

## Test Report

**Report No. :** CQASZ20190500019EX-01  
**Applicant:** MAYFLASH LIMITED  
**Address of Applicant:** 3/F, Buiding No.1, TingWei Industrial Park, LiuFang Rd, No.67, BaoAn, Shenzhen, China.  
**Manufacturer:** MAYFLASH LIMITED  
**Address of Manufacturer:** 3/F, Buiding No.1, TingWei Industrial Park, LiuFang Rd, No.67, BaoAn, Shenzhen, China.  
**Equipment Under Test (EUT):**  
**Product:** MAGIC-S V1.1  
**Test Model No.:** MAGIC-S V1.1  
**Brand Name:** N/A  
**FCC ID:** 2ASVQ-MAGICSV1  
**Standards:** 47 CFR Part 15, Subpart C  
**Date of Test:** May 10, 2019 to May 30, 2019  
**Date of Issue:** May 30, 2019  
**Test Result :** PASS\*

**Tested By:**

Daisy Qin

**Reviewed By:**

(Daisy Qin)  
Aaron Ma

**Approved By:**

(Aaron Ma)  
Jack Ai

( Jack Ai)



\* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

## 1 Version

### Revision History Of Report

| Report No.            | Version | Description    | Issue Date   |
|-----------------------|---------|----------------|--------------|
| CQASZ20190500019EX-01 | Rev.01  | Initial report | May 30, 2019 |

## 2 Test Summary

| Test Item                                                         | Test Requirement                                                                | Test method        | Result |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------|--------|
| Antenna Requirement                                               | 47 CFR Part 15, Subpart C Section 15.203/15.247 (c)                             | ANSI C63.10 (2013) | PASS   |
| AC Power Line Conducted Emission                                  | 47 CFR Part 15, Subpart C Section 15.207                                        | ANSI C63.10 (2013) | PASS   |
| Conducted Peak Output Power                                       | 47 CFR Part 15, Subpart C Section 15.247 (b)(1)                                 | ANSI C63.10 (2013) | PASS   |
| 20dB Occupied Bandwidth                                           | 47 CFR Part 15, Subpart C Section 15.247 (a)(1)                                 | ANSI C63.10 (2013) | PASS   |
| Carrier Frequencies Separation                                    | 47 CFR Part 15, Subpart C Section 15.247 (a)(1)                                 | ANSI C63.10 (2013) | PASS   |
| Hopping Channel Number                                            | 47 CFR Part 15, Subpart C Section 15.247 (a)(1)                                 | ANSI C63.10 (2013) | PASS   |
| Dwell Time                                                        | 47 CFR Part 15, Subpart C Section 15.247 (a)(1)                                 | ANSI C63.10 (2013) | PASS   |
| Pseudorandom Frequency Hopping Sequence                           | 47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002) | ANSI C63.10 (2013) | PASS   |
| Band-edge for RF Conducted Emissions                              | 47 CFR Part 15, Subpart C Section 15.247(d)                                     | ANSI C63.10 (2013) | PASS   |
| RF Conducted Spurious Emissions                                   | 47 CFR Part 15, Subpart C Section 15.247(d)                                     | ANSI C63.10 (2013) | PASS   |
| Radiated Spurious emissions                                       | 47 CFR Part 15, Subpart C Section 15.205/15.209                                 | ANSI C63.10 (2013) | PASS   |
| Restricted bands around fundamental frequency (Radiated Emission) | 47 CFR Part 15, Subpart C Section 15.205/15.209                                 | ANSI C63.10 (2013) | PASS   |

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## 4 General Information

### 4.1 Client Information

|                          |                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------|
| Applicant:               | MAYFLASH LIMITED                                                                       |
| Address of Applicant:    | 3/F, Buiding No.1, TingWei Industrial Park, LiuFang Rd, No.67, BaoAn, Shenzhen, China. |
| Manufacturer:            | MAYFLASH LIMITED                                                                       |
| Address of Manufacturer: | 3/F, Buiding No.1, TingWei Industrial Park, LiuFang Rd, No.67, BaoAn, Shenzhen, China. |

### 4.2 General Description of EUT

|                       |                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| Product Name:         | MAGIC-S V1.1                                                                                                       |
| Test Model No.:       | MAGIC-S V1.1                                                                                                       |
| Trade Mark:           | N/A                                                                                                                |
| Hardware Version:     | V 1.1                                                                                                              |
| Software Version:     | V 1.04                                                                                                             |
| Operation Frequency:  | 2402MHz~2480MHz                                                                                                    |
| Bluetooth Version:    | V4.2/ EDR                                                                                                          |
| Modulation Technique: | Frequency Hopping Spread Spectrum(FHSS)                                                                            |
| Modulation Type:      | GFSK, $\pi/4$ DQPSK, 8DPSK                                                                                         |
| Transfer Rate:        | 1Mbps/2Mbps/3Mbps                                                                                                  |
| Number of Channel:    | 79                                                                                                                 |
| Hopping Channel Type: | Adaptive Frequency Hopping systems                                                                                 |
| Product Type:         | <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Fix Location |
| Antenna Type:         | PCB Antenna                                                                                                        |
| Antenna Gain:         | 0 dBi                                                                                                              |
| EUT Power Supply:     | DC 5V from PC                                                                                                      |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 0                                   | 2402MHz   | 20      | 2422MHz   | 40      | 2442MHz   | 60      | 2462MHz   |
| 1                                   | 2403MHz   | 21      | 2423MHz   | 41      | 2443MHz   | 61      | 2463MHz   |
| 2                                   | 2404MHz   | 22      | 2424MHz   | 42      | 2444MHz   | 62      | 2464MHz   |
| 3                                   | 2405MHz   | 23      | 2425MHz   | 43      | 2445MHz   | 63      | 2465MHz   |
| 4                                   | 2406MHz   | 24      | 2426MHz   | 44      | 2446MHz   | 64      | 2466MHz   |
| 5                                   | 2407MHz   | 25      | 2427MHz   | 45      | 2447MHz   | 65      | 2467MHz   |
| 6                                   | 2408MHz   | 26      | 2428MHz   | 46      | 2448MHz   | 66      | 2468MHz   |
| 7                                   | 2409MHz   | 27      | 2429MHz   | 47      | 2449MHz   | 67      | 2469MHz   |
| 8                                   | 2410MHz   | 28      | 2430MHz   | 48      | 2450MHz   | 68      | 2470MHz   |
| 9                                   | 2411MHz   | 29      | 2431MHz   | 49      | 2451MHz   | 69      | 2471MHz   |
| 10                                  | 2412MHz   | 30      | 2432MHz   | 50      | 2452MHz   | 70      | 2472MHz   |
| 11                                  | 2413MHz   | 31      | 2433MHz   | 51      | 2453MHz   | 71      | 2473MHz   |
| 12                                  | 2414MHz   | 32      | 2434MHz   | 52      | 2454MHz   | 72      | 2474MHz   |
| 13                                  | 2415MHz   | 33      | 2435MHz   | 53      | 2455MHz   | 73      | 2475MHz   |
| 14                                  | 2416MHz   | 34      | 2436MHz   | 54      | 2456MHz   | 74      | 2476MHz   |
| 15                                  | 2417MHz   | 35      | 2437MHz   | 55      | 2457MHz   | 75      | 2477MHz   |
| 16                                  | 2418MHz   | 36      | 2438MHz   | 56      | 2458MHz   | 76      | 2478MHz   |
| 17                                  | 2419MHz   | 37      | 2439MHz   | 57      | 2459MHz   | 77      | 2479MHz   |
| 18                                  | 2420MHz   | 38      | 2440MHz   | 58      | 2460MHz   | 78      | 2480MHz   |
| 19                                  | 2421MHz   | 39      | 2441MHz   | 59      | 2461MHz   |         |           |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel             | Frequency |
|---------------------|-----------|
| The Lowest channel  | 2402MHz   |
| The Middle channel  | 2441MHz   |
| The Highest channel | 2480MHz   |

### 4.3 Test Environment

| Operating Environment: |                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Temperature:           | 25.0 °C                                                                                                                     |
| Humidity:              | 53 % RH                                                                                                                     |
| Atmospheric Pressure:  | 995mbar                                                                                                                     |
| Test Mode:             | Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT. |

### 4.4 Description of Support Units

The EUT has been tested with associated equipment below.

| Description   | Manufacturer | Model No.      | Remark         | FCC certification |
|---------------|--------------|----------------|----------------|-------------------|
| PC            | Lenovo       | ThinkPad E450c | Provide by lab | FCC ID            |
| AC/DC Adapter | Lenovo       | ADLX65NLC3A    | Provide by lab | FCC SDOC          |

#### 4.5 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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology 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 CQA laboratory is reported:

| No. | Item                               | Uncertainty        | Notes |
|-----|------------------------------------|--------------------|-------|
| 1   | Radiated Emission (Below 1GHz)     | ±5.12dB            | (1)   |
| 2   | Radiated Emission (Above 1GHz)     | ±4.60dB            | (1)   |
| 3   | Conducted Disturbance (0.15~30MHz) | ±3.34dB            | (1)   |
| 4   | Radio Frequency                    | $3 \times 10^{-8}$ | (1)   |
| 5   | Duty cycle                         | 0.6 %.             | (1)   |
| 6   | Occupied Bandwidth                 | 1.1%               | (1)   |
| 7   | RF conducted power                 | 0.86dB             | (1)   |
| 8   | RF power density                   | 0.74               | (1)   |
| 9   | Conducted Spurious emissions       | 0.86dB             | (1)   |
| 10  | Temperature test                   | 0.8°C              | (1)   |
| 11  | Humidity test                      | 2.0%               | (1)   |
| 12  | Supply voltages                    | 0.5 %.             | (1)   |
| 13  | time                               | 0.6 %.             | (1)   |
| 14  | Frequency Error                    | 5.5 Hz             | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 4.6 Test Location

**Shenzhen Huaxia Testing Technology Co., Ltd,**

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

## 4.7 Test Facility

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

• **ISED No.: 22984**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements

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

• **CNAS (No. CNAS L5785)**

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen 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 No.:522263

## 4.8 Abnormalities from Standard Conditions

None.

## 4.9 Other Information Requested by the Customer

None.

#### 4.10 Equipment List

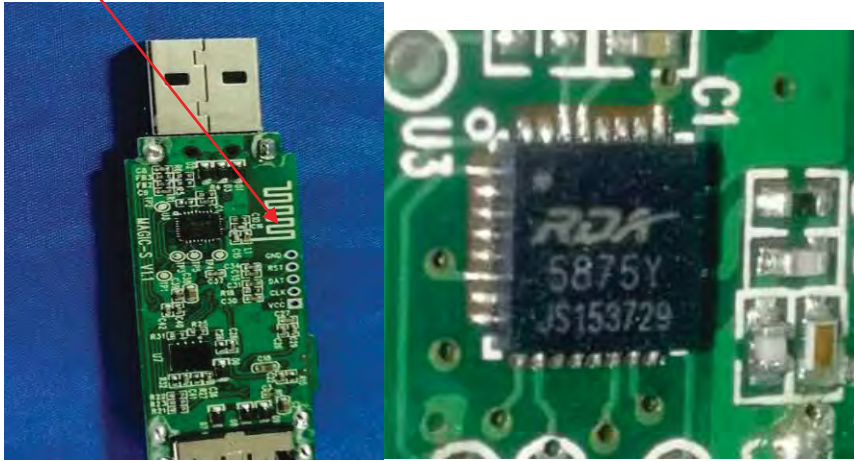
| Test Equipment             | Manufacturer | Model No.              | Instrument No. | Calibration Date | Calibration Due Date |
|----------------------------|--------------|------------------------|----------------|------------------|----------------------|
| EMI Test Receiver          | R&S          | ESR7                   | CQA-005        | 2018/9/26        | 2019/9/25            |
| Spectrum analyzer          | R&S          | FSU26                  | CQA-038        | 2018/10/28       | 2019/10/27           |
| Preamplifier               | MITEQ        | AFS4-00010300-18-10P-4 | CQA-035        | 2018/9/26        | 2019/9/25            |
| Preamplifier               | MITEQ        | AMF-6D-02001800-29-20P | CQA-036        | 2018/11/2        | 2019/11/1            |
| Loop antenna               | Schwarzbeck  | FMZB1516               | CQA-087        | 2018/10/28       | 2020/10/27           |
| Bilog Antenna              | R&S          | HL562                  | CQA-011        | 2018/9/26        | 2020/9/25            |
| Horn Antenna               | R&S          | HF906                  | CQA-012        | 2018/9/26        | 2020/9/25            |
| Horn Antenna               | Schwarzbeck  | BBHA 9170              | CQA-088        | 2018/9/26        | 2020/9/25            |
| Coaxial Cable (Above 1GHz) | CQA          | N/A                    | C019           | 2018/9/26        | 2019/9/25            |
| Coaxial Cable (Below 1GHz) | CQA          | N/A                    | C020           | 2018/9/26        | 2019/9/25            |
| Spectrum analyzer          | Agilent      | E4440A                 | CQA-103        | 2018/10/28       | 2019/10/27           |
| Antenna Connector          | CQA          | RFC-01                 | CQA-080        | 2018/9/26        | 2019/9/25            |
| RF cable(9KHz~40GHz)       | CQA          | RF-01                  | CQA-079        | 2018/9/26        | 2019/9/25            |
| Power divider              | MIDWEST      | PWD-2533-02-SMA-79     | CQA-067        | 2018/9/26        | 2019/9/25            |
| EMI Test Receiver          | R&S          | ESPI3                  | CQA-013        | 2018/9/26        | 2019/9/25            |
| LISN                       | R&S          | ENV216                 | CQA-003        | 2018/11/5        | 2019/11/4            |
| Coaxial cable              | CQA          | N/A                    | CQA-C009       | 2018/9/26        | 2019/9/25            |

Note:

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

## 5 Test results and Measurement Data

### 5.1 Antenna Requirement

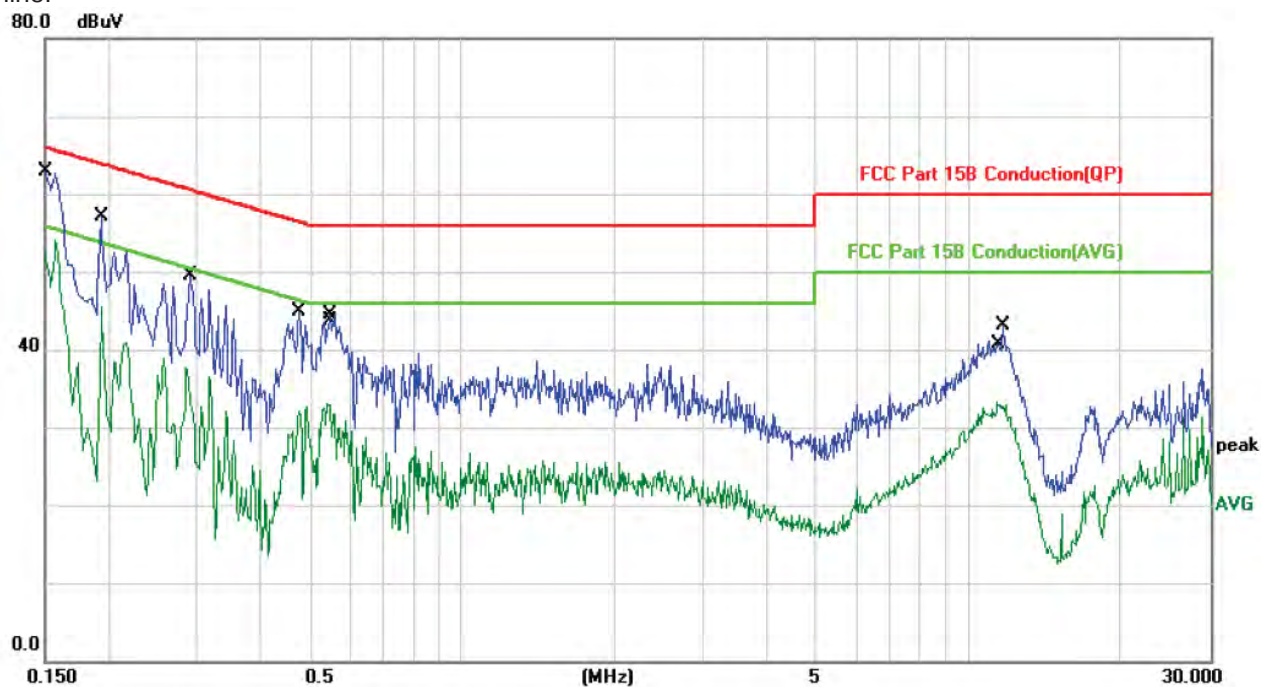
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 47 CFR Part 15C Section 15.203 /247(c)                                                                                                                                                |
| <p>15.203 requirement:<br/>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.</p> <p>15.247(b) (4) requirement:<br/>The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p> |                                                                                                                                                                                       |
| <b>EUT Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>PCB Antenna</p>  <p>The antenna is PCB Antenna. The best case gain of the antenna is 0 dBi.</p> |



|                        |                                                                                                                                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exploratory Test Mode: | Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel.                                      |
| Final Test Mode:       | Through Pre-scan, find the 3DH5 of data type and 8DPSK modulation at the highest channel is the worst case.<br>Only the worst case is recorded in the report. |
| Test Voltage:          | AC 120V/60Hz                                                                                                                                                  |
| Test Results:          | Pass                                                                                                                                                          |

**Measurement Data**

L line:

