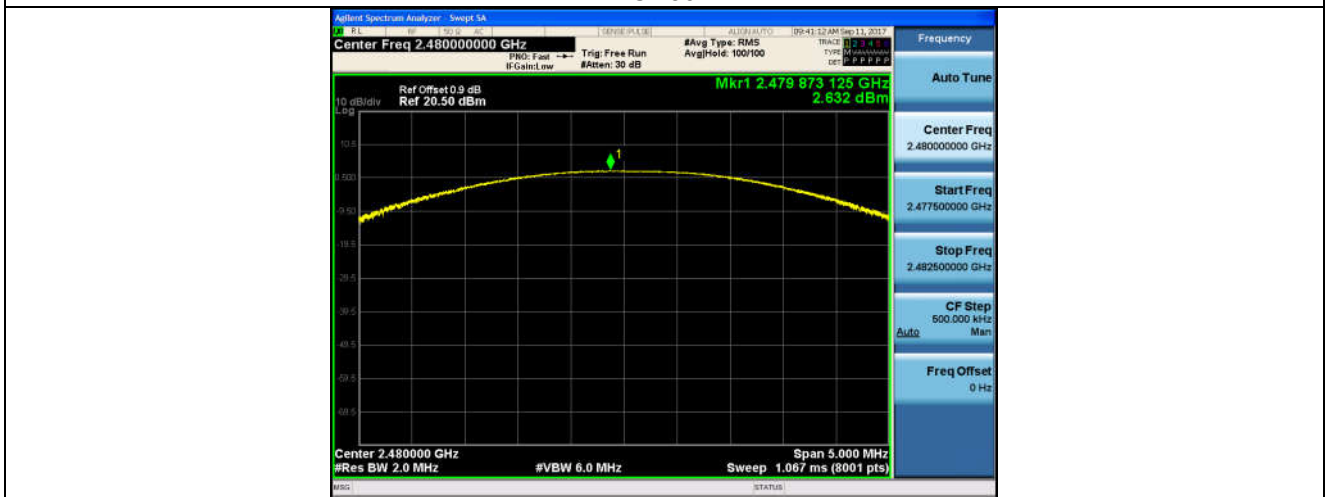
### CH78



CH00

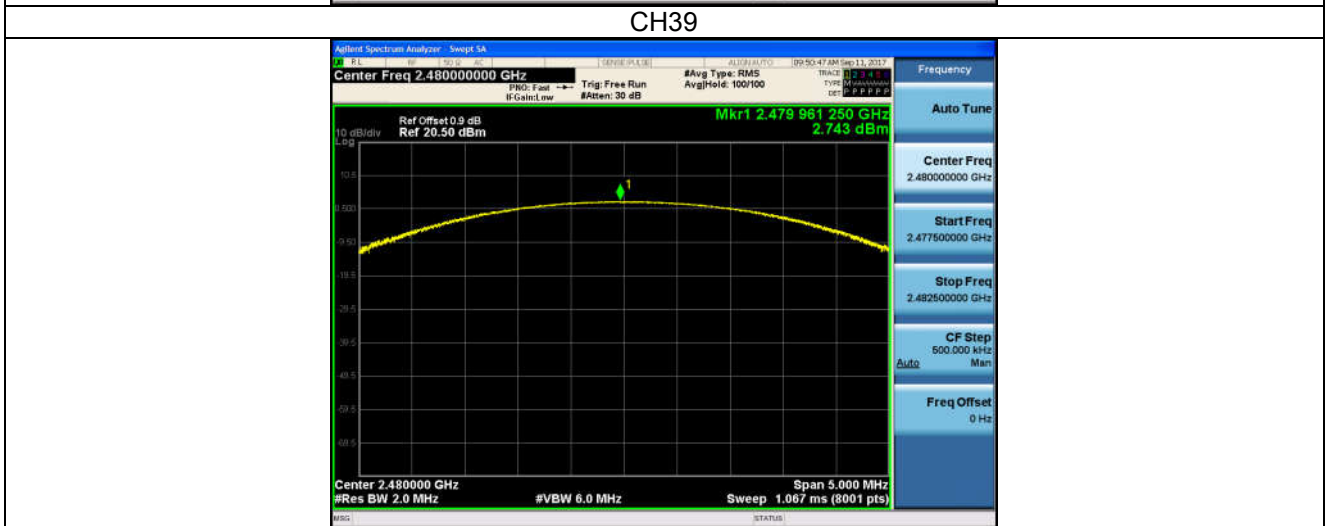
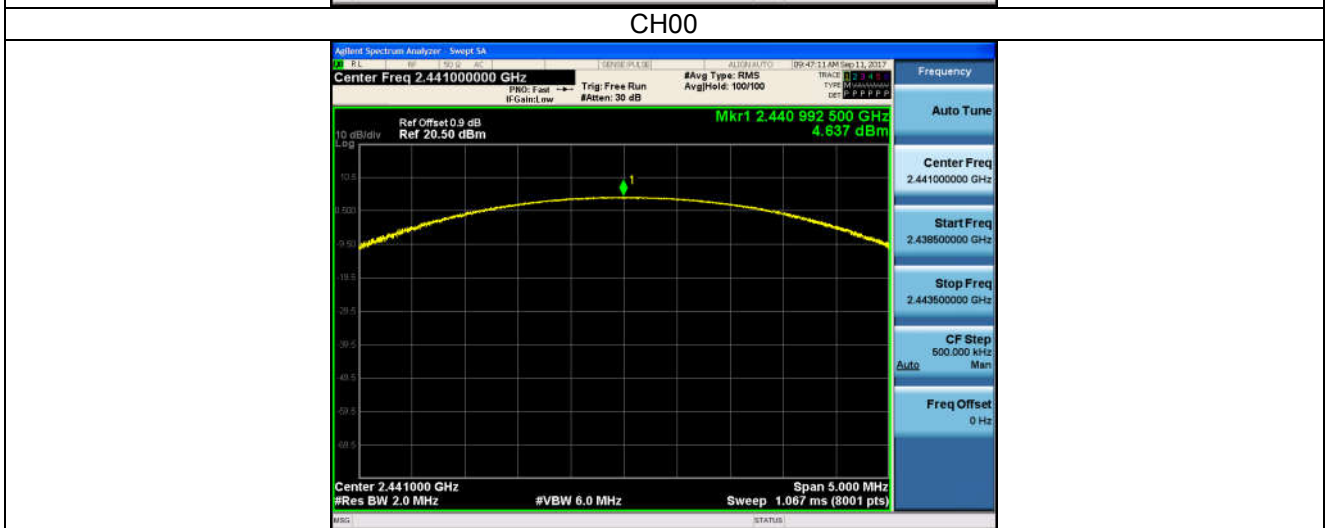
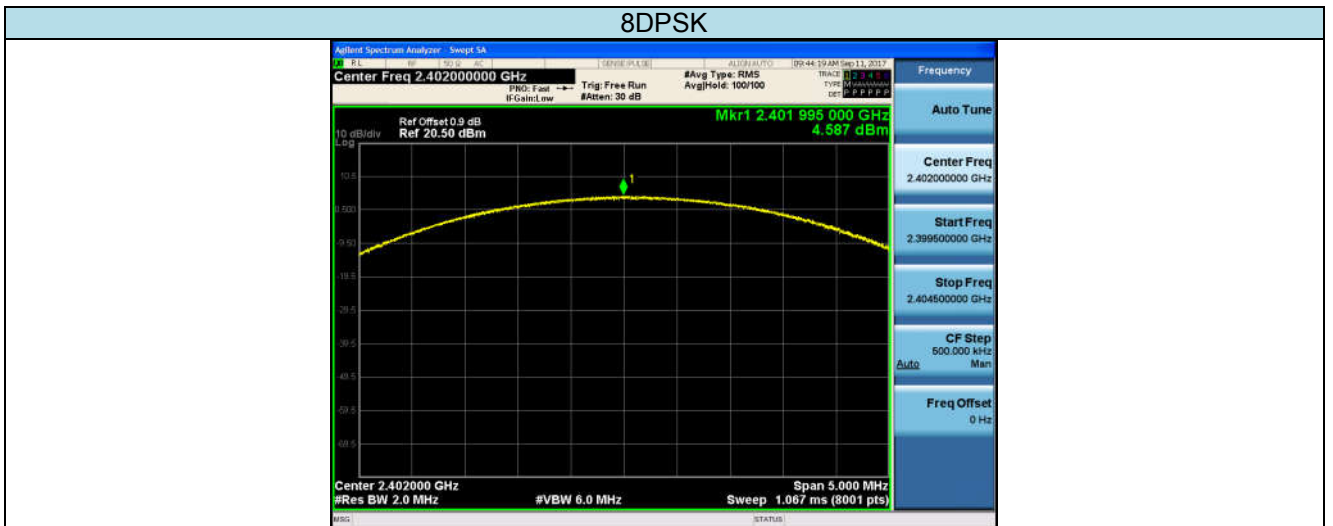


CH39



CH78





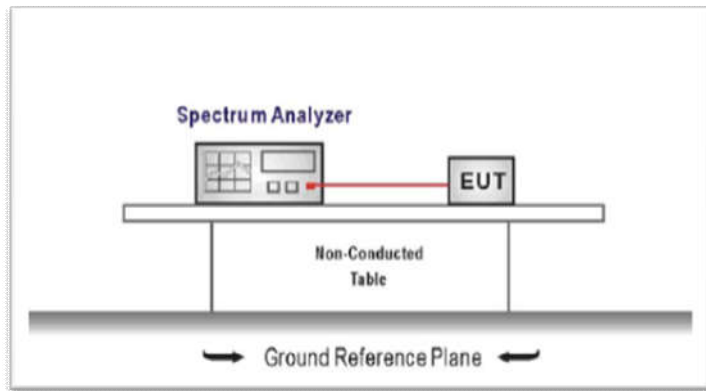
### CH78

### 5.4. 20dB Emission Bandwidth

**LIMIT**

N/A

**TEST CONFIGURATION**



**TEST PROCEDURE**

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
 Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
 RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW  
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

**TEST MODE:**

Please refer to the clause 3.3

**TEST RESULTS**

**Passed**       **Not Applicable**

| Modulation type | Channel | 20dB Bandwidth (MHz) | Limit (MHz) | Result |
|-----------------|---------|----------------------|-------------|--------|
| GFSK            | 00      | 0.921                | -           | Pass   |
|                 | 39      | 0.927                |             |        |
|                 | 78      | 0.917                |             |        |
| $\pi/4$ DQPSK   | 00      | 1.341                | -           | Pass   |
|                 | 39      | 1.327                |             |        |
|                 | 78      | 1.327                |             |        |
| 8DPSK           | 00      | 1.328                | -           | Pass   |
|                 | 39      | 1.214                |             |        |
|                 | 78      | 1.294                |             |        |