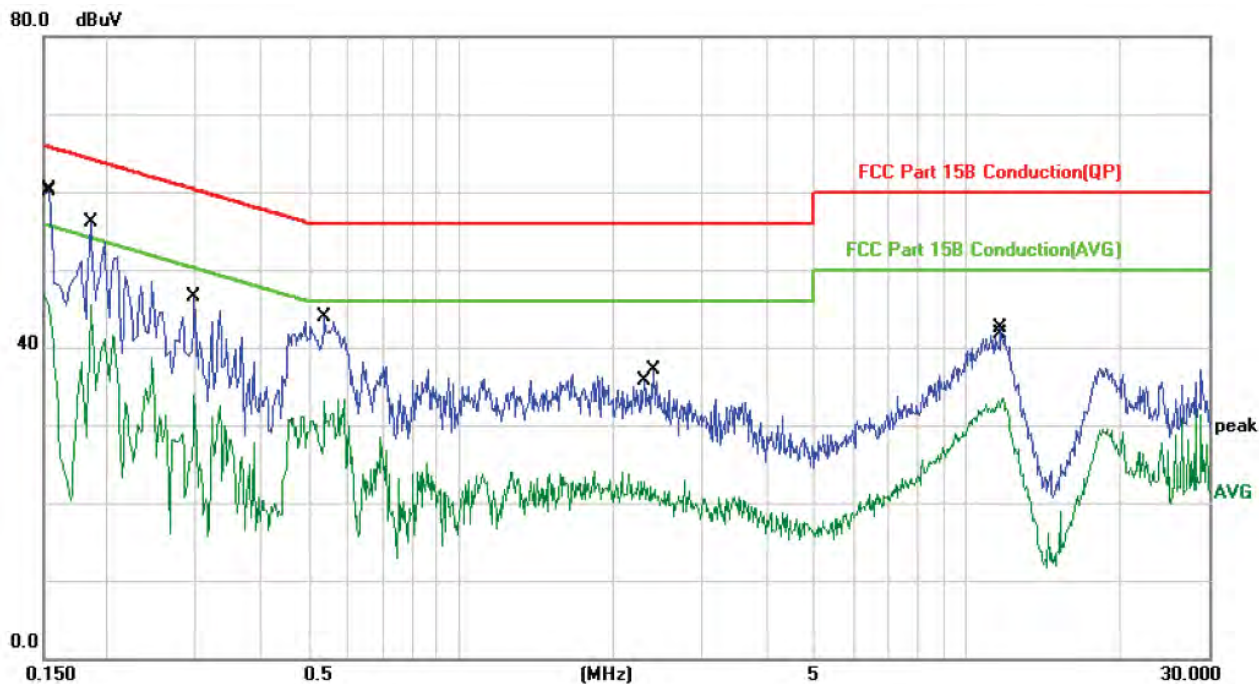


| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   | *   | 0.1500       | 62.95                    | 0.00                    | 62.95                    | 65.99         | -3.04      | QP       |         |
| 2   |     | 0.1500       | 52.57                    | 0.00                    | 52.57                    | 55.99         | -3.42      | AVG      |         |
| 3   |     | 0.1940       | 57.01                    | 0.00                    | 57.01                    | 63.86         | -6.85      | QP       |         |
| 4   |     | 0.1940       | 45.48                    | 0.00                    | 45.48                    | 53.86         | -8.38      | AVG      |         |
| 5   |     | 0.2860       | 37.67                    | 0.10                    | 37.77                    | 50.64         | -12.87     | AVG      |         |
| 6   |     | 0.2900       | 49.35                    | 0.10                    | 49.45                    | 60.52         | -11.07     | QP       |         |
| 7   |     | 0.4780       | 44.71                    | 0.10                    | 44.81                    | 56.37         | -11.56     | QP       |         |
| 8   |     | 0.4780       | 31.91                    | 0.10                    | 32.01                    | 46.37         | -14.36     | AVG      |         |
| 9   |     | 0.5420       | 32.93                    | 0.10                    | 33.03                    | 46.00         | -12.97     | AVG      |         |
| 10  |     | 0.5500       | 44.43                    | 0.10                    | 44.53                    | 56.00         | -11.47     | QP       |         |
| 11  |     | 11.4180      | 32.77                    | 0.44                    | 33.21                    | 50.00         | -16.79     | AVG      |         |
| 12  |     | 11.6860      | 42.61                    | 0.45                    | 43.06                    | 60.00         | -16.94     | QP       |         |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

N line:

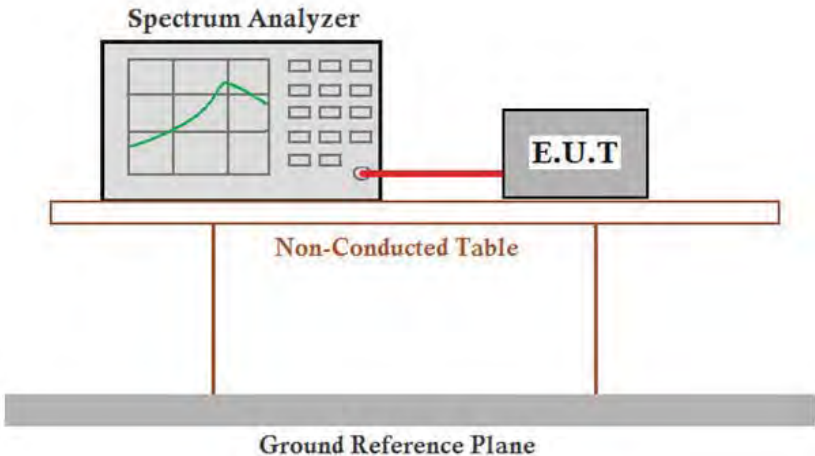


| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measurement | Limit | Over   | Detector | Comment |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV          | dB             | dBuV        | dBuV  | dB     |          |         |
| 1   |     | 0.1500  | 46.90         | 0.00           | 46.90       | 55.99 | -9.09  | AVG      |         |
| 2   | *   | 0.1539  | 60.23         | 0.00           | 60.23       | 65.78 | -5.55  | QP       |         |
| 3   |     | 0.1860  | 56.17         | 0.00           | 56.17       | 64.21 | -8.04  | QP       |         |
| 4   |     | 0.1860  | 45.50         | 0.00           | 45.50       | 54.21 | -8.71  | AVG      |         |
| 5   |     | 0.2980  | 46.43         | 0.10           | 46.53       | 60.30 | -13.77 | QP       |         |
| 6   |     | 0.2980  | 33.75         | 0.10           | 33.85       | 50.30 | -16.45 | AVG      |         |
| 7   |     | 0.5380  | 43.82         | 0.10           | 43.92       | 56.00 | -12.08 | QP       |         |
| 8   |     | 0.5380  | 32.97         | 0.10           | 33.07       | 46.00 | -12.93 | AVG      |         |
| 9   |     | 2.3020  | 22.58         | 0.10           | 22.68       | 46.00 | -23.32 | AVG      |         |
| 10  |     | 2.4020  | 36.90         | 0.11           | 37.01       | 56.00 | -18.99 | QP       |         |
| 11  |     | 11.6820 | 41.99         | 0.45           | 42.44       | 60.00 | -17.56 | QP       |         |
| 12  |     | 11.7540 | 33.08         | 0.45           | 33.53       | 50.00 | -16.47 | AVG      |         |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

### 5.3 Conducted Peak Output Power

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (b)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | 30dBm                                                                                                                                                                                                                                                                          |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                 |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

## Measurement Data

| GFSK mode          |                         |             |        |
|--------------------|-------------------------|-------------|--------|
| Test channel       | Peak Output Power (dBm) | Limit (dBm) | Result |
| Lowest             | 3.770                   | 30.00       | Pass   |
| Middle             | 2.809                   | 30.00       | Pass   |
| Highest            | 3.999                   | 30.00       | Pass   |
| $\pi/4$ DQPSK mode |                         |             |        |
| Test channel       | Peak Output Power (dBm) | Limit (dBm) | Result |
| Lowest             | 3.695                   | 30.00       | Pass   |
| Middle             | 2.839                   | 30.00       | Pass   |
| Highest            | 4.048                   | 30.00       | Pass   |
| 8DPSK mode         |                         |             |        |
| Test channel       | Peak Output Power (dBm) | Limit (dBm) | Result |
| Lowest             | 3.773                   | 30.00       | Pass   |
| Middle             | 2.835                   | 30.00       | Pass   |
| Highest            | 4.067                   | 30.00       | Pass   |

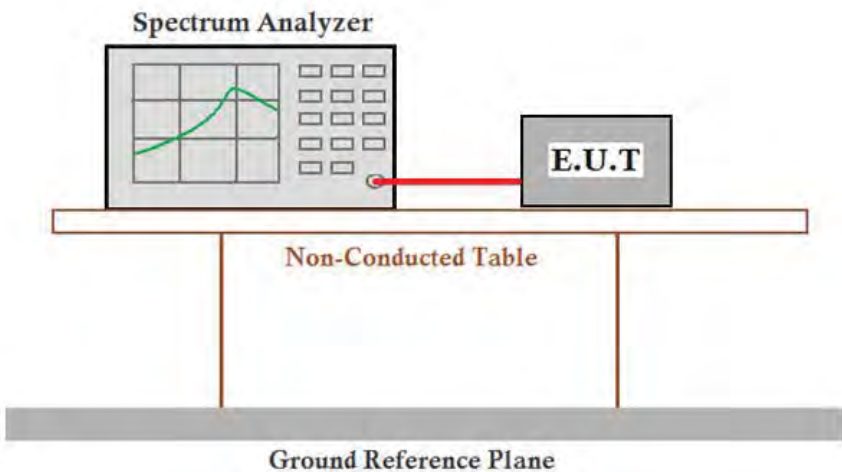
Test plot as follows:

| Graphs   |                                                                                                                                                                                                                                                                                              |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GFSK/LCH | <p>Key parameters for GFSK/LCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.402000000 GHz</li> <li>Ref: 20.00 dBm</li> <li>Mkr1: 2.40165 GHz, 3.770 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul> |
| GFSK/MCH | <p>Key parameters for GFSK/MCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.441000000 GHz</li> <li>Ref: 20.00 dBm</li> <li>Mkr1: 2.44085 GHz, 2.809 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul> |
| GFSK/HCH | <p>Key parameters for GFSK/HCH:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.480000000 GHz</li> <li>Ref: 20.00 dBm</li> <li>Mkr1: 2.47988 GHz, 3.999 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul> |

|                                    |                                                                                      |
|------------------------------------|--------------------------------------------------------------------------------------|
| <p><math>\pi/4</math>DQPSK/LCH</p> |    |
| <p><math>\pi/4</math>DQPSK/MCH</p> |   |
| <p><math>\pi/4</math>DQPSK/HCH</p> |  |

|           |                                                                                                                                                                                                                                                                                                                                                                  |  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 8DPSK/LCH |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.40200000 GHz</li> <li>Mkr1: 2.402 03 GHz, 3.773 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul>   |  |
| 8DPSK/MCH |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.44100000 GHz</li> <li>Mkr1: 2.440 65 GHz, 2.835 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul>  |  |
| 8DPSK/HCH |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.48000000 GHz</li> <li>Mkr1: 2.479 92 GHz, 4.067 dBm</li> <li>Span: 20.00 MHz</li> <li>#Res BW: 4 MHz</li> <li>#VBW: 8.0 MHz</li> <li>Sweep: 1.067 ms (2001 pts)</li> </ul> |  |

## 5.4 20dB Occupy Bandwidth

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | NA                                                                                                                                                                                                                                                                             |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                 |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

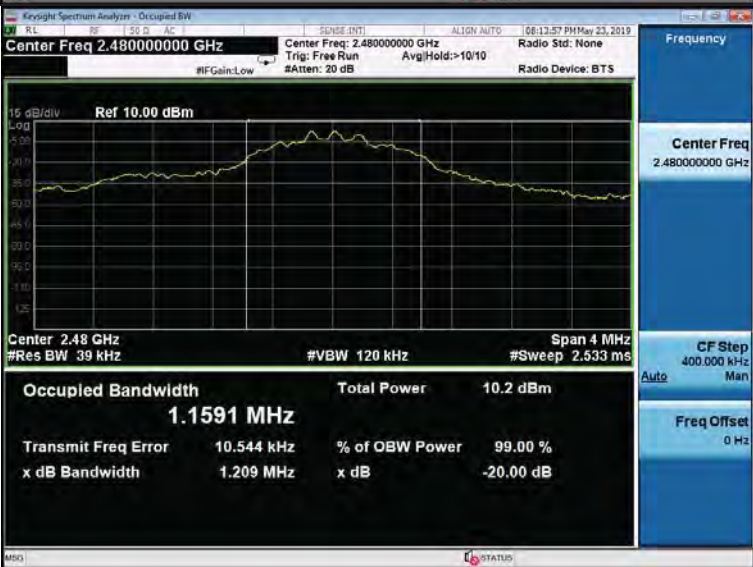
### Measurement Data

| Test channel | 20dB Occupy Bandwidth (MHz) |               |       |
|--------------|-----------------------------|---------------|-------|
|              | GFSK                        | $\pi/4$ DQPSK | 8DPSK |
| Lowest       | 0.8157                      | 1.181         | 1.232 |
| Middle       | 0.8268                      | 1.186         | 1.216 |
| Highest      | 0.8714                      | 1.256         | 1.209 |

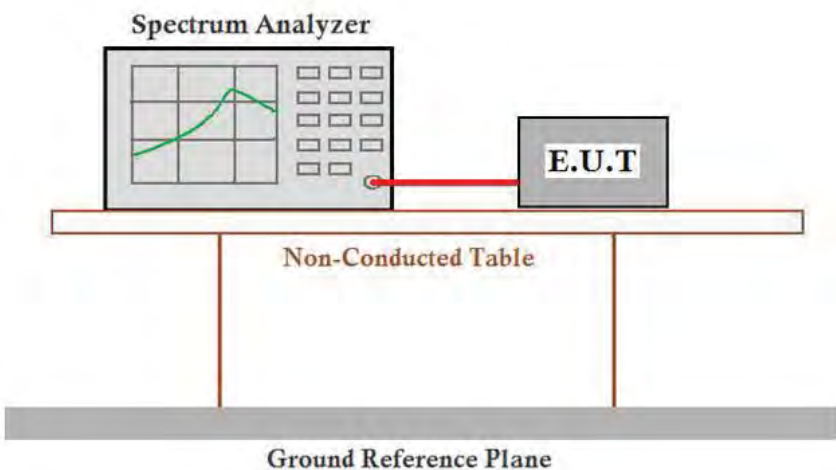
Test plot as follows:



|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><math>\pi/4</math>DQPSK/LCH</p> |  <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.40200000 GHz</p> <p>Center Freq: 2.40200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain: Low</p> <p>#Atten: 30 dB</p> <p>Ref 10.00 dBm</p> <p>15 dB/div</p> <p>Log</p> <p>Center 2.402 GHz</p> <p>#Res BW 39 kHz</p> <p>#VBW 120 kHz</p> <p>Span 4 MHz</p> <p>Sweep 2.533 ms</p> <p>Occupied Bandwidth</p> <p>1.1119 MHz</p> <p>Total Power</p> <p>9.70 dBm</p> <p>Transmit Freq Error</p> <p>20.950 kHz</p> <p>% of OBW Power</p> <p>99.00 %</p> <p>x dB Bandwidth</p> <p>1.181 MHz</p> <p>x dB</p> <p>-20.00 dB</p> <p>Frequency</p> <p>Center Freq</p> <p>2.40200000 GHz</p> <p>CF Step</p> <p>400.000 kHz</p> <p>Man</p> <p>Freq Offset</p> <p>0 Hz</p>    |
| <p><math>\pi/4</math>DQPSK/MCH</p> |  <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.44100000 GHz</p> <p>Center Freq: 2.44100000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: &gt;10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain: Low</p> <p>#Atten: 20 dB</p> <p>Ref 10.00 dBm</p> <p>15 dB/div</p> <p>Log</p> <p>Center 2.441 GHz</p> <p>#Res BW 39 kHz</p> <p>#VBW 120 kHz</p> <p>Span 4 MHz</p> <p>Sweep 2.533 ms</p> <p>Occupied Bandwidth</p> <p>1.1134 MHz</p> <p>Total Power</p> <p>9.15 dBm</p> <p>Transmit Freq Error</p> <p>17.283 kHz</p> <p>% of OBW Power</p> <p>99.00 %</p> <p>x dB Bandwidth</p> <p>1.186 MHz</p> <p>x dB</p> <p>-20.00 dB</p> <p>Frequency</p> <p>Center Freq</p> <p>2.44100000 GHz</p> <p>CF Step</p> <p>400.000 kHz</p> <p>Man</p> <p>Freq Offset</p> <p>0 Hz</p> |
| <p><math>\pi/4</math>DQPSK/HCH</p> |  <p>KeySight Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.48000000 GHz</p> <p>Center Freq: 2.48000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain: Low</p> <p>#Atten: 30 dB</p> <p>Ref 10.00 dBm</p> <p>10 dB/div</p> <p>Log</p> <p>Center 2.48 GHz</p> <p>#Res BW 39 kHz</p> <p>#VBW 120 kHz</p> <p>Span 4 MHz</p> <p>Sweep 2.533 ms</p> <p>Occupied Bandwidth</p> <p>1.2926 MHz</p> <p>Total Power</p> <p>7.40 dBm</p> <p>Transmit Freq Error</p> <p>-28.948 kHz</p> <p>% of OBW Power</p> <p>99.00 %</p> <p>x dB Bandwidth</p> <p>1.256 MHz</p> <p>x dB</p> <p>-20.00 dB</p> <p>Frequency</p> <p>Center Freq</p> <p>2.48000000 GHz</p> <p>CF Step</p> <p>400.000 kHz</p> <p>Man</p> <p>Freq Offset</p> <p>0 Hz</p>  |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8DPSK/LCH |  <p>Center Freq 2.40200000 GHz</p> <p>Center Freq: 2.40200000 GHz<br/>Trig: Free Run<br/>Avg/Hold: 100/100<br/>Radio Std: None<br/>Radio Device: BTS</p> <p>#FGain: Low<br/>#Atten: 30 dB</p> <p>10 dB/div Ref 10.00 dBm</p> <p>Center 2.402 GHz<br/>#Res BW 39 kHz<br/>#VBW 120 kHz<br/>Span 4 MHz<br/>Sweep 2.533 ms</p> <p>Occupied Bandwidth 1.1746 MHz<br/>Total Power 8.52 dBm</p> <p>Transmit Freq Error 24.261 kHz<br/>% of OBW Power 99.00 %<br/>x dB Bandwidth 1.232 MHz<br/>x dB -20.00 dB</p> <p>Frequency<br/>Center Freq 2.40200000 GHz<br/>CF Step 400.000 kHz<br/>Auto Man<br/>Freq Offset 0 Hz</p>  |
| 8DPSK/MCH |  <p>Center Freq 2.44100000 GHz</p> <p>Center Freq: 2.44100000 GHz<br/>Trig: Free Run<br/>Avg/Hold: 100/100<br/>Radio Std: None<br/>Radio Device: BTS</p> <p>#FGain: Low<br/>#Atten: 30 dB</p> <p>10 dB/div Ref 10.00 dBm</p> <p>Center 2.441 GHz<br/>#Res BW 39 kHz<br/>#VBW 120 kHz<br/>Span 4 MHz<br/>Sweep 2.533 ms</p> <p>Occupied Bandwidth 1.1669 MHz<br/>Total Power 8.05 dBm</p> <p>Transmit Freq Error 19.235 kHz<br/>% of OBW Power 99.00 %<br/>x dB Bandwidth 1.216 MHz<br/>x dB -20.00 dB</p> <p>Frequency<br/>Center Freq 2.44100000 GHz<br/>CF Step 400.000 kHz<br/>Auto Man<br/>Freq Offset 0 Hz</p> |
| 8DPSK/HCH |  <p>Center Freq 2.48000000 GHz</p> <p>Center Freq: 2.48000000 GHz<br/>Trig: Free Run<br/>Avg/Hold: 10/10<br/>Radio Std: None<br/>Radio Device: BTS</p> <p>#FGain: Low<br/>#Atten: 20 dB</p> <p>15 dB/div Ref 10.00 dBm</p> <p>Center 2.48 GHz<br/>#Res BW 39 kHz<br/>#VBW 120 kHz<br/>Span 4 MHz<br/>Sweep 2.533 ms</p> <p>Occupied Bandwidth 1.1591 MHz<br/>Total Power 10.2 dBm</p> <p>Transmit Freq Error 10.544 kHz<br/>% of OBW Power 99.00 %<br/>x dB Bandwidth 1.209 MHz<br/>x dB -20.00 dB</p> <p>Frequency<br/>Center Freq 2.48000000 GHz<br/>CF Step 400.000 kHz<br/>Auto Man<br/>Freq Offset 0 Hz</p>   |

## 5.5 Frequencies Separation

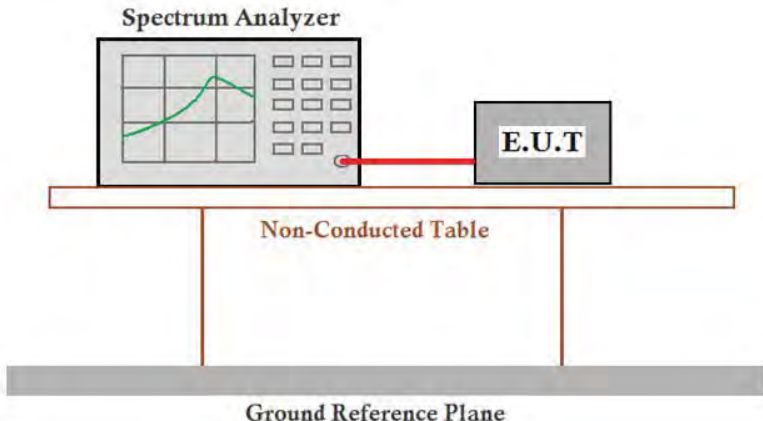
|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | 2/3 of the 20dB bandwidth                                                                                                                                                                                                                                                      |
|                        | Remark: the transmission power is less than 0.125W.                                                                                                                                                                                                                            |
| Exploratory Test Mode: | Hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                     |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

| Modulation    | Channel | Channel Separation (MHz) | Limit(MHz)                  | Result |
|---------------|---------|--------------------------|-----------------------------|--------|
| GFSK          | CH39    | 1.000                    | 25KHz or 2/3*20dB bandwidth | Pass   |
|               | CH40    |                          |                             |        |
| $\pi/4$ DQPSK | CH39    | 1.000                    | 25KHz or 2/3*20dB bandwidth | Pass   |
|               | CH40    |                          |                             |        |
| 8DPSK         | CH39    | 1.002                    | 25KHz or 2/3*20dB bandwidth | Pass   |
|               | CH40    |                          |                             |        |

Test plot as follows:

| Graphs        |                                                                                                                                                                                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GFSK          |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Start Freq: 2.439500000 GHz</li> <li>Stop Freq: 2.441500000 GHz</li> <li>Center Freq: 2.440500000 GHz</li> <li>Bandwidth: 300 kHz</li> <li>Power: -0.039 dBm</li> </ul>   |
| $\pi/4$ DQPSK |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Start Freq: 2.439500000 GHz</li> <li>Stop Freq: 2.441500000 GHz</li> <li>Center Freq: 2.440500000 GHz</li> <li>Bandwidth: 300 kHz</li> <li>Power: 0.030 dBm</li> </ul>   |
| 8DPSK         |  <p>Key parameters from the screenshot:</p> <ul style="list-style-type: none"> <li>Start Freq: 2.439500000 GHz</li> <li>Stop Freq: 2.441500000 GHz</li> <li>Center Freq: 2.440500000 GHz</li> <li>Bandwidth: 300 kHz</li> <li>Power: -0.120 dBm</li> </ul> |

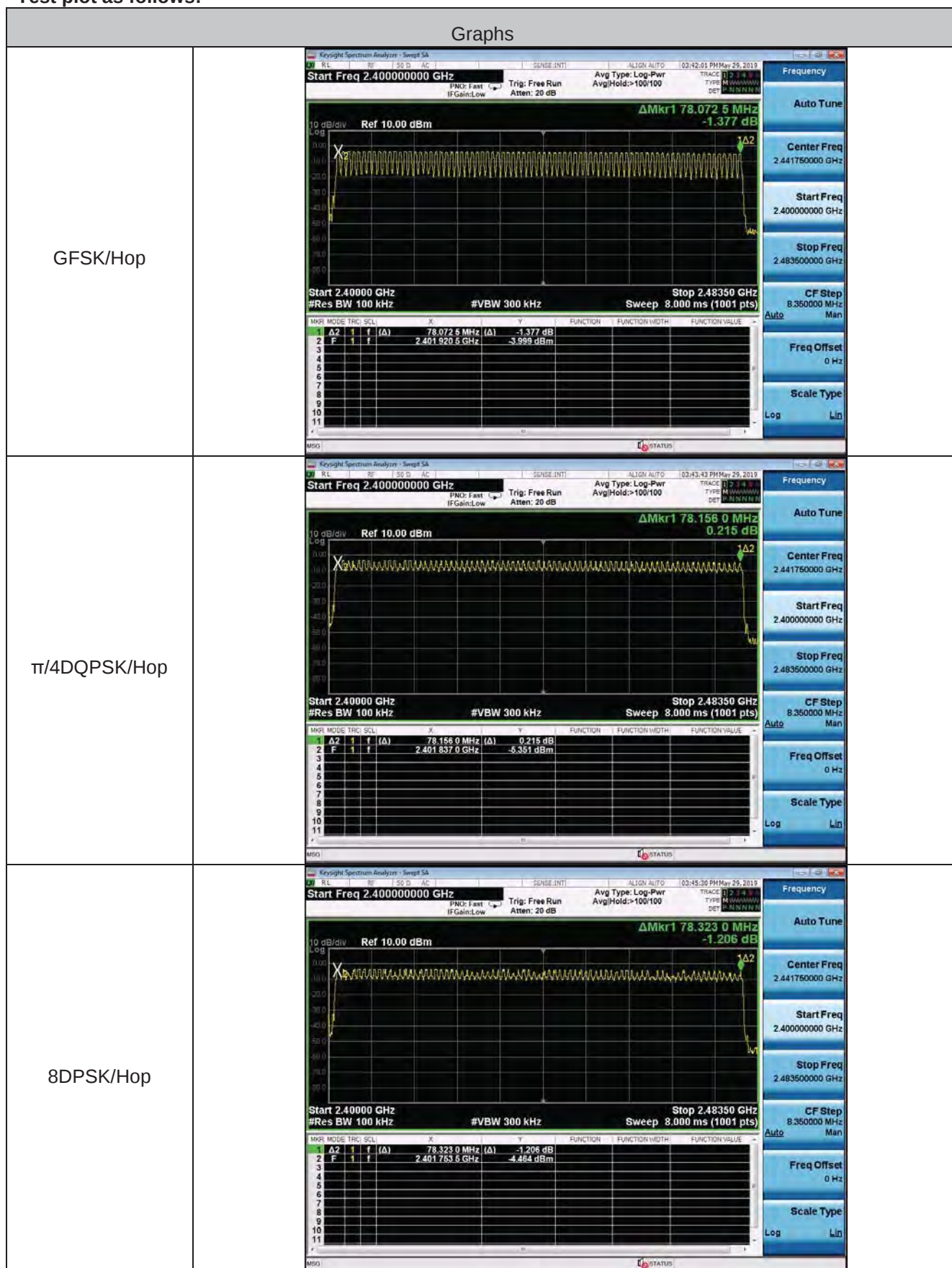
## 5.6 Hopping Channel Number

|                        |                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                                                                                                                                                          |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                               |
| Test Setup:            |  <p>Remark: Offset=Cable loss+ attenuation factor.</p>                                                                                                                                       |
| Limit:                 | At least 15 channels                                                                                                                                                                                                                                                           |
| Exploratory Test Mode: | hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                     |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report. |
| Test Results:          | Pass                                                                                                                                                                                                                                                                           |

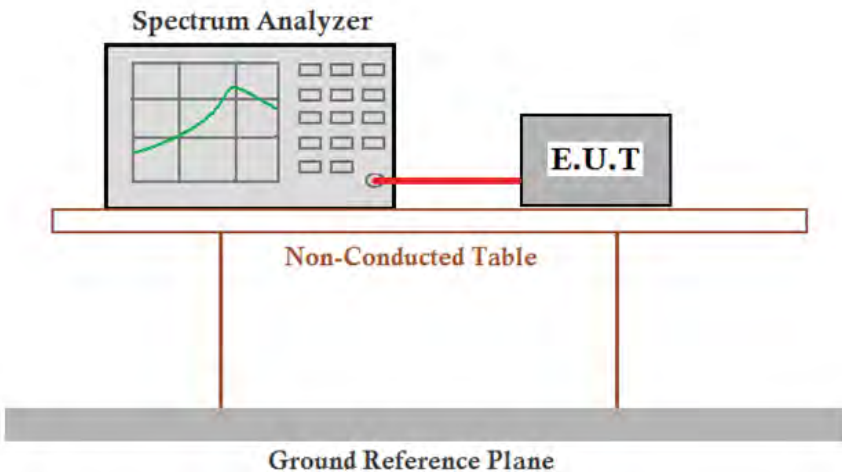
### Measurement Data

| Mode          | Hopping channel numbers | Limit     |
|---------------|-------------------------|-----------|
| GFSK          | 79                      | $\geq 15$ |
| $\pi/4$ DQPSK | 79                      | $\geq 15$ |
| 8DPSK         | 79                      | $\geq 15$ |

Test plot as follows:



## 5.7 Dwell Time

|                   |                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1)                                                                                                    |
| Test Method:      | ANSI C63.10:2013                                                                                                                         |
| Test Setup:       |  <p>Remark: Offset=Cable loss+ attenuation factor.</p> |
| Test Mode:        | Hopping transmitting with all kind of modulation and all kind of data type.                                                              |
| Limit:            | 0.4 Second                                                                                                                               |
| Test Results:     | Pass                                                                                                                                     |

### Measurement Data

| Mode     | Packet | Channel | Burst Width<br>[ms/hop/ch] | Dwell Time[s] | Limit (second) |
|----------|--------|---------|----------------------------|---------------|----------------|
| GFSK     | DH1    | MCH     | 0.407                      | 0.130         | ≤0.4           |
| GFSK     | DH3    | MCH     | 1.662                      | 0.266         | ≤0.4           |
| GFSK     | DH5    | MCH     | 2.912                      | 0.311         | ≤0.4           |
| π/4DQPSK | 2DH1   | MCH     | 0.416                      | 0.133         | ≤0.4           |
| π/4DQPSK | 2DH3   | MCH     | 1.667                      | 0.267         | ≤0.4           |
| π/4DQPSK | 2DH5   | MCH     | 2.909                      | 0.310         | ≤0.4           |
| 8DPSK    | 3DH1   | MCH     | 0.412                      | 0.132         | ≤0.4           |
| 8DPSK    | 3DH3   | MCH     | 1.667                      | 0.267         | ≤0.4           |
| 8DPSK    | 3DH5   | MCH     | 2.913                      | 0.311         | ≤0.4           |

#### Remark:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

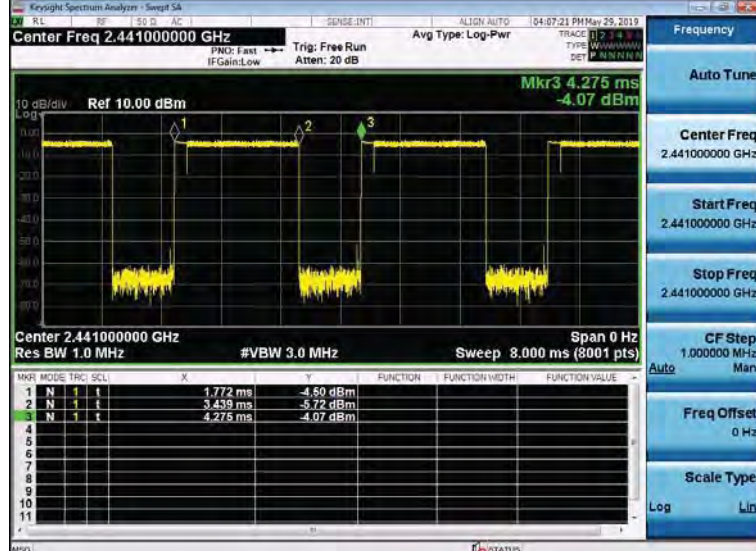
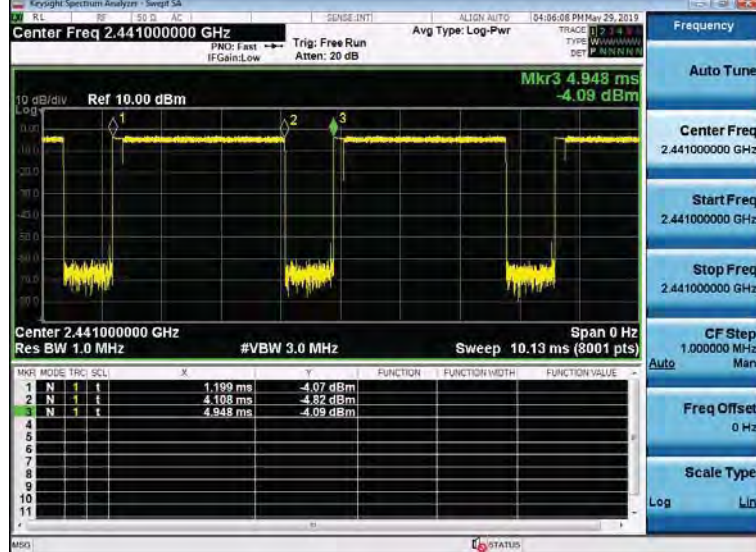
DH1/2DH1/3DH1 Dwell time = Burst Width(ms)\*(1600/ (2\*79))\*31.6