| Modulation Type: |   | GFSK |
|------------------|---|------|
| CH00             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.402000000 GHz</p> <p>Center Freq: 2.402000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.402 GHz</p> <p>#Res BW: 10 kHz</p> <p>#VBW: 30 kHz</p> <p>Span: 2 MHz</p> <p>Sweep: 19.13 ms</p> <p>Occupied Bandwidth: 884.24 kHz</p> <p>Total Power: 10.1 dBm</p> <p>Transmit Freq Error: 39.789 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 920.9 kHz</p> <p>x dB: -20.00 dB</p> <p>Frequency: 2.402000000 GHz</p> <p>CF Step: 200.000 kHz</p> <p>Freq Offset: 0 Hz</p> |      |
| CH39             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.441000000 GHz</p> <p>Center Freq: 2.441000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.441 GHz</p> <p>#Res BW: 10 kHz</p> <p>#VBW: 30 kHz</p> <p>Span: 2 MHz</p> <p>Sweep: 19.13 ms</p> <p>Occupied Bandwidth: 876.31 kHz</p> <p>Total Power: 9.72 dBm</p> <p>Transmit Freq Error: 35.560 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 926.7 kHz</p> <p>x dB: -20.00 dB</p> <p>Frequency: 2.441000000 GHz</p> <p>CF Step: 200.000 kHz</p> <p>Freq Offset: 0 Hz</p> |      |
| CH78             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.480000000 GHz</p> <p>Center Freq: 2.480000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.48 GHz</p> <p>#Res BW: 10 kHz</p> <p>#VBW: 30 kHz</p> <p>Span: 2 MHz</p> <p>Sweep: 19.13 ms</p> <p>Occupied Bandwidth: 879.57 kHz</p> <p>Total Power: 7.73 dBm</p> <p>Transmit Freq Error: 38.025 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 916.5 kHz</p> <p>x dB: -20.00 dB</p> <p>Frequency: 2.480000000 GHz</p> <p>CF Step: 200.000 kHz</p> <p>Freq Offset: 0 Hz</p>  |      |

| Modulation Type: |  | $\pi/4$ DQPSK  |
|------------------|--|--|
| <p>CH00</p>      |  | <p>Frequency</p> <p>Center Freq<br/>2.402000000 GHz</p> <p>CF Step<br/>250.000 kHz</p> <p>Freq Offset<br/>0 Hz</p> |
| <p>CH39</p>      |  | <p>Frequency</p> <p>Center Freq<br/>2.441000000 GHz</p> <p>CF Step<br/>250.000 kHz</p> <p>Freq Offset<br/>0 Hz</p> |
| <p>CH78</p>      |  | <p>Frequency</p> <p>Center Freq<br/>2.480000000 GHz</p> <p>CF Step<br/>250.000 kHz</p> <p>Freq Offset<br/>0 Hz</p> |

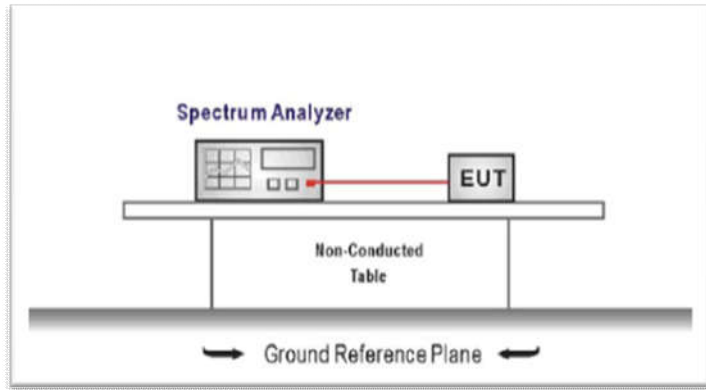
| Modulation Type: |   | 8DPSK   |
|------------------|---|---|
| CH00             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.402000000 GHz</p> <p>Center Freq: 2.402000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.402 GHz</p> <p>#Res BW: 30 kHz</p> <p>#VBW: 100 kHz</p> <p>Span: 2.5 MHz</p> <p>Sweep: 2.667 ms</p> <p>Occupied Bandwidth: 1.2072 MHz</p> <p>Total Power: 6.26 dBm</p> <p>Transmit Freq Error: 35.241 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.328 MHz</p> <p>x dB: -20.00 dB</p> | <p>Frequency</p> <p>Center Freq: 2.402000000 GHz</p> <p>CF Step: 250.000 kHz</p> <p>Freq Offset: 0 Hz</p> |
| CH39             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.441000000 GHz</p> <p>Center Freq: 2.441000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.441 GHz</p> <p>#Res BW: 30 kHz</p> <p>#VBW: 100 kHz</p> <p>Span: 2.5 MHz</p> <p>Sweep: 2.667 ms</p> <p>Occupied Bandwidth: 1.1931 MHz</p> <p>Total Power: 8.54 dBm</p> <p>Transmit Freq Error: 45.437 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.214 MHz</p> <p>x dB: -20.00 dB</p> | <p>Frequency</p> <p>Center Freq: 2.441000000 GHz</p> <p>CF Step: 250.000 kHz</p> <p>Freq Offset: 0 Hz</p> |
| CH78             | <p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.480000000 GHz</p> <p>Center Freq: 2.480000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset: 0.9 dB</p> <p>Ref: 10.50 dBm</p> <p>10 dB/div</p> <p>Center: 2.48 GHz</p> <p>#Res BW: 30 kHz</p> <p>#VBW: 100 kHz</p> <p>Span: 2.5 MHz</p> <p>Sweep: 2.667 ms</p> <p>Occupied Bandwidth: 1.2246 MHz</p> <p>Total Power: 5.74 dBm</p> <p>Transmit Freq Error: 48.869 kHz</p> <p>OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.294 MHz</p> <p>x dB: -20.00 dB</p>  | <p>Frequency</p> <p>Center Freq: 2.480000000 GHz</p> <p>CF Step: 250.000 kHz</p> <p>Freq Offset: 0 Hz</p> |

### 5.5. Carrier Frequencies Separation

**LIMIT**

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1): frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3\*20 dB bandwidth of the hopping channel, whichever is greater.