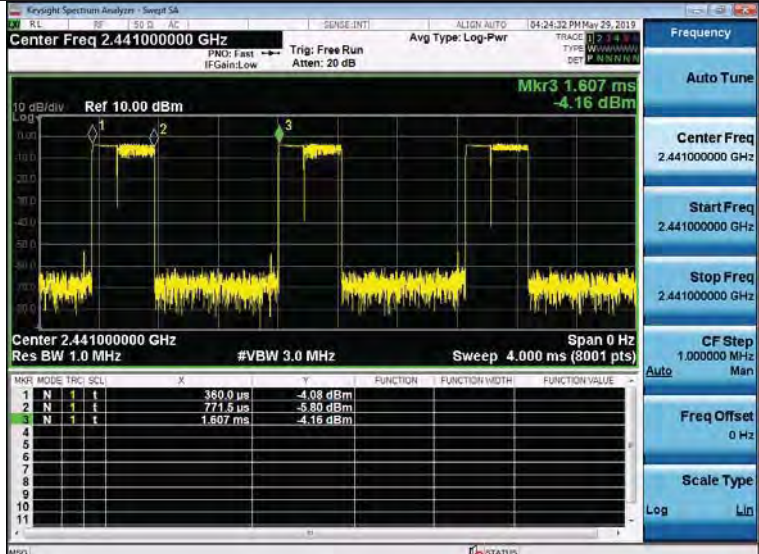
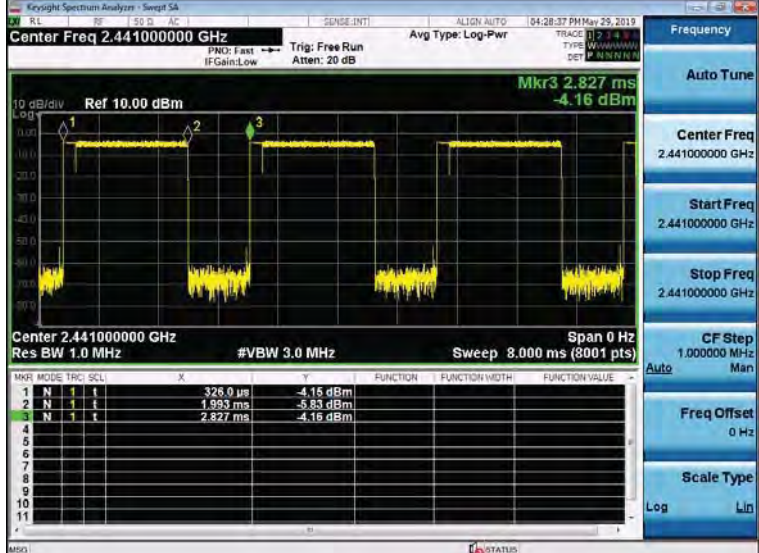
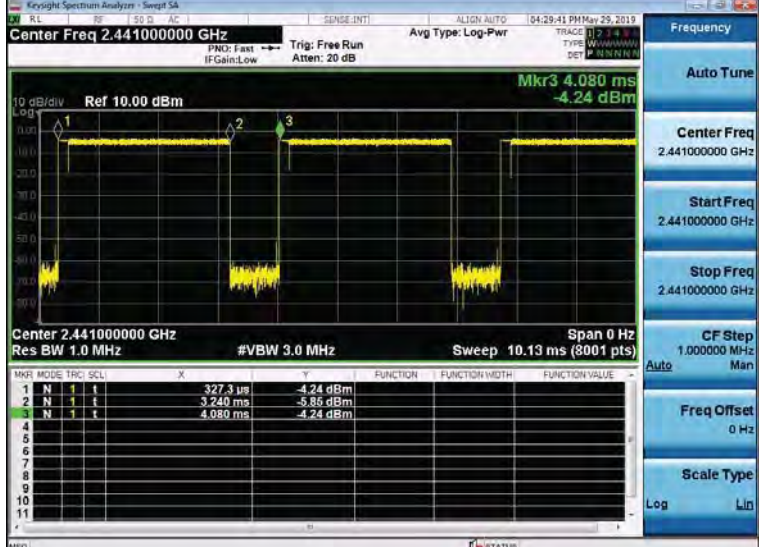
DH3/2DH3/3DH3 Dwell time = Burst Width (ms)\*(1600/ (4\*79))\*31.6

DH5/2DH5/3DH5 Dwell time = Burst Width (ms)\*(1600/ (6\*79))\*31.6

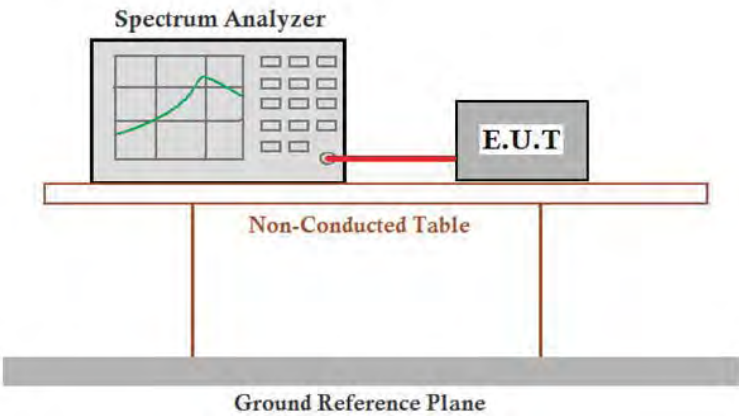
Test plot as follows:



| $\pi/4$ DQPSK<br>_2DH1/MCH |  <table><tr><th>MKR</th><th>MODE</th><th>TRG</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>t</td><td>389.5 us</td><td>-4.32 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>t</td><td>805.6 us</td><td>-5.73 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>t</td><td>1.640 ms</td><td>-4.65 dBm</td><td></td><td></td><td></td></tr></table>   | MKR | MODE | TRG      | SCL       | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | t | 389.5 us | -4.32 dBm |  |  |  | 2 | N | 1 | t | 805.6 us | -5.73 dBm |  |  |  | 3 | N | 1 | t | 1.640 ms | -4.65 dBm |  |  |  |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|----------|-----------|----------|----------------|----------------|----------------|----------------|---|---|---|---|----------|-----------|--|--|--|---|---|---|---|----------|-----------|--|--|--|---|---|---|---|----------|-----------|--|--|--|
| MKR                        | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TRG | SCL  | X        | Y         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 1                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 389.5 us | -4.32 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 2                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 805.6 us | -5.73 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 3                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 1.640 ms | -4.65 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| $\pi/4$ DQPSK<br>_2DH3/MCH |  <table><tr><th>MKR</th><th>MODE</th><th>TRG</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>t</td><td>1.772 ms</td><td>-4.50 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>t</td><td>3.439 ms</td><td>-5.72 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>t</td><td>4.275 ms</td><td>-4.07 dBm</td><td></td><td></td><td></td></tr></table>  | MKR | MODE | TRG      | SCL       | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | t | 1.772 ms | -4.50 dBm |  |  |  | 2 | N | 1 | t | 3.439 ms | -5.72 dBm |  |  |  | 3 | N | 1 | t | 4.275 ms | -4.07 dBm |  |  |  |
| MKR                        | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TRG | SCL  | X        | Y         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 1                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 1.772 ms | -4.50 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 2                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 3.439 ms | -5.72 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 3                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 4.275 ms | -4.07 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| $\pi/4$ DQPSK<br>_2DH5/MCH |  <table><tr><th>MKR</th><th>MODE</th><th>TRG</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>t</td><td>1.199 ms</td><td>-4.07 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>t</td><td>4.108 ms</td><td>-4.82 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>t</td><td>4.948 ms</td><td>-4.09 dBm</td><td></td><td></td><td></td></tr></table> | MKR | MODE | TRG      | SCL       | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | t | 1.199 ms | -4.07 dBm |  |  |  | 2 | N | 1 | t | 4.108 ms | -4.82 dBm |  |  |  | 3 | N | 1 | t | 4.948 ms | -4.09 dBm |  |  |  |
| MKR                        | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TRG | SCL  | X        | Y         | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 1                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 1.199 ms | -4.07 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 2                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 4.108 ms | -4.82 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |
| 3                          | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1   | t    | 4.948 ms | -4.09 dBm |          |                |                |                |                |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |   |   |   |   |          |           |  |  |  |

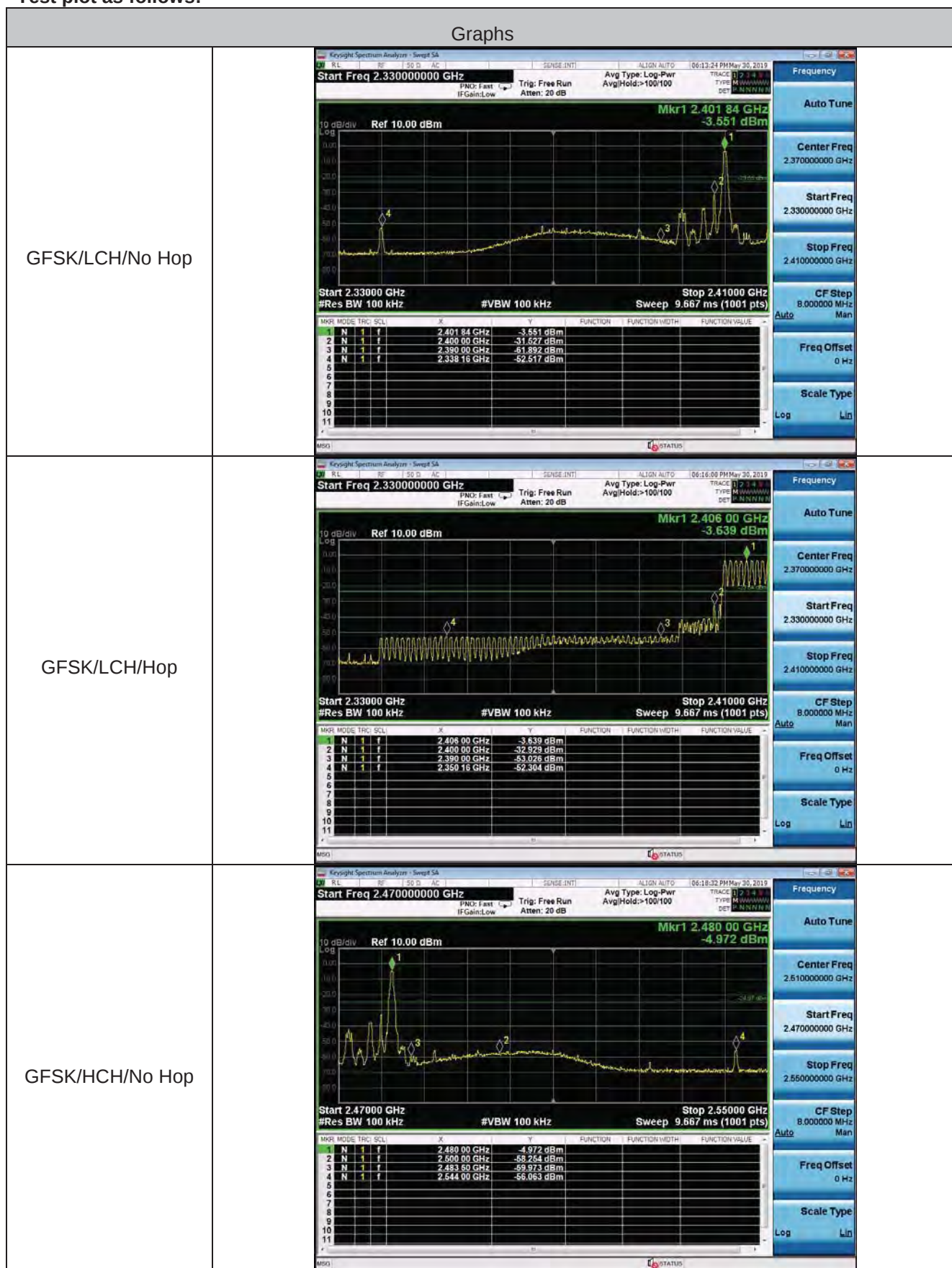
|                |                                                                                      |
|----------------|--------------------------------------------------------------------------------------|
| 8DPSK_3DH1/MCH |    |
| 8DPSK_3DH3/MCH |   |
| 8DPSK_3DH5/MCH |  |

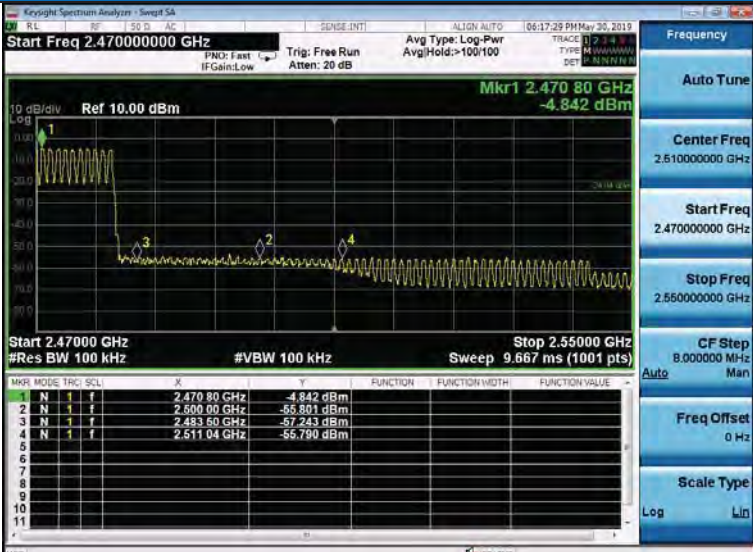
## 5.8 Band-edge for RF Conducted Emissions

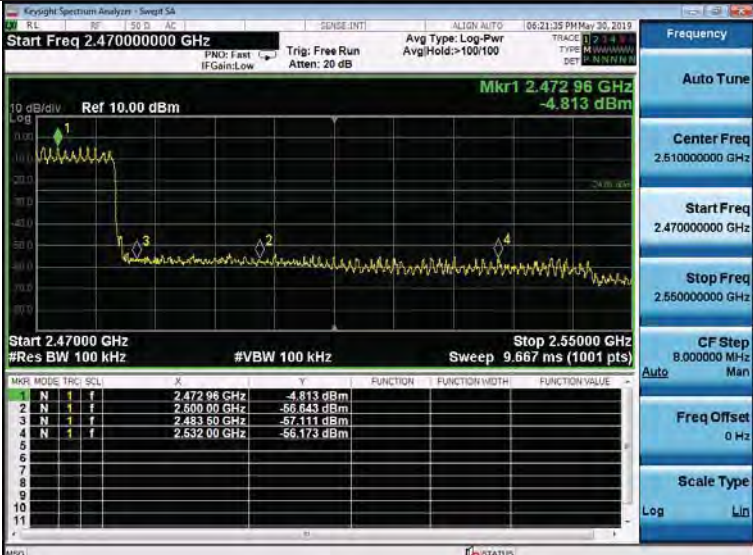
|                        |                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                     |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                       |
| Test Setup:            |  <p>Remark: Offset=cable loss+ attenuation factor.</p>                                                                                                                                                                                                                                               |
| Limit:                 | In any 100kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Exploratory Test Mode: | Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                                                                                                             |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.<br>Only the worst case is recorded in the report.                                                                                                         |
| Test Results:          | Pass                                                                                                                                                                                                                                                                                                                                                                                   |

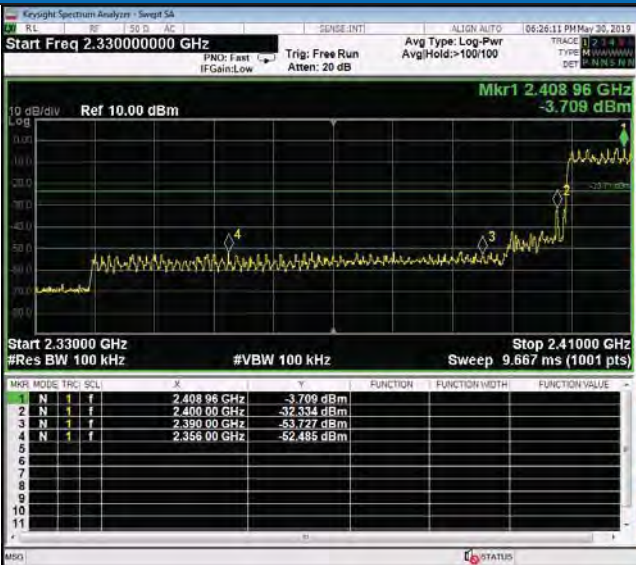
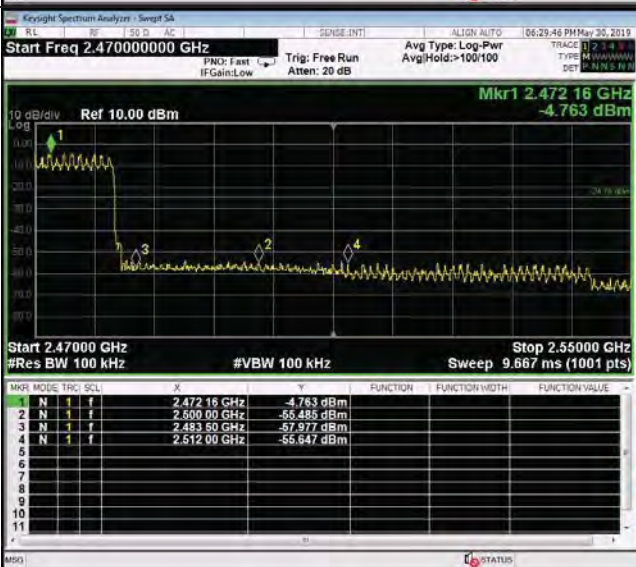
| Mode          | Test Channel | Frequency [MHz] | Frequency Hopping | Emission Level [dBm] | Limit [dBm] | Result |
|---------------|--------------|-----------------|-------------------|----------------------|-------------|--------|
| GFSK          | LCH          | 2400            | Off               | -31.527              | -23.55      | PASS   |
|               |              |                 | On                | -32.929              | -23.64      | PASS   |
| GFSK          | HCH          | 2483.5          | Off               | -59.973              | -24.97      | PASS   |
|               |              |                 | On                | -57.243              | -24.84      | PASS   |
| $\pi/4$ DQPSK | LCH          | 2400            | Off               | -31.698              | -23.55      | PASS   |
|               |              |                 | On                | -31.908              | -23.55      | PASS   |
| $\pi/4$ DQPSK | HCH          | 2483.5          | Off               | -59.774              | -24.93      | PASS   |
|               |              |                 | On                | -57.111              | -24.81      | PASS   |
| 8DPSK         | LCH          | 2400            | Off               | -31.704              | -23.59      | PASS   |
|               |              |                 | On                | -32.334              | -23.71      | PASS   |
| 8DPSK         | HCH          | 2483.5          | Off               | -60.454              | -25.00      | PASS   |
|               |              |                 | On                | -57.977              | -24.76      | PASS   |

Test plot as follows:

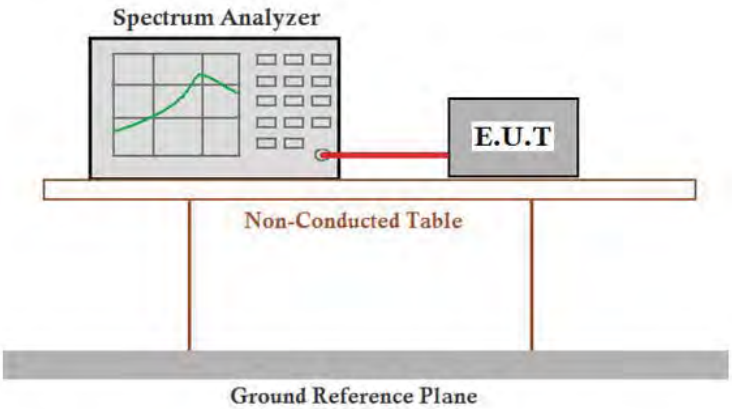


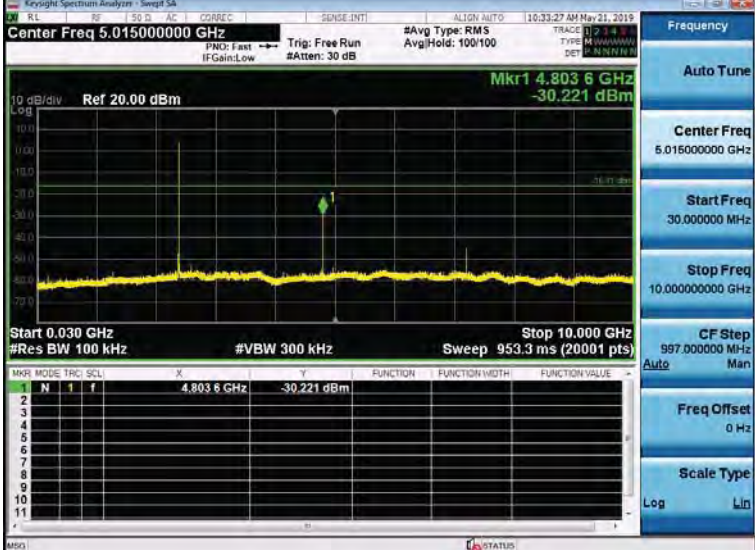
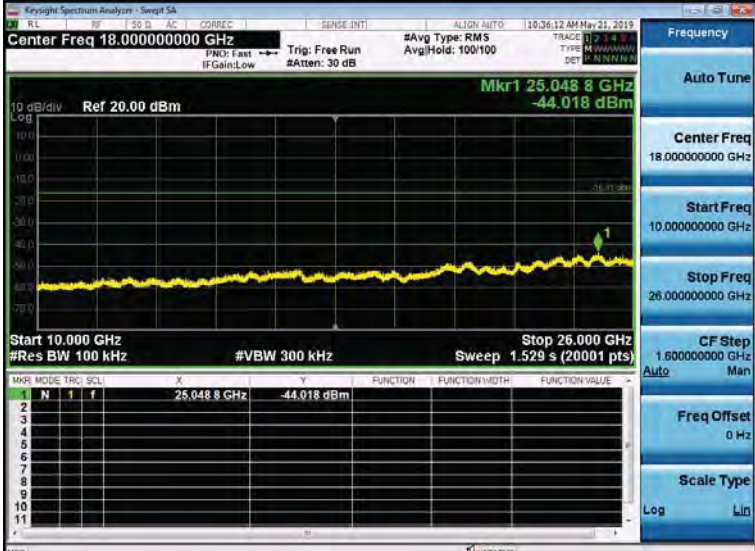
| GFSK/HCH/Hop             |  <table><thead><tr><th>MKR</th><th>MODE</th><th>TRIG</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.470 80 GHz</td><td>-4.842 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.500 00 GHz</td><td>-55.801 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.483 60 GHz</td><td>-57.243 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.511 04 GHz</td><td>-55.790 dBm</td><td></td><td></td><td></td></tr></tbody></table>   | MKR  | MODE | TRIG         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.470 80 GHz | -4.842 dBm |  |  |  | 2 | N | 1 | f | 2.500 00 GHz | -55.801 dBm |  |  |  | 3 | N | 1 | f | 2.483 60 GHz | -57.243 dBm |  |  |  | 4 | N | 1 | f | 2.511 04 GHz | -55.790 dBm |  |  |  |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|--------------|-------------|----------|----------------|----------------|----------------|----------------|---|---|---|---|--------------|------------|--|--|--|---|---|---|---|--------------|-------------|--|--|--|---|---|---|---|--------------|-------------|--|--|--|---|---|---|---|--------------|-------------|--|--|--|
| MKR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TRIG | SCL  | X            | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.470 80 GHz | -4.842 dBm  |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.500 00 GHz | -55.801 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.483 60 GHz | -57.243 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.511 04 GHz | -55.790 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
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| MKR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TRIG | SCL  | X            | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.402 16 GHz | -3.546 dBm  |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.400 00 GHz | -31.698 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.390 00 GHz | -60.873 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.338 16 GHz | -52.213 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
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| MKR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TRIG | SCL  | X            | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.403 12 GHz | -3.552 dBm  |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.400 00 GHz | -31.908 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.390 00 GHz | -52.938 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1    | f    | 2.358 96 GHz | -52.241 dBm |          |                |                |                |                |   |   |   |   |              |            |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |   |   |   |   |              |             |  |  |  |

| $\pi/4$ DQPSK/HCH/No Hop |  <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.48016 GHz</td><td>-4.928 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.50000 GHz</td><td>-57.910 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.48350 GHz</td><td>-59.774 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.54400 GHz</td><td>-55.463 dBm</td><td></td><td></td><td></td></tr></table>   | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.48016 GHz | -4.928 dBm |  |  |  | 2 | N | 1 | f | 2.50000 GHz | -57.910 dBm |  |  |  | 3 | N | 1 | f | 2.48350 GHz | -59.774 dBm |  |  |  | 4 | N | 1 | f | 2.54400 GHz | -55.463 dBm |  |  |  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-------------|-------------|----------|----------------|----------------|----------------|----------------|---|---|---|---|-------------|------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|
| MNR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.48016 GHz | -4.928 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.50000 GHz | -57.910 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.48350 GHz | -59.774 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.54400 GHz | -55.463 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| $\pi/4$ DQPSK/HCH/Hop    |  <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.47296 GHz</td><td>-4.813 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.50000 GHz</td><td>-56.643 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.48350 GHz</td><td>-57.111 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.53200 GHz</td><td>-56.173 dBm</td><td></td><td></td><td></td></tr></table>  | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.47296 GHz | -4.813 dBm |  |  |  | 2 | N | 1 | f | 2.50000 GHz | -56.643 dBm |  |  |  | 3 | N | 1 | f | 2.48350 GHz | -57.111 dBm |  |  |  | 4 | N | 1 | f | 2.53200 GHz | -56.173 dBm |  |  |  |
| MNR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.47296 GHz | -4.813 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.50000 GHz | -56.643 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.48350 GHz | -57.111 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.53200 GHz | -56.173 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 8DPSK/LCH/No Hop         |  <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.40216 GHz</td><td>-3.541 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.40000 GHz</td><td>-31.704 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.39000 GHz</td><td>-51.996 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.33816 GHz</td><td>-52.072 dBm</td><td></td><td></td><td></td></tr></table> | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.40216 GHz | -3.541 dBm |  |  |  | 2 | N | 1 | f | 2.40000 GHz | -31.704 dBm |  |  |  | 3 | N | 1 | f | 2.39000 GHz | -51.996 dBm |  |  |  | 4 | N | 1 | f | 2.33816 GHz | -52.072 dBm |  |  |  |
| MNR                      | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.40216 GHz | -3.541 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.40000 GHz | -31.704 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.39000 GHz | -51.996 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                        | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1   | f    | 2.33816 GHz | -52.072 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |

| 8DPSK/LCH/Hop    |  <table data-bbox="596 591 1235 777"><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.40896 GHz</td><td>-3.709 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.40000 GHz</td><td>-52.334 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.39000 GHz</td><td>-53.727 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.35600 GHz</td><td>-52.485 dBm</td><td></td><td></td><td></td></tr></tbody></table>     | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.40896 GHz | -3.709 dBm |  |  |  | 2 | N | 1 | f | 2.40000 GHz | -52.334 dBm |  |  |  | 3 | N | 1 | f | 2.39000 GHz | -53.727 dBm |  |  |  | 4 | N | 1 | f | 2.35600 GHz | -52.485 dBm |  |  |  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-------------|-------------|----------|----------------|----------------|----------------|----------------|---|---|---|---|-------------|------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|---|---|---|---|-------------|-------------|--|--|--|
| MNR              | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.40896 GHz | -3.709 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.40000 GHz | -52.334 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.39000 GHz | -53.727 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.35600 GHz | -52.485 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 8DPSK/HCH/No Hop |  <table data-bbox="596 1151 1235 1344"><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.48016 GHz</td><td>-4.997 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.50000 GHz</td><td>-57.810 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.48350 GHz</td><td>-50.454 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.54408 GHz</td><td>-56.245 dBm</td><td></td><td></td><td></td></tr></tbody></table>  | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.48016 GHz | -4.997 dBm |  |  |  | 2 | N | 1 | f | 2.50000 GHz | -57.810 dBm |  |  |  | 3 | N | 1 | f | 2.48350 GHz | -50.454 dBm |  |  |  | 4 | N | 1 | f | 2.54408 GHz | -56.245 dBm |  |  |  |
| MNR              | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.48016 GHz | -4.997 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.50000 GHz | -57.810 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.48350 GHz | -50.454 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.54408 GHz | -56.245 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 8DPSK/HCH/Hop    |  <table data-bbox="596 1711 1235 1908"><thead><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr></thead><tbody><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.47216 GHz</td><td>-4.763 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.50000 GHz</td><td>-55.485 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.48350 GHz</td><td>-57.977 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.51200 GHz</td><td>-55.647 dBm</td><td></td><td></td><td></td></tr></tbody></table> | MNR | MODE | TRC         | SCL         | X        | Y              | FUNCTION       | FUNCTION WIDTH | FUNCTION VALUE | 1 | N | 1 | f | 2.47216 GHz | -4.763 dBm |  |  |  | 2 | N | 1 | f | 2.50000 GHz | -55.485 dBm |  |  |  | 3 | N | 1 | f | 2.48350 GHz | -57.977 dBm |  |  |  | 4 | N | 1 | f | 2.51200 GHz | -55.647 dBm |  |  |  |
| MNR              | MODE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TRC | SCL  | X           | Y           | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 1                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.47216 GHz | -4.763 dBm  |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 2                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.50000 GHz | -55.485 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 3                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.48350 GHz | -57.977 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |
| 4                | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1   | f    | 2.51200 GHz | -55.647 dBm |          |                |                |                |                |   |   |   |   |             |            |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |   |   |   |   |             |             |  |  |  |

## 5.9 Spurious RF Conducted Emissions

|                        |                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement:      | 47 CFR Part 15C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                     |
| Test Method:           | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                       |
| Test Setup:            |  <p>Remark: Offset=cable loss+ attenuation factor.</p>                                                                                                                                                                                                                                               |
| Limit:                 | In any 100kHz bandwidth outside the frequency band in which the spread spectrum 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. |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type                                                                                                                                                                                                                                                                                                         |
| Final Test Mode:       | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type.                                                                                                                                                           |
| Test Results:          | Pass                                                                                                                                                                                                                                                                                                                                                                                   |

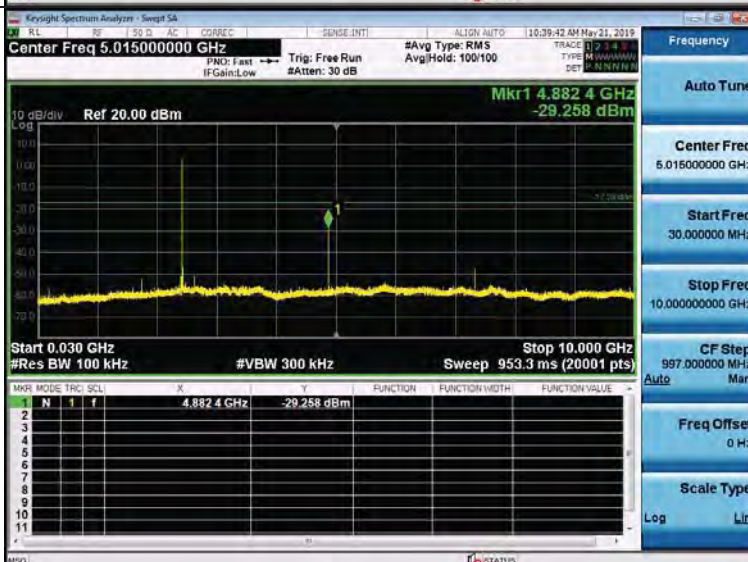
| GFSK LCH Graphs |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference       |  |  <p>Keysight Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.402000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Mkr1 2.401 861 0 GHz 3.690 dBm</p> <p>Center 2.402000 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Span 4.000 MHz</p> <p>Sweep 1.067 ms (8001 pts)</p> <p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.402000000 GHz</p> <p>Start Freq 2.400000000 GHz</p> <p>Stop Freq 2.404000000 GHz</p> <p>CF Step 400.000 kHz</p> <p>Freq Offset 0 Hz</p> <p>Scale Type Log Lin</p>        |
| 30MHz-10GHz     |  |  <p>Keysight Spectrum Analyzer - Swept SA</p> <p>Center Freq 5.015000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Mkr1 4.803 6 GHz -30.221 dBm</p> <p>Start 0.030 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Stop 10.000 GHz</p> <p>Sweep 953.3 ms (20001 pts)</p> <p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 5.015000000 GHz</p> <p>Start Freq 30.0000000 MHz</p> <p>Stop Freq 10.000000000 GHz</p> <p>CF Step 997.0000000 MHz</p> <p>Freq Offset 0 Hz</p> <p>Scale Type Log Lin</p>       |
| 10GHz-26GHz     |  |  <p>Keysight Spectrum Analyzer - Swept SA</p> <p>Center Freq 18.000000000 GHz</p> <p>Ref 20.00 dBm</p> <p>Mkr1 25.048 8 GHz -44.018 dBm</p> <p>Start 10.000 GHz</p> <p>#Res BW 100 kHz</p> <p>#VBW 300 kHz</p> <p>Stop 26.000 GHz</p> <p>Sweep 1.529 s (20001 pts)</p> <p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 18.000000000 GHz</p> <p>Start Freq 10.000000000 GHz</p> <p>Stop Freq 26.000000000 GHz</p> <p>CF Step 1.600000000 GHz</p> <p>Freq Offset 0 Hz</p> <p>Scale Type Log Lin</p> |

GFSK MCH Graphs

Reference



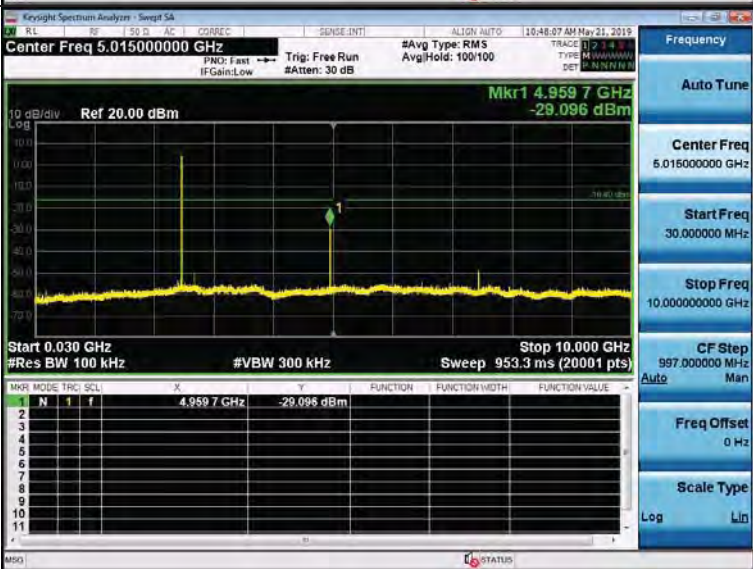
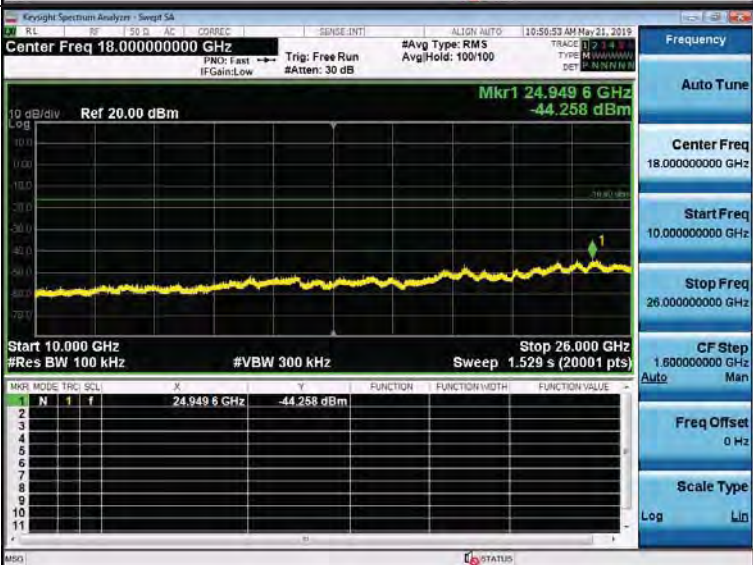
30MHz-10GHz