**TEST CONFIGURATION**



**TEST PROCEDURE**

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
 Span = wide enough to capture the peaks of two adjacent channels  
 RBW ≥ 1% of the span, VBW ≥ RBW  
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

**TEST MODE:**

Please refer to the clause 3.3

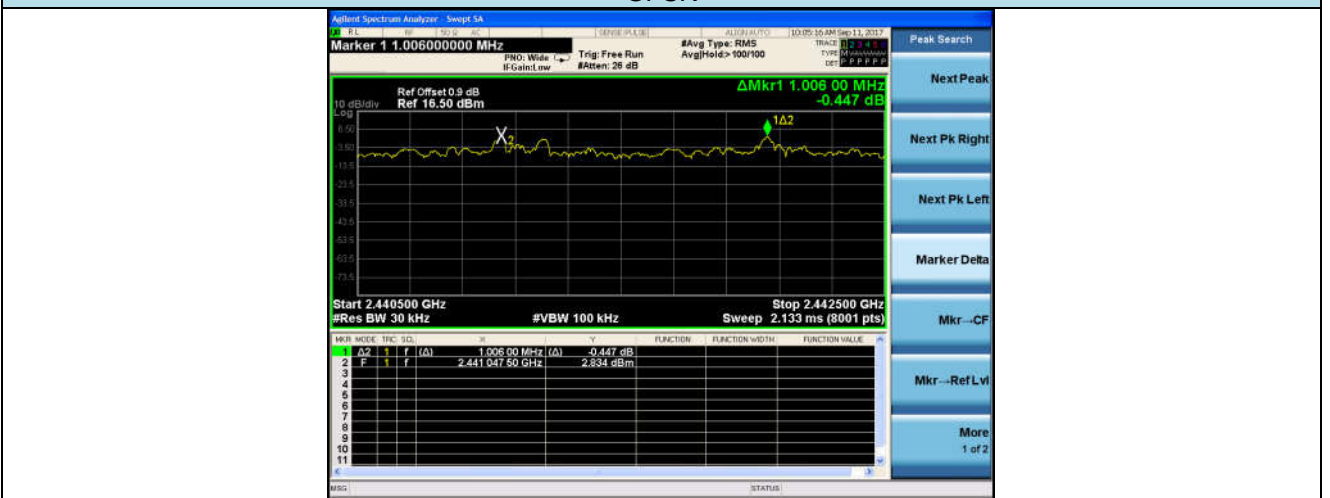
**TEST RESULTS**

**Passed**       **Not Applicable**

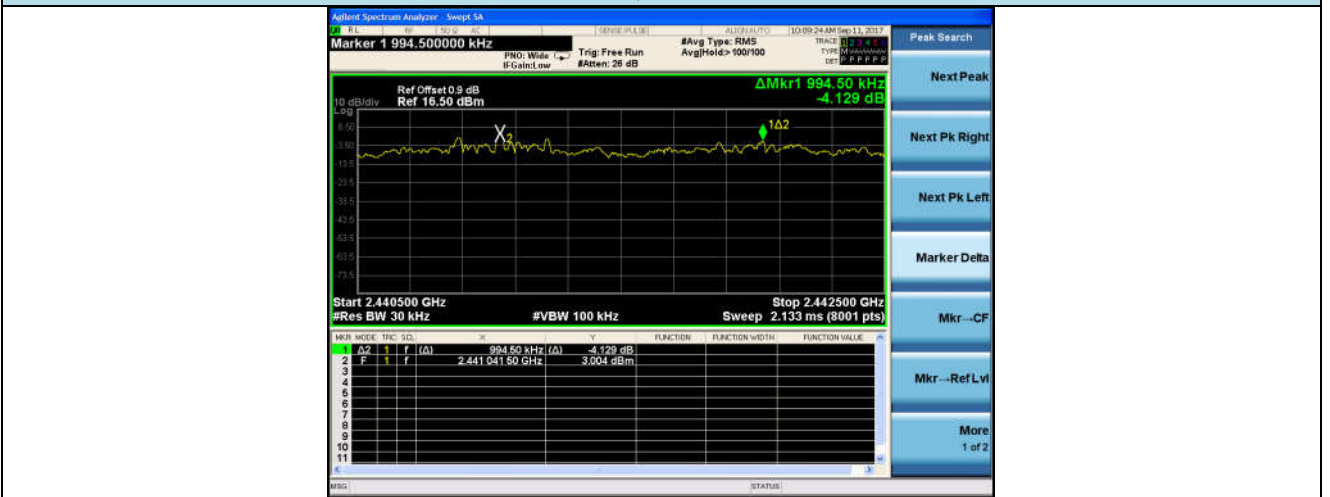
| Modulation type | Channel | Carrier Frequencies Separation (MHz) | Limit (MHz) | Result |
|-----------------|---------|--------------------------------------|-------------|--------|
| GFSK            | 39      | 1.019                                | ≥0.927      | Pass   |
| π/4DQPSK        | 39      | 1.006                                | ≥0.894      | Pass   |
| 8DPSK           | 39      | 0.995                                | ≥0.885      | Pass   |