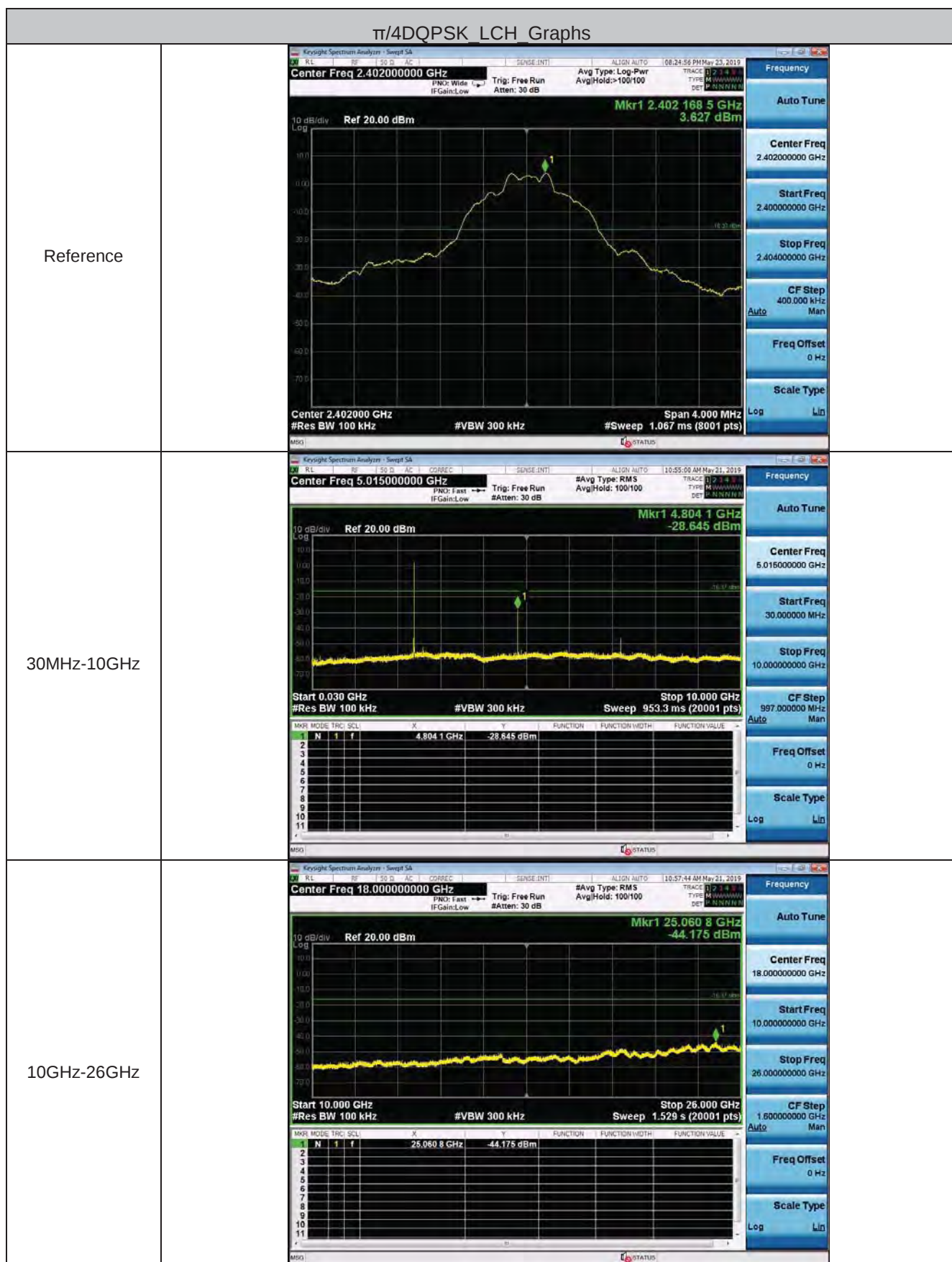


10GHz-26GHz

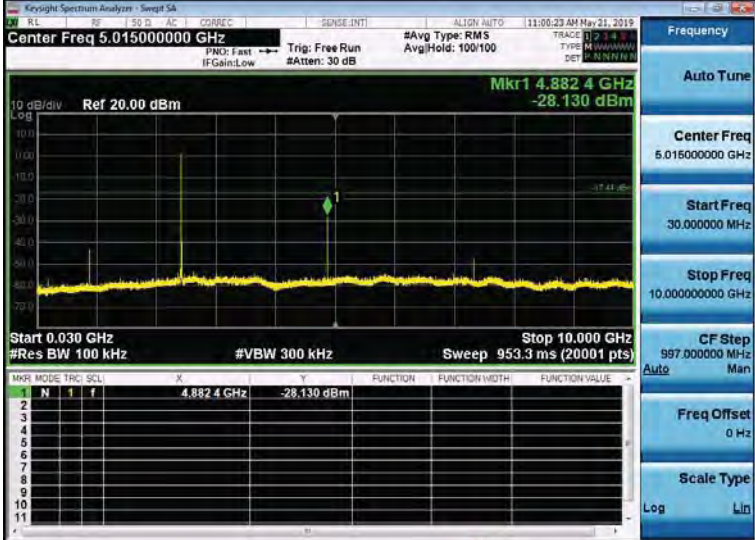
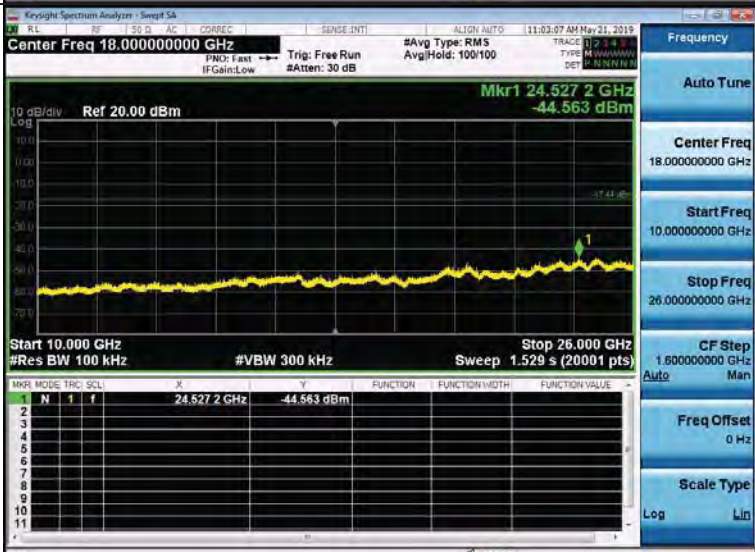


GFSK HCH Graphs

|             |                                                                                                                                                                                                                                                                                                         |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference   |  <p>Key parameters for Reference:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.480000000 GHz</li> <li>Span: 4.000 MHz</li> <li>Res BW: 100 kHz</li> <li>Mkr1: 2.480 074 0 GHz, 3.598 dBm</li> </ul>      |
| 30MHz-10GHz |  <p>Key parameters for 30MHz-10GHz:</p> <ul style="list-style-type: none"> <li>Center Freq: 5.015000000 GHz</li> <li>Span: 10.000 GHz</li> <li>Res BW: 100 kHz</li> <li>Mkr1: 4.959 7 GHz, -29.096 dBm</li> </ul>    |
| 10GHz-26GHz |  <p>Key parameters for 10GHz-26GHz:</p> <ul style="list-style-type: none"> <li>Center Freq: 18.000000000 GHz</li> <li>Span: 16.000 GHz</li> <li>Res BW: 100 kHz</li> <li>Mkr1: 24.949 6 GHz, -44.258 dBm</li> </ul> |



$\pi/4$ DQPSK MCH Graphs

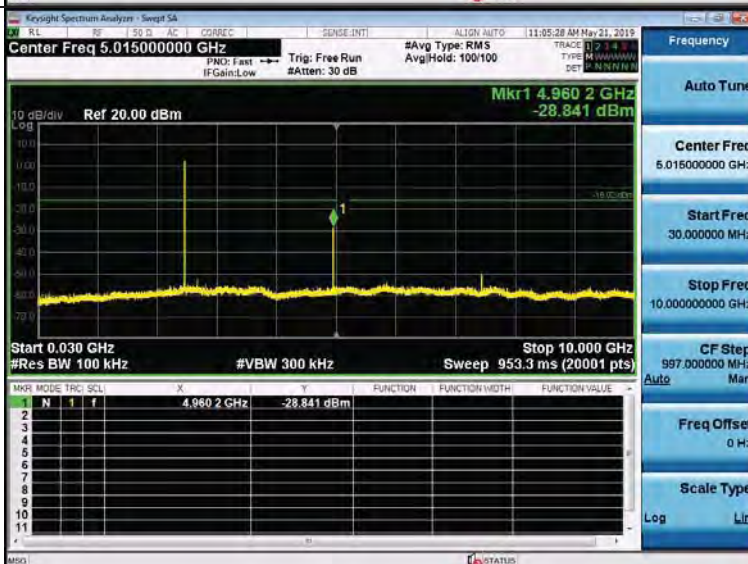
|             |                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reference   |  <p>Key parameters for Reference signal:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.441000000 GHz</li> <li>Span: 4.000 MHz</li> <li>Res BW: 100 kHz</li> <li>VBW: 300 kHz</li> <li>Sweep: 1.067 ms (8001 pts)</li> <li>Marker 1: 2.4411785 GHz, 2.560 dBm</li> </ul>      |
| 30MHz-10GHz |  <p>Key parameters for 30MHz-10GHz range:</p> <ul style="list-style-type: none"> <li>Center Freq: 5.015000000 GHz</li> <li>Span: 10.000 GHz</li> <li>Res BW: 100 kHz</li> <li>VBW: 300 kHz</li> <li>Sweep: 953.3 ms (20001 pts)</li> <li>Marker 1: 4.8824 GHz, -28.130 dBm</li> </ul>   |
| 10GHz-26GHz |  <p>Key parameters for 10GHz-26GHz range:</p> <ul style="list-style-type: none"> <li>Center Freq: 18.000000000 GHz</li> <li>Span: 16.000 GHz</li> <li>Res BW: 100 kHz</li> <li>VBW: 300 kHz</li> <li>Sweep: 1.529 s (20001 pts)</li> <li>Marker 1: 24.5272 GHz, -44.563 dBm</li> </ul> |

$\pi/4$ DQPSK HCH Graphs

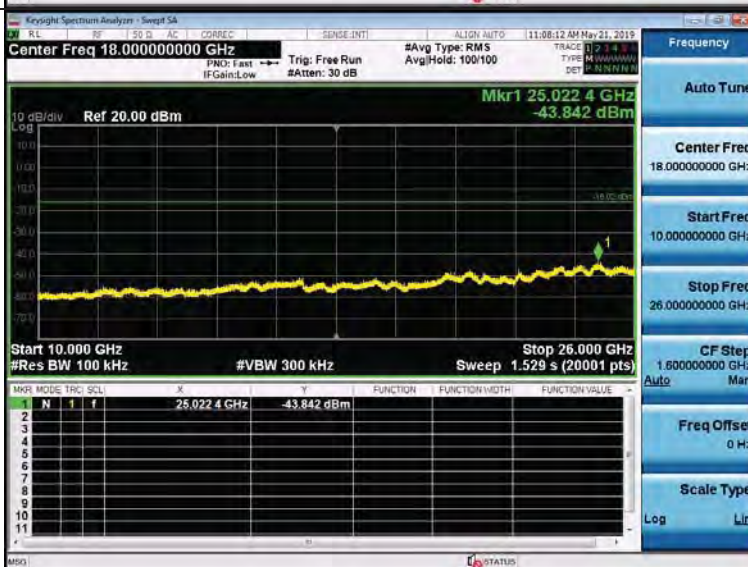
Reference



30MHz-10GHz



10GHz-26GHz

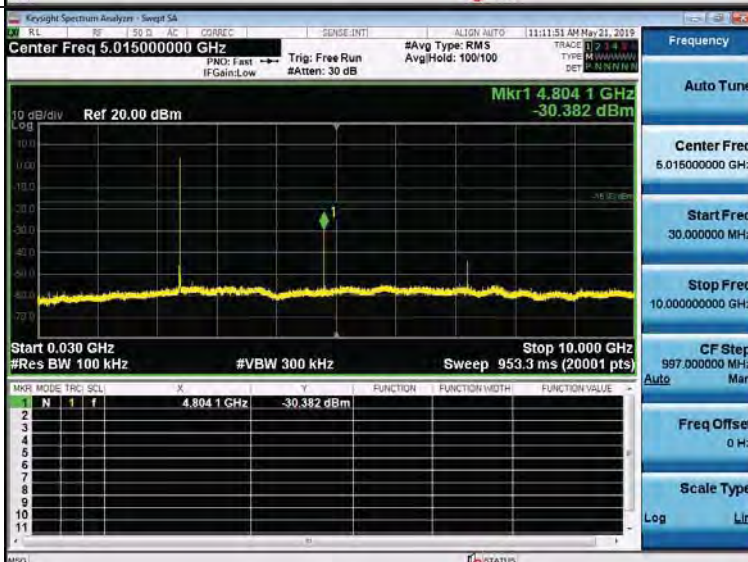


8DPSK LCH Graphs

Reference



30MHz-10GHz



10GHz-26GHz

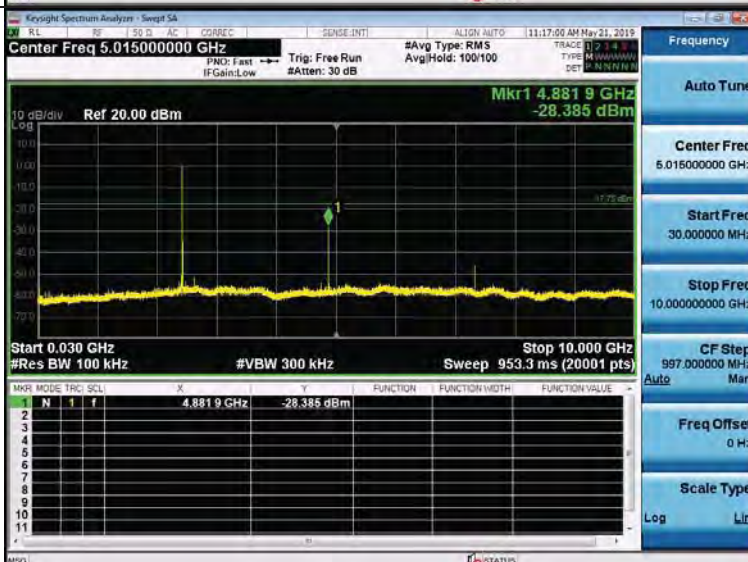


8DPSK MCH Graphs

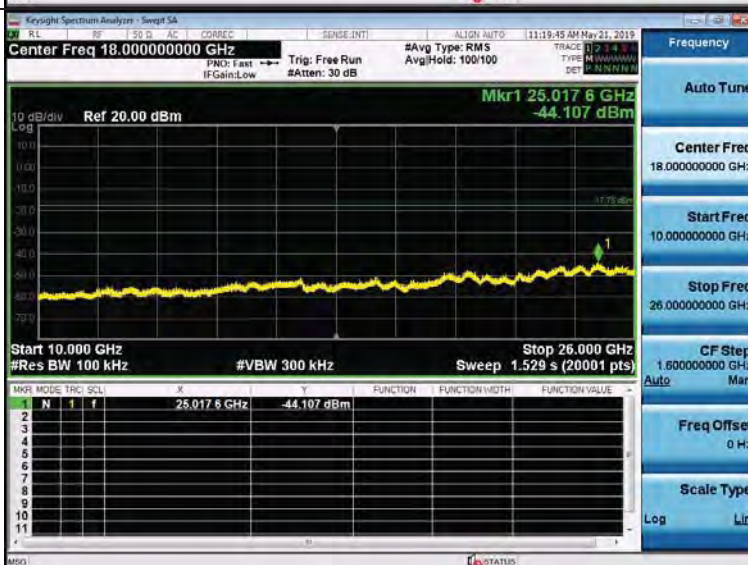
Reference



30MHz-10GHz



10GHz-26GHz

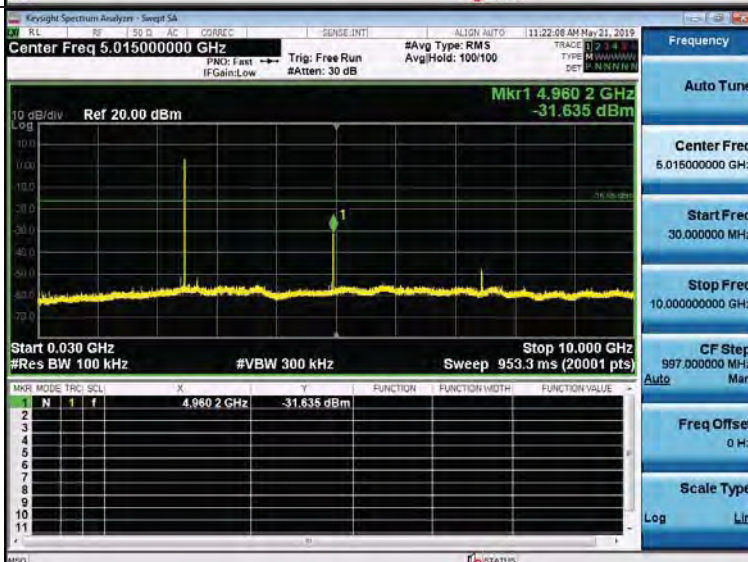


8DPSK HCH Graphs

Reference



30MHz-10GHz



10GHz-26GHz



**Remark:**

Pre test 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

## 5.10 Other requirements Frequency Hopping Spread Spectrum System

| Test Requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 47 CFR Part 15C Section 15.247 (a)(1), (h) requirement: |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <p>The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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.</p> <p>Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.</p> <p>The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.</p> |                                                         |
| Compliance for section 15.247(a)(1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                         |
| <p>According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th 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; i.e. the shift register is initialized with nine ones.</p> <ul style="list-style-type: none"> <li>• Number of shift register stages: 9</li> <li>• Length of pseudo-random sequence: <math>2^9 - 1 = 511</math> bits</li> <li>• Longest sequence of zeros: 8 (non-inverted signal)</li> </ul> <div data-bbox="300 1368 1347 1520" data-label="Diagram"> </div> <p style="text-align: center;"><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p> <p>An example of Pseudorandom Frequency Hopping Sequence as follow:</p> <div data-bbox="274 1615 1259 1765" data-label="Diagram"> </div> <p>Each frequency used equally on the average by each transmitter.</p> <p>According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.</p>                                                                                                                                                                                                                                                                                    |                                                         |
| Compliance for section 15.247(g)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                         |
| <p>According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                         |