GFSK



$\pi/4$ DQPSK/MCH



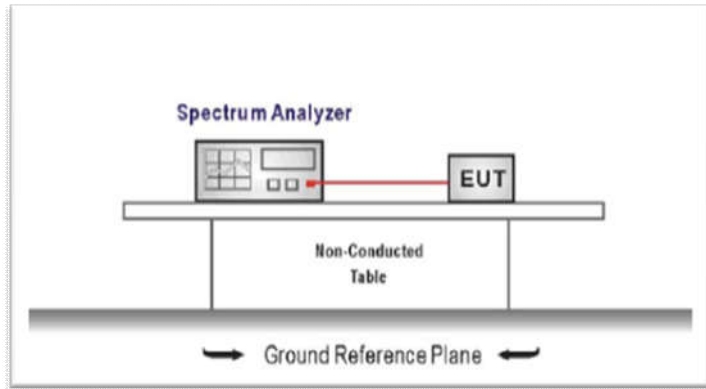
8DPSK

## 5.6. Hopping Channel Number

### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):  
 Frequency hopping systems in the 2400–2483.5 MHz band shall use at least **15** channels.

### TEST CONFIGURATION



### TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
 Span = the frequency band of operation  
 RBW  $\geq$  1% of the span, VBW  $\geq$  RBW  
 Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

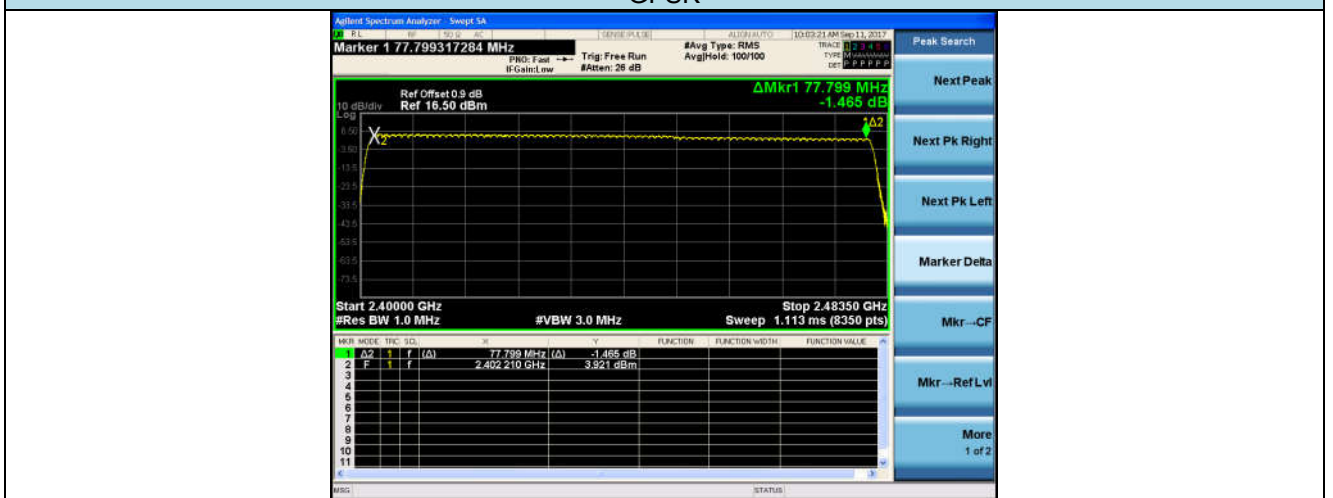
**Passed**       **Not Applicable**

| Modulation type | Channel number | Limit        | Result |
|-----------------|----------------|--------------|--------|
| GFSK            | 79             | $\geq 15.00$ | Pass   |
| $\pi/4$ DQPSK   | 79             |              |        |
| 8DPSK           | 79             |              |        |

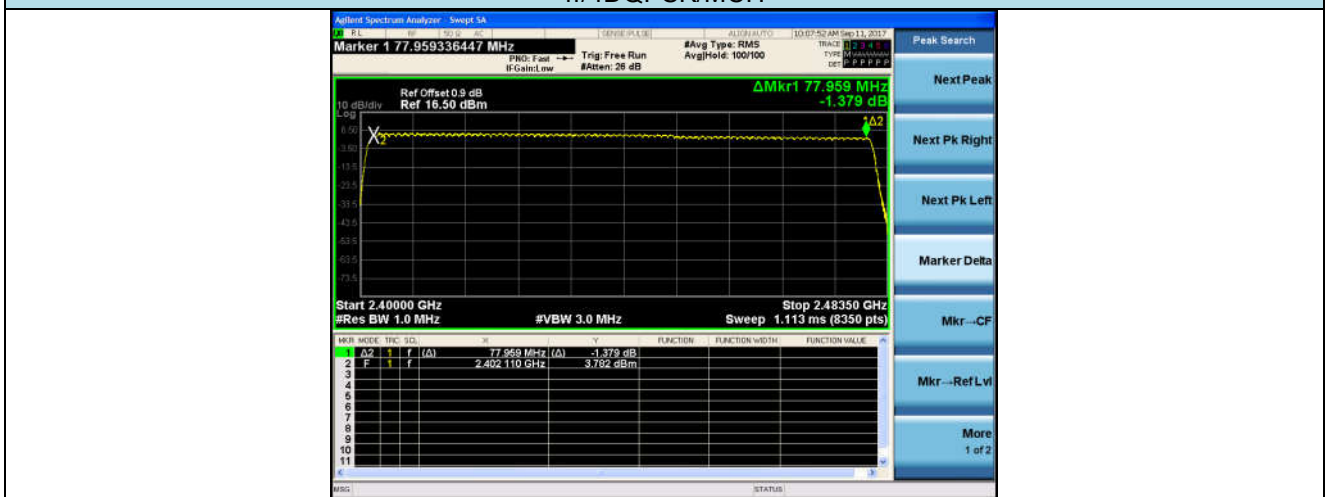




GFSK



$\pi/4$ DQPSK/MCH



8DPSK

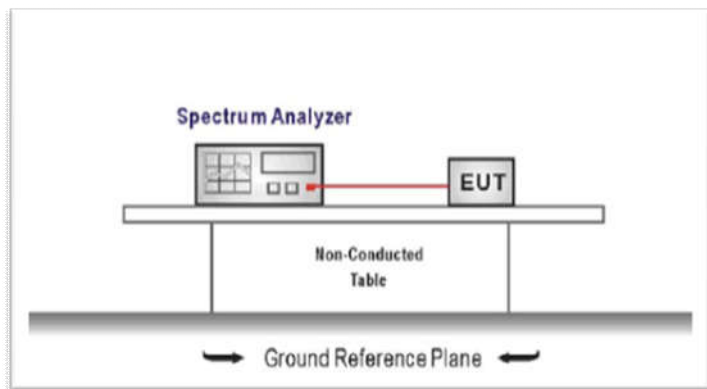
### 5.7. Dwell Time

#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:  
 Span = zero span, centered on a hopping channel, RBW= 1 MHz, VBW ≥ RBW  
 Sweep = as necessary to capture the entire dwell time per hopping channel,  
 Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

Passed       Not Applicable

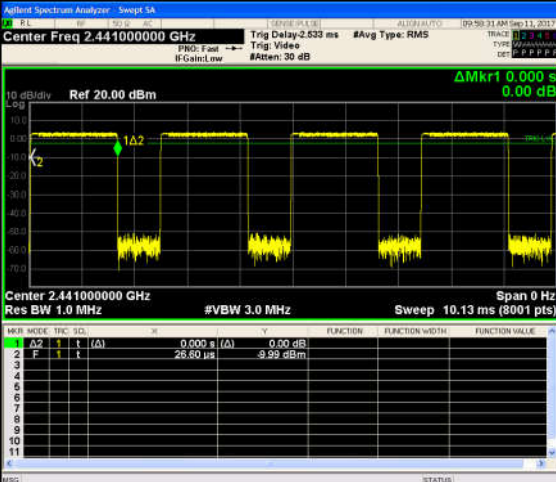
| Modulation type | Channel | Dwell time (Second) | Limit (Second) | Result |
|-----------------|---------|---------------------|----------------|--------|
| GFSK            | DH1     | 0.131               | ≤0.40          | Pass   |
|                 | DH3     | 0.267               |                |        |
|                 | DH5     | 0.310               |                |        |
| π/4DQPSK        | 2DH1    | 0.134               | ≤0.40          | Pass   |
|                 | 2DH3    | 0.267               |                |        |
|                 | 2DH5    | 0.312               |                |        |
| 8DPSK           | 3DH1    | 0.134               | ≤0.40          | Pass   |
|                 | 3DH3    | 0.267               |                |        |
|                 | 3DH5    | 0.312               |                |        |

Note:

1. We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.
2. Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2DH1, 3DH1  
 Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2DH3, 3DH3  
 Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2DH5, 3DH5

| Modulation Type: |  | GFSK |
|------------------|--|------|
| DH1              | <p>Agilent Spectrum Analyzer - Swept SA<br/>         Center Freq 2.441000000 GHz<br/>         Ref 20.00 dBm<br/>         Trig Delay: 2.633 ms #Avg Type: RMS<br/>         Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)<br/>         ΔMkr1 0.000 s 0.00 dB<br/>         1 Δ2 1 t (Δ) 0.000 s (Δ) 0.00 dB<br/>         2 F 1 t (Δ) 26.80 μs -7.67 dBm</p> |      |
| DH3              | <p>Agilent Spectrum Analyzer - Swept SA<br/>         Center Freq 2.441000000 GHz<br/>         Ref 20.00 dBm<br/>         Trig Delay: 2.633 ms #Avg Type: RMS<br/>         Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)<br/>         ΔMkr1 0.000 s 0.00 dB<br/>         1 Δ2 1 t (Δ) 0.000 s (Δ) 0.00 dB<br/>         2 F 1 t (Δ) 26.80 μs -7.66 dBm</p> |      |
| DH5              | <p>Agilent Spectrum Analyzer - Swept SA<br/>         Center Freq 2.441000000 GHz<br/>         Ref 20.00 dBm<br/>         Trig Delay: 2.533 ms #Avg Type: RMS<br/>         Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)<br/>         ΔMkr1 0.000 s 0.00 dB<br/>         1 Δ2 1 t (Δ) 0.000 s (Δ) 0.00 dB<br/>         2 F 1 t (Δ) 2.526 ms -9.49 dBm</p> |      |