**Compliance for section 15.247(h)**

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

### 5.11 Radiated Spurious Emission & Restricted bands

|                   |                                                                                                                                                                                                                                                                             |                                  |                |            |                          |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|------------|--------------------------|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205                                                                                                                                                                                                                                   |                                  |                |            |                          |
| Test Method:      | ANSI C63.10: 2013                                                                                                                                                                                                                                                           |                                  |                |            |                          |
| Test Site:        | Measurement Distance: 3m (Semi-Anechoic Chamber)                                                                                                                                                                                                                            |                                  |                |            |                          |
| Receiver Setup:   | Frequency                                                                                                                                                                                                                                                                   | Detector                         | RBW            | VBW        | Remark                   |
|                   | 0.009MHz-0.090MHz                                                                                                                                                                                                                                                           | Peak                             | 10kHz          | 30kHz      | Peak                     |
|                   | 0.009MHz-0.090MHz                                                                                                                                                                                                                                                           | Average                          | 10kHz          | 30kHz      | Average                  |
|                   | 0.090MHz-0.110MHz                                                                                                                                                                                                                                                           | Quasi-peak                       | 10kHz          | 30kHz      | Quasi-peak               |
|                   | 0.110MHz-0.490MHz                                                                                                                                                                                                                                                           | Peak                             | 10kHz          | 30kHz      | Peak                     |
|                   | 0.110MHz-0.490MHz                                                                                                                                                                                                                                                           | Average                          | 10kHz          | 30kHz      | Average                  |
|                   | 0.490MHz -30MHz                                                                                                                                                                                                                                                             | Quasi-peak                       | 10kHz          | 30kHz      | Quasi-peak               |
|                   | 30MHz-1GHz                                                                                                                                                                                                                                                                  | Peak                             | 100 kHz        | 300kHz     | Peak                     |
|                   | Above 1GHz                                                                                                                                                                                                                                                                  | Peak                             | 1MHz           | 3MHz       | Peak                     |
|                   |                                                                                                                                                                                                                                                                             | Peak                             | 1MHz           | 10Hz       | Average                  |
| Limit:            | Frequency                                                                                                                                                                                                                                                                   | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark     | Measurement distance (m) |
|                   | 0.009MHz-0.490MHz                                                                                                                                                                                                                                                           | 2400/F(kHz)                      | -              | -          | 300                      |
|                   | 0.490MHz-1.705MHz                                                                                                                                                                                                                                                           | 24000/F(kHz)                     | -              | -          | 30                       |
|                   | 1.705MHz-30MHz                                                                                                                                                                                                                                                              | 30                               | -              | -          | 30                       |
|                   | 30MHz-88MHz                                                                                                                                                                                                                                                                 | 100                              | 40.0           | Quasi-peak | 3                        |
|                   | 88MHz-216MHz                                                                                                                                                                                                                                                                | 150                              | 43.5           | Quasi-peak | 3                        |
|                   | 216MHz-960MHz                                                                                                                                                                                                                                                               | 200                              | 46.0           | Quasi-peak | 3                        |
|                   | 960MHz-1GHz                                                                                                                                                                                                                                                                 | 500                              | 54.0           | Quasi-peak | 3                        |
|                   | Above 1GHz                                                                                                                                                                                                                                                                  | 500                              | 54.0           | Average    | 3                        |
|                   | Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device. |                                  |                |            |                          |

Test Setup:

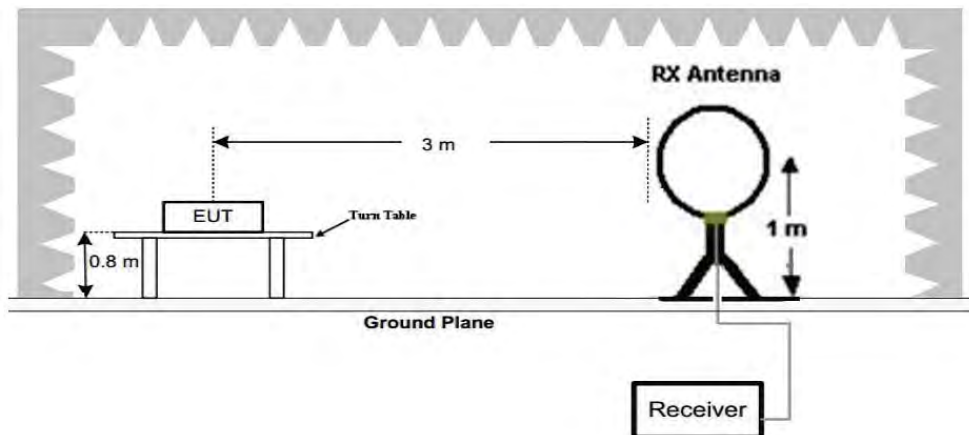


Figure 1. Below 30MHz

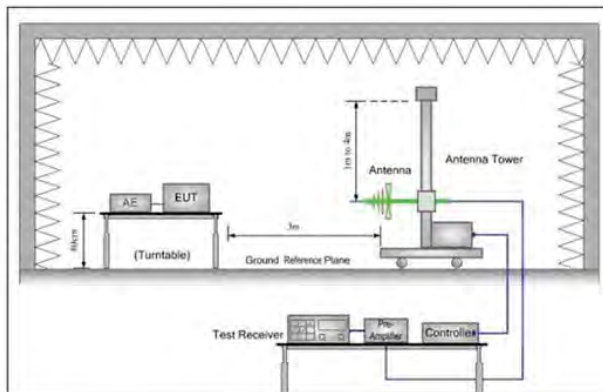


Figure 2. 30MHz to 1GHz

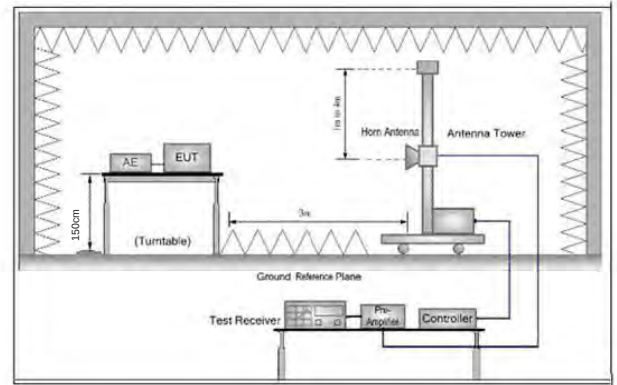


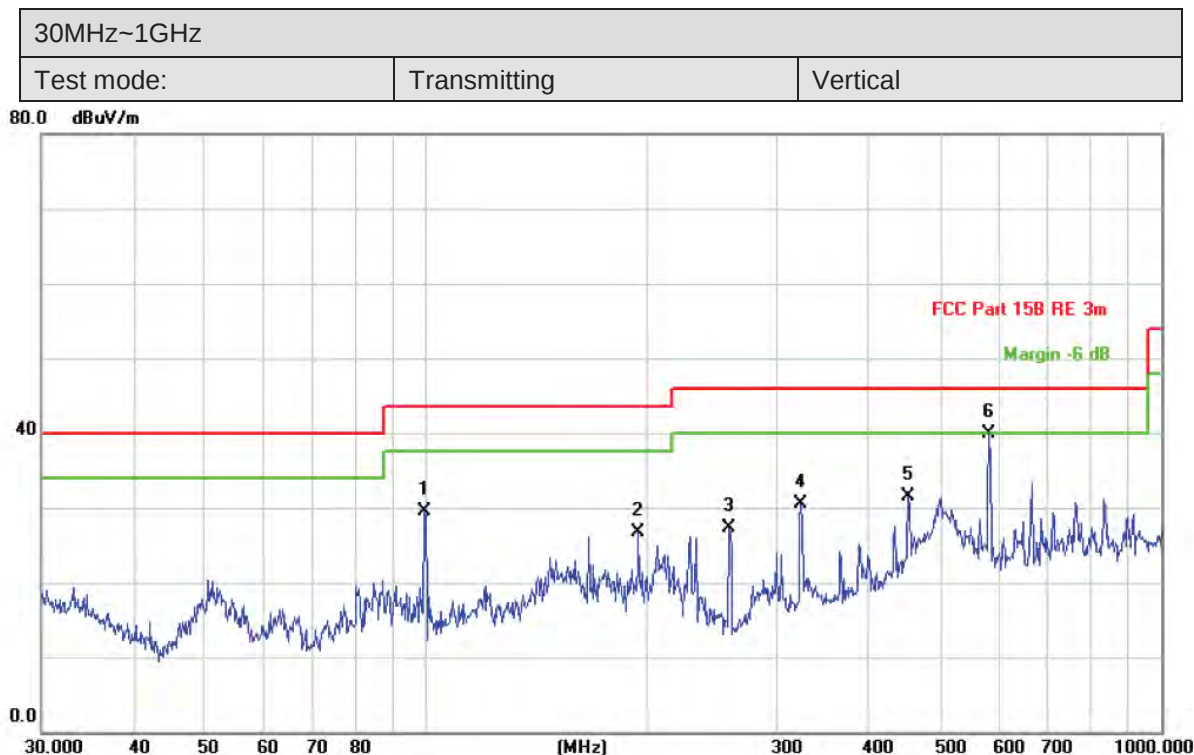
Figure 3. Above 1 GHz

Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.  
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.  
Note: For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | <p>d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p> <p>g. Test the EUT in the lowest channel (2402MHz), the middle channel (2441MHz), the Highest channel (2480MHz)</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p> |
| Exploratory Test Mode: | Non-hopping transmitting mode with all kind of modulation and all kind of data type<br>Transmitting mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Final Test Mode:       | Through Pre-scan, find the 3DH5 of data type and 8DPSK modulation is the worst case.<br>For below 1GHz part, through pre-scan, the worst case is the highest channel.<br>Only the worst case is recorded in the report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Test Results:          | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### 5.11.1 Radiated Emission below 1GHz



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB/m           | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree |
| 1   |     | 99.5281  | 45.44         | -15.99         | 29.45       | 43.50  | -14.05 | QP             |              |        |
| 2   |     | 194.4534 | 40.42         | -13.70         | 26.72       | 43.50  | -16.78 | QP             |              |        |
| 3   |     | 258.3264 | 39.81         | -12.55         | 27.26       | 46.00  | -18.74 | QP             |              |        |
| 4   |     | 323.3204 | 41.08         | -10.57         | 30.51       | 46.00  | -15.49 | QP             |              |        |
| 5   |     | 452.7197 | 38.39         | -6.94          | 31.45       | 46.00  | -14.55 | QP             |              |        |
| 6   | *   | 582.7425 | 44.08         | -4.22          | 39.86       | 46.00  | -6.14  | QP             |              |        |

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

|            |              |            |
|------------|--------------|------------|
| Test mode: | Transmitting | Horizontal |
|------------|--------------|------------|



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB/m           | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree |
| 1   |     | 99.8777  | 39.79         | -15.91         | 23.88       | 43.50  | -19.62 | QP             |              |        |
| 2   |     | 193.7728 | 50.19         | -14.01         | 36.18       | 43.50  | -7.32  | QP             |              |        |
| 3   |     | 227.6906 | 49.23         | -13.27         | 35.96       | 46.00  | -10.04 | QP             |              |        |
| 4   | *   | 323.3204 | 50.78         | -9.90          | 40.88       | 46.00  | -5.12  | QP             |              |        |
| 5   |     | 452.7197 | 47.05         | -7.22          | 39.83       | 46.00  | -6.17  | QP             |              |        |
| 6   |     | 839.1818 | 34.18         | -0.89          | 33.29       | 46.00  | -12.71 | QP             |              |        |

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

### 5.11.2 Transmitter Emission above 1GHz

| mode:       |               | GFSK(DH5)   |                | Test channel: |               | Lowest        |           |
|-------------|---------------|-------------|----------------|---------------|---------------|---------------|-----------|
| Frequency   | Meter Reading | Factor      | Emission Level | Limits        | Over          | Detector Type | Ant. Pol. |
| (MHz)       | (dBμV)        | (dB)        | (dBμV/m)       | (dBμV/m)      | (dB)          |               | H/V       |
| <b>2390</b> | <b>55.67</b>  | <b>-9.2</b> | <b>46.47</b>   | <b>74</b>     | <b>-27.53</b> | <b>Peak</b>   | <b>H</b>  |
| 2400        | 56.83         | -9.39       | 47.44          | 74            | -26.56        | Peak          | H         |
| 4804        | 52.23         | -4.33       | 47.90          | 74            | -26.10        | Peak          | H         |
| 7206        | 49.22         | 1.01        | 50.23          | 74            | -23.77        | Peak          | H         |
| <b>2390</b> | <b>55.27</b>  | <b>-9.2</b> | <b>46.07</b>   | <b>74</b>     | <b>-27.93</b> | <b>Peak</b>   | <b>V</b>  |
| 2400        | 56.21         | -9.39       | 46.82          | 74            | -27.18        | Peak          | V         |
| 4804        | 54.49         | -4.33       | 50.16          | 74            | -23.84        | Peak          | V         |
| 7206        | 49.55         | 1.01        | 50.56          | 74            | -23.44        | Peak          | V         |

| mode:     |               | GFSK(DH5) |                | Test channel: |        | Middle        |           |
|-----------|---------------|-----------|----------------|---------------|--------|---------------|-----------|
| Frequency | Meter Reading | Factor    | Emission Level | Limits        | Over   | Detector Type | Ant. Pol. |
| (MHz)     | (dBμV)        | (dB)      | (dBμV/m)       | (dBμV/m)      | (dB)   |               | H/V       |
| 4882      | 52.33         | -4.11     | 48.22          | 74            | -25.78 | <b>Peak</b>   | H         |
| 7323      | 49.49         | 1.51      | 51.00          | 74            | -23.00 | Peak          | H         |
| 4882      | 53.25         | -4.11     | 49.14          | 74            | -24.86 | <b>Peak</b>   | V         |
| 7323      | 49.19         | 1.51      | 50.70          | 74            | -23.30 | Peak          | V         |

| mode:         |               | GFSK(DH5)    |                | Test channel: |               | Highest       |           |
|---------------|---------------|--------------|----------------|---------------|---------------|---------------|-----------|
| Frequency     | Meter Reading | Factor       | Emission Level | Limits        | Over          | Detector Type | Ant. Pol. |
| (MHz)         | (dBμV)        | (dB)         | (dBμV/m)       | (dBμV/m)      | (dB)          |               | H/V       |
| <b>2483.5</b> | <b>56.69</b>  | <b>-9.29</b> | <b>47.40</b>   | <b>74</b>     | <b>-26.60</b> | <b>Peak</b>   | <b>H</b>  |
| 4960          | 50.83         | -4.04        | 46.79          | 74            | -27.21        | Peak          | H         |
| 7440          | 48.79         | 1.57         | 50.36          | 74            | -23.64        | Peak          | H         |
| <b>2483.5</b> | <b>53.28</b>  | <b>-9.29</b> | <b>43.99</b>   | <b>74</b>     | <b>-30.01</b> | <b>Peak</b>   | <b>V</b>  |
| 4960          | 49.03         | -4.04        | 44.99          | 74            | -29.01        | Peak          | V         |
| 7440          | 50.21         | 1.57         | 51.78          | 74            | -22.22        | Peak          | V         |

| mode:       |               | $\pi/4$ DQPSK (2DH5) |                | Test channel:  |               | Lowest        |           |
|-------------|---------------|----------------------|----------------|----------------|---------------|---------------|-----------|
| Frequency   | Meter Reading | Factor               | Emission Level | Limits         | Over          | Detector Type | Ant. Pol. |
| (MHz)       | (dB $\mu$ V)  | (dB)                 | (dB $\mu$ V/m) | (dB $\mu$ V/m) | (dB)          |               | H/V       |
| <b>2390</b> | <b>55.21</b>  | <b>-9.2</b>          | <b>46.01</b>   | <b>74</b>      | <b>-27.99</b> | <b>Peak</b>   | <b>H</b>  |
| 2400        | 56.27         | -9.39                | 46.88          | 74             | -27.12        | Peak          | H         |
| 4804        | 53.62         | -4.33                | 49.29          | 74             | -24.71        | Peak          | H         |
| 7206        | 50.36         | 1.01                 | 51.37          | 74             | -22.63        | Peak          | H         |
| <b>2390</b> | <b>53.71</b>  | <b>-9.2</b>          | <b>44.51</b>   | <b>74</b>      | <b>-29.49</b> | <b>Peak</b>   | <b>V</b>  |
| 2400        | 54.99         | -9.39                | 45.60          | 74             | -28.40        | Peak          | V         |
| 4804        | 54.14         | -4.33                | 49.81          | 74             | -24.19        | Peak          | V         |
| 7206        | 48.57         | 1.01                 | 49.58          | 74             | -24.42        | Peak          | V         |

| mode:     |               | $\pi/4$ DQPSK (2DH5) |                | Test channel:  |        | Middle        |           |
|-----------|---------------|----------------------|----------------|----------------|--------|---------------|-----------|
| Frequency | Meter Reading | Factor               | Emission Level | Limits         | Over   | Detector Type | Ant. Pol. |
| (MHz)     | (dB $\mu$ V)  | (dB)                 | (dB $\mu$ V/m) | (dB $\mu$ V/m) | (dB)   |               | H/V       |
| 4882      | 52.34         | -4.11                | 48.23          | 74             | -25.77 | Peak          | H         |
| 7323      | 48.74         | 1.51                 | 50.25          | 74             | -23.75 | Peak          | H         |
| 4882      | 53.95         | -4.11                | 49.84          | 74             | -24.16 | Peak          | V         |
| 7323      | 50.26         | 1.51                 | 51.77          | 74             | -22.23 | Peak          | V         |