| Modulation Type: |      | $\pi/4$ DQPSK   |     |      |             |                |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
|------------------|------|---|-----|------|-------------|----------------|----------------|----------|----------------|----------------|---|----|---|---|-----|-------------|---------|--|---|---|---|---|--|----------|-----------|--|
| 2DH1             |      | <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.633 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>10 dB/div</p> <p>Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td>0.000 s (Δ)</td> <td>0.00 dB</td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td></td> <td>1.121 ms</td> <td>-8.19 dBm</td> <td></td> </tr> </tbody> </table> | MNR | MODE | TRF         | SC             | Y              | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) | 0.000 s (Δ) | 0.00 dB |  | 2 | F | t | t |  | 1.121 ms | -8.19 dBm |  |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION    | FUNCTION WIDTH | FUNCTION VALUE |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 1                | Δ2   | t   | t   | (Δ)  | 0.000 s (Δ) | 0.00 dB        |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 2                | F    | t   | t   |      | 1.121 ms    | -8.19 dBm      |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 2DH3             |      | <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.533 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>10 dB/div</p> <p>Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td>0.000 s (Δ)</td> <td>0.00 dB</td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td></td> <td>2.104 ms</td> <td>-7.92 dBm</td> <td></td> </tr> </tbody> </table> | MNR | MODE | TRF         | SC             | Y              | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) | 0.000 s (Δ) | 0.00 dB |  | 2 | F | t | t |  | 2.104 ms | -7.92 dBm |  |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION    | FUNCTION WIDTH | FUNCTION VALUE |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 1                | Δ2   | t   | t   | (Δ)  | 0.000 s (Δ) | 0.00 dB        |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 2                | F    | t   | t   |      | 2.104 ms    | -7.92 dBm      |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 2DH5             |      | <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.533 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>10 dB/div</p> <p>Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td>0.000 s (Δ)</td> <td>0.00 dB</td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td></td> <td>2.174 ms</td> <td>-8.86 dBm</td> <td></td> </tr> </tbody> </table> | MNR | MODE | TRF         | SC             | Y              | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) | 0.000 s (Δ) | 0.00 dB |  | 2 | F | t | t |  | 2.174 ms | -8.86 dBm |  |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION    | FUNCTION WIDTH | FUNCTION VALUE |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 1                | Δ2   | t   | t   | (Δ)  | 0.000 s (Δ) | 0.00 dB        |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |
| 2                | F    | t   | t   |      | 2.174 ms    | -8.86 dBm      |                |          |                |                |   |    |   |   |     |             |         |  |   |   |   |   |  |          |           |  |

| Modulation Type: |      | 8DPSK   |     |      |          |                |                     |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
|------------------|------|---|-----|------|----------|----------------|---------------------|----------|----------------|----------------|---|----|---|---|-----|--|--|---------------------|---|---|---|---|-----|--|--|--------------------|
| 3DH1             |      |  <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.633 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>Center 2.441000000 GHz</p> <p>Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>0.000 s (Δ) 0.00 dB</td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>26.80 μs -8.63 dBm</td> </tr> </tbody> </table>   | MNR | MODE | TRF      | SC             | Y                   | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) |  |  | 0.000 s (Δ) 0.00 dB | 2 | F | t | t | (Δ) |  |  | 26.80 μs -8.63 dBm |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE      |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 1                | Δ2   | t   | t   | (Δ)  |          |                | 0.000 s (Δ) 0.00 dB |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 2                | F    | t   | t   | (Δ)  |          |                | 26.80 μs -8.63 dBm  |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 3DH3             |      |  <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.633 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>Center 2.441000000 GHz</p> <p>Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>0.000 s (Δ) 0.00 dB</td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>26.80 μs -9.99 dBm</td> </tr> </tbody> </table>  | MNR | MODE | TRF      | SC             | Y                   | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) |  |  | 0.000 s (Δ) 0.00 dB | 2 | F | t | t | (Δ) |  |  | 26.80 μs -9.99 dBm |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE      |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 1                | Δ2   | t   | t   | (Δ)  |          |                | 0.000 s (Δ) 0.00 dB |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 2                | F    | t   | t   | (Δ)  |          |                | 26.80 μs -9.99 dBm  |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 3DH5             |      |  <p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.441000000 GHz</p> <p>Trig Delay-2.633 ms #Avg Type: RMS</p> <p>Ref 20.00 dBm</p> <p>Center 2.441000000 GHz</p> <p>Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRF</th> <th>SC</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>0.000 s (Δ) 0.00 dB</td> </tr> <tr> <td>2</td> <td>F</td> <td>t</td> <td>t</td> <td>(Δ)</td> <td></td> <td></td> <td>618.9 μs -7.45 dBm</td> </tr> </tbody> </table> | MNR | MODE | TRF      | SC             | Y                   | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | 1 | Δ2 | t | t | (Δ) |  |  | 0.000 s (Δ) 0.00 dB | 2 | F | t | t | (Δ) |  |  | 618.9 μs -7.45 dBm |
| MNR              | MODE | TRF   | SC  | Y    | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE      |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 1                | Δ2   | t   | t   | (Δ)  |          |                | 0.000 s (Δ) 0.00 dB |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |
| 2                | F    | t   | t   | (Δ)  |          |                | 618.9 μs -7.45 dBm  |          |                |                |   |    |   |   |     |  |  |                     |   |   |   |   |     |  |  |                    |

### 5.8. Pseudorandom Frequency Hopping Sequence

#### LIMIT

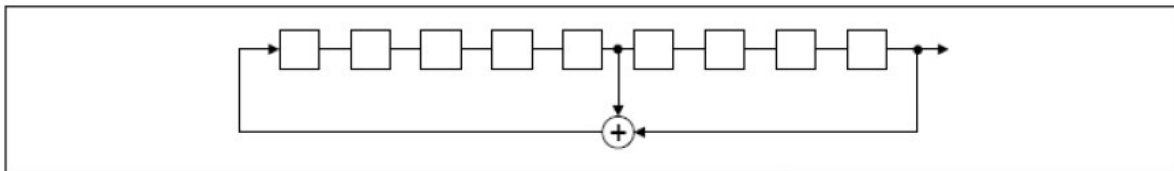
FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

#### TEST RESULTS

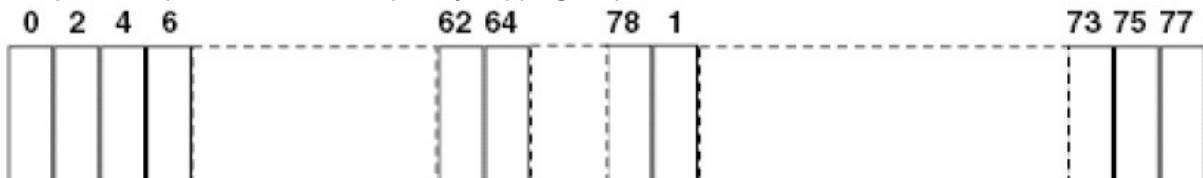
The pseudorandom frequency hopping sequence may be generated in a nine-stage shift register whose 5<sup>th</sup> and 9<sup>th</sup> stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits
- Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally on the average by each transmitter. The system receiver has input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

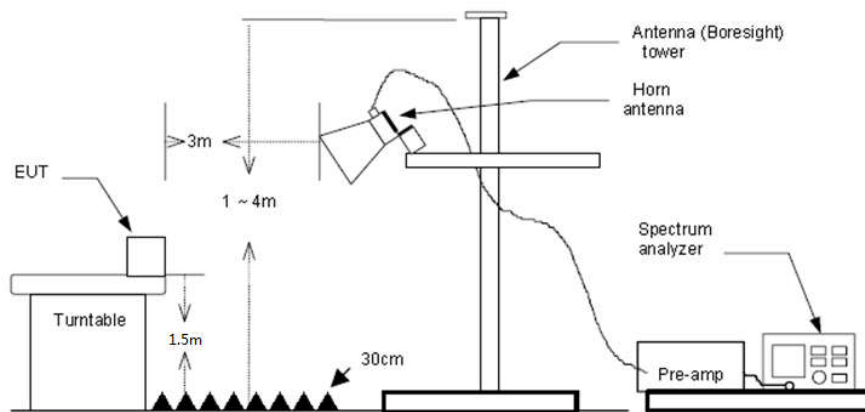
## 5.9. Restricted band (radiated)

### LIMIT

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:  
 RBW=1 MHz, VBW=3 MHz for Peak value  
 RBW=1 MHz, VBW=10 Hz for Average value.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

**Passed**       **Not Applicable**

Note:

- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
- 2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.
- 3) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

| CH00            |                   |                       |                 |                    |                |                     |                   |              |            |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-------------------|--------------|------------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Margin Limit (dB) | Polarization | Test value |
| 2310.00         | 33.40             | 28.05                 | 6.62            | 37.65              | 30.42          | 74.00               | -43.58            | Vertical     | Peak       |
| 2390.03         | 36.33             | 27.65                 | 6.75            | 37.87              | 32.86          | 74.00               | -41.14            | Vertical     |            |
| 2310.00         | 22.92             | 28.05                 | 6.62            | 37.65              | 19.94          | 54.00               | -34.06            | Vertical     | Average    |
| 2390.03         | 22.58             | 27.65                 | 6.75            | 37.87              | 19.11          | 54.00               | -34.89            | Vertical     |            |
| 2310.00         | 35.64             | 28.05                 | 6.62            | 37.65              | 32.66          | 74.00               | -41.34            | Horizontal   | Peak       |
| 2390.03         | 35.01             | 27.65                 | 6.75            | 37.87              | 31.54          | 74.00               | -42.46            | Horizontal   |            |
| 2310.00         | 22.67             | 28.05                 | 6.62            | 37.65              | 19.69          | 54.00               | -34.31            | Horizontal   | Average    |
| 2390.03         | 22.54             | 27.65                 | 6.75            | 37.87              | 19.07          | 54.00               | -34.93            | Horizontal   |            |

| CH78            |                   |                       |                 |                    |                |                     |                   |              |            |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-------------------|--------------|------------|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Margin Limit (dB) | Polarization | Test value |
| 2483.50         | 63.42             | 27.26                 | 6.83            | 37.87              | 59.64          | 74.00               | -14.36            | Vertical     | Peak       |
| 2500.00         | 37.67             | 27.20                 | 6.84            | 37.87              | 33.84          | 74.00               | -40.16            | Vertical     |            |
| 2483.50         | 31.65             | 27.26                 | 6.83            | 37.87              | 27.87          | 54.00               | -26.13            | Vertical     | Average    |
| 2500.00         | 23.46             | 27.20                 | 6.84            | 37.87              | 19.63          | 54.00               | -34.37            | Vertical     |            |
| 2483.50         | 61.86             | 27.26                 | 6.83            | 37.87              | 58.08          | 74.00               | -15.92            | Horizontal   | Peak       |
| 2500.00         | 38.44             | 27.20                 | 6.84            | 37.87              | 34.61          | 74.00               | -39.39            | Horizontal   |            |
| 2483.50         | 29.66             | 27.26                 | 6.83            | 37.87              | 25.88          | 54.00               | -28.12            | Horizontal   | Average    |
| 2500.00         | 22.54             | 27.20                 | 6.84            | 37.87              | 18.71          | 54.00               | -35.29            | Horizontal   |            |