| mode:         |               | $\pi/4$ DQPSK (2DH5) |                | Test channel:  |               | Highest       |           |
|---------------|---------------|----------------------|----------------|----------------|---------------|---------------|-----------|
| Frequency     | Meter Reading | Factor               | Emission Level | Limits         | Over          | Detector Type | Ant. Pol. |
| (MHz)         | (dB $\mu$ V)  | (dB)                 | (dB $\mu$ V/m) | (dB $\mu$ V/m) | (dB)          |               | H/V       |
| <b>2483.5</b> | <b>54.33</b>  | <b>-9.29</b>         | <b>45.04</b>   | <b>74</b>      | <b>-28.96</b> | <b>Peak</b>   | <b>H</b>  |
| 4960          | 53.13         | -4.04                | 49.09          | 74             | -24.91        | Peak          | H         |
| 7440          | 49.58         | 1.57                 | 51.15          | 74             | -22.85        | Peak          | H         |
| <b>2483.5</b> | <b>54.68</b>  | <b>-9.29</b>         | <b>45.39</b>   | <b>74</b>      | <b>-28.61</b> | <b>Peak</b>   | <b>V</b>  |
| 4960          | 49.33         | -4.04                | 45.29          | 74             | -28.71        | Peak          | V         |
| 7440          | 49.09         | 1.57                 | 50.66          | 74             | -23.34        | Peak          | V         |

| mode:       |               | 8DPSK(3DH5) |                | Test channel: |               | Lowest        |           |
|-------------|---------------|-------------|----------------|---------------|---------------|---------------|-----------|
| Frequency   | Meter Reading | Factor      | Emission Level | Limits        | Over          | Detector Type | Ant. Pol. |
| (MHz)       | (dBμV)        | (dB)        | (dBμV/m)       | (dBμV/m)      | (dB)          |               | H/V       |
| <b>2390</b> | <b>54.26</b>  | <b>-9.2</b> | <b>45.06</b>   | <b>74</b>     | <b>-28.94</b> | <b>Peak</b>   | <b>H</b>  |
| 2400        | 56.95         | -9.39       | 47.56          | 74            | -26.44        | Peak          | H         |
| 4804        | 51.27         | -4.33       | 46.94          | 74            | -27.06        | Peak          | H         |
| 7206        | 50.96         | 1.01        | 51.97          | 74            | -22.03        | Peak          | H         |
| <b>2390</b> | <b>56.20</b>  | <b>-9.2</b> | <b>47.00</b>   | <b>74</b>     | <b>-27.00</b> | <b>Peak</b>   | <b>V</b>  |
| 2400        | 56.40         | -9.39       | 47.01          | 74            | -26.99        | Peak          | V         |
| 4804        | 53.87         | -4.33       | 49.54          | 74            | -24.46        | Peak          | V         |
| 7206        | 50.55         | 1.01        | 51.56          | 74            | -22.44        | Peak          | V         |

| mode:     |               | 8DPSK(3DH5) |                | Test channel: |        | Middle        |           |
|-----------|---------------|-------------|----------------|---------------|--------|---------------|-----------|
| Frequency | Meter Reading | Factor      | Emission Level | Limits        | Over   | Detector Type | Ant. Pol. |
| (MHz)     | (dBμV)        | (dB)        | (dBμV/m)       | (dBμV/m)      | (dB)   |               | H/V       |
| 4882      | 51.09         | -4.11       | 46.98          | 74            | -27.02 | Peak          | H         |
| 7323      | 49.03         | 1.51        | 50.54          | 74            | -23.46 | Peak          | H         |
| 4882      | 53.24         | -4.11       | 49.13          | 74            | -24.87 | Peak          | V         |
| 7323      | 50.71         | 1.51        | 52.22          | 74            | -21.78 | Peak          | V         |

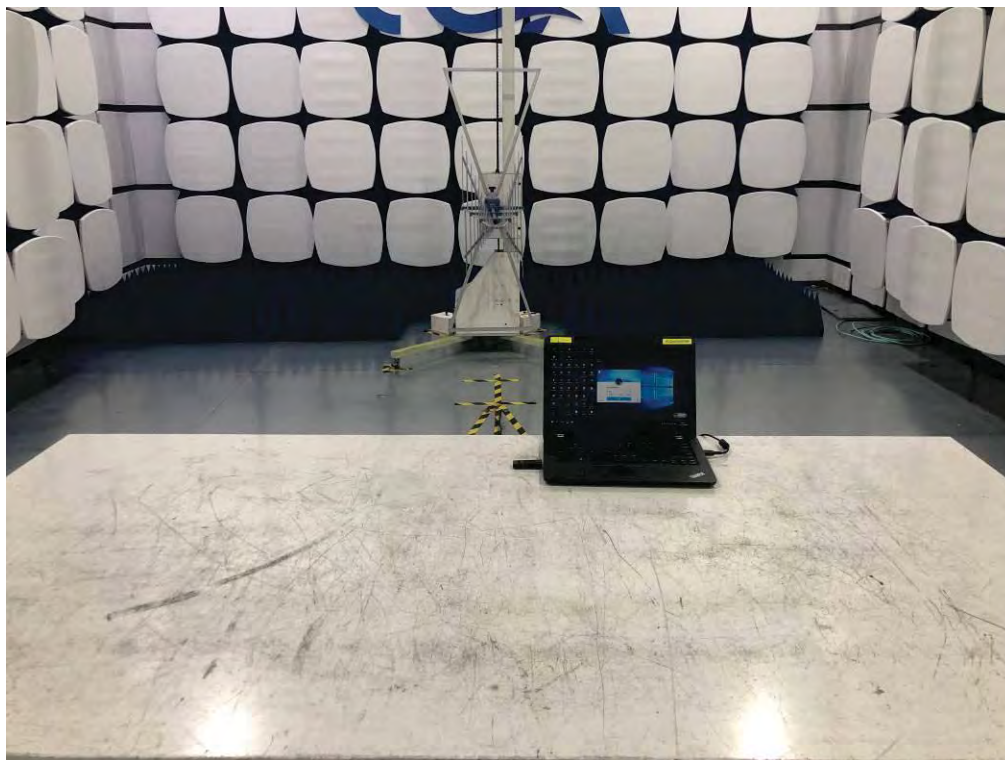
| Worse case mode: |               | 8DPSK(3DH5)  |                | Test channel: |               | Highest       |           |
|------------------|---------------|--------------|----------------|---------------|---------------|---------------|-----------|
| Frequency        | Meter Reading | Factor       | Emission Level | Limits        | Over          | Detector Type | Ant. Pol. |
| (MHz)            | (dBμV)        | (dB)         | (dBμV/m)       | (dBμV/m)      | (dB)          |               | H/V       |
| <b>2483.5</b>    | <b>54.96</b>  | <b>-9.29</b> | <b>45.67</b>   | <b>74</b>     | <b>-28.33</b> | <b>Peak</b>   | <b>H</b>  |
| 4960             | 50.71         | -4.04        | 46.67          | 74            | -27.33        | Peak          | H         |
| 7440             | 50.61         | 1.57         | 52.18          | 74            | -21.82        | Peak          | H         |
| <b>2483.5</b>    | <b>53.34</b>  | <b>-9.29</b> | <b>44.05</b>   | <b>74</b>     | <b>-29.95</b> | <b>Peak</b>   | <b>V</b>  |
| 4960             | 49.81         | -4.04        | 45.77          | 74            | -28.23        | Peak          | V         |
| 7440             | 51.23         | 1.57         | 52.80          | 74            | -21.20        | Peak          | V         |

Remark:

- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

## 6 Photographs - EUT Test Setup

### 6.1 Radiated Emission

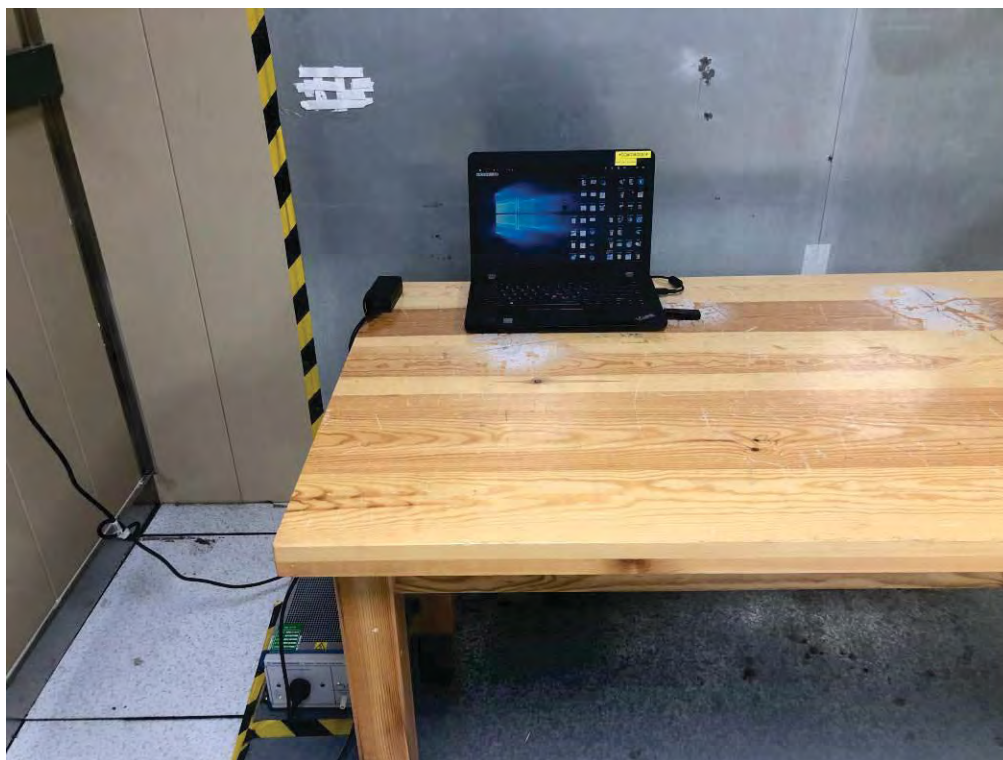


30MHz~1GHz



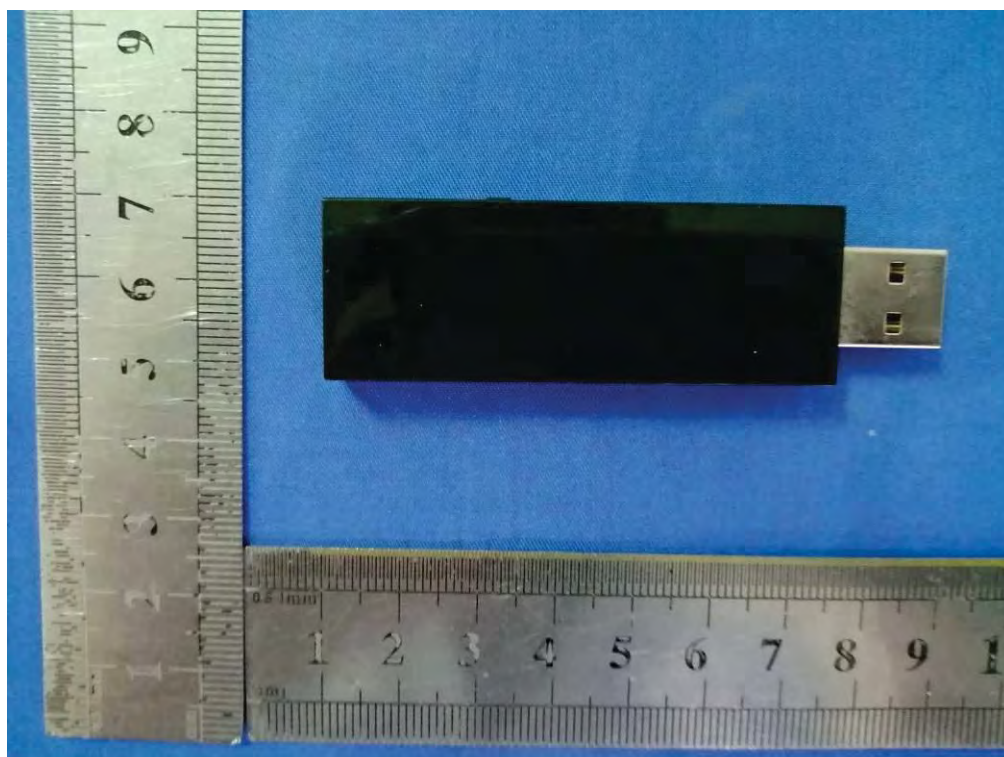
Above 1GHz

## 6.2 Conducted Emission



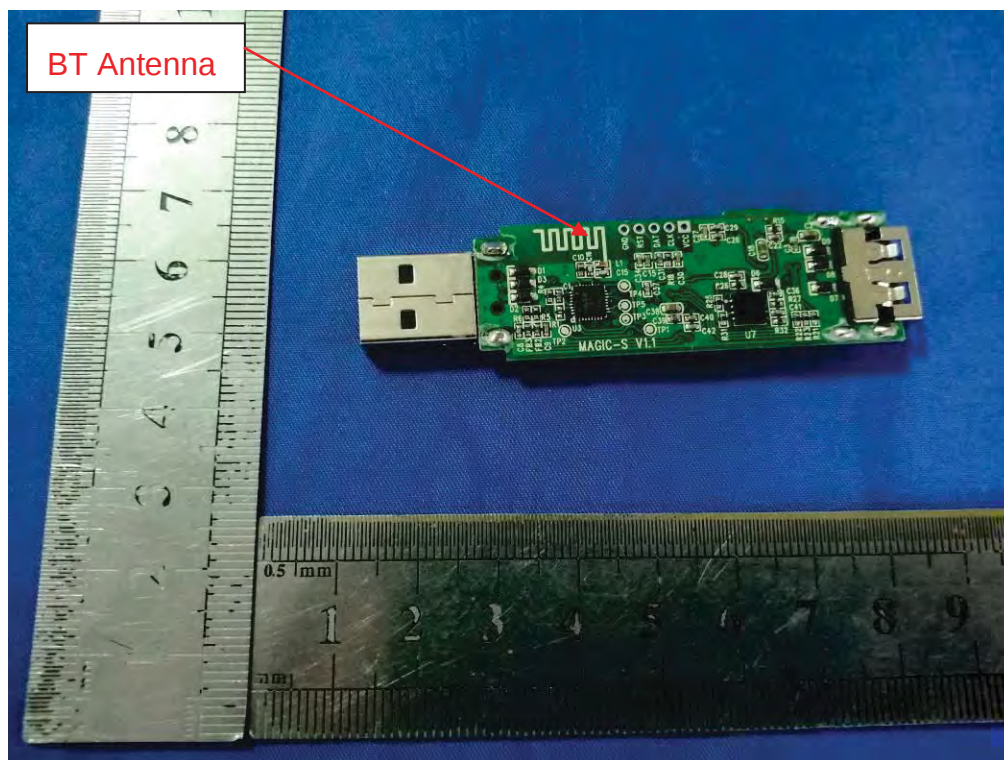
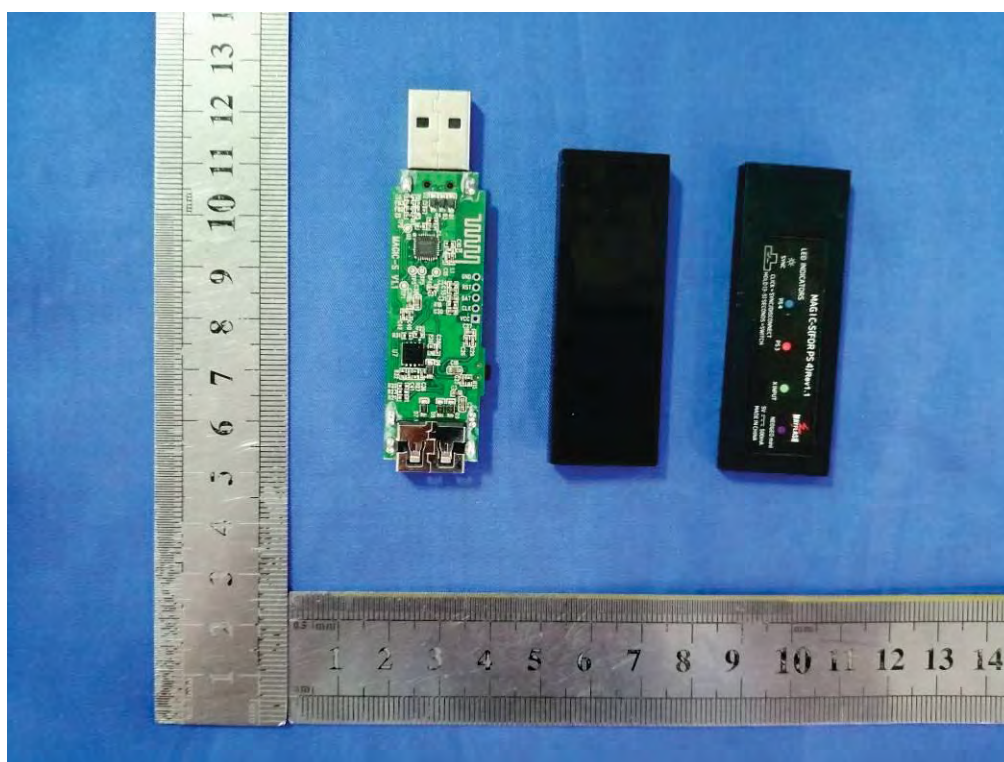
## 7 PHOTOGRAPHS OF EUT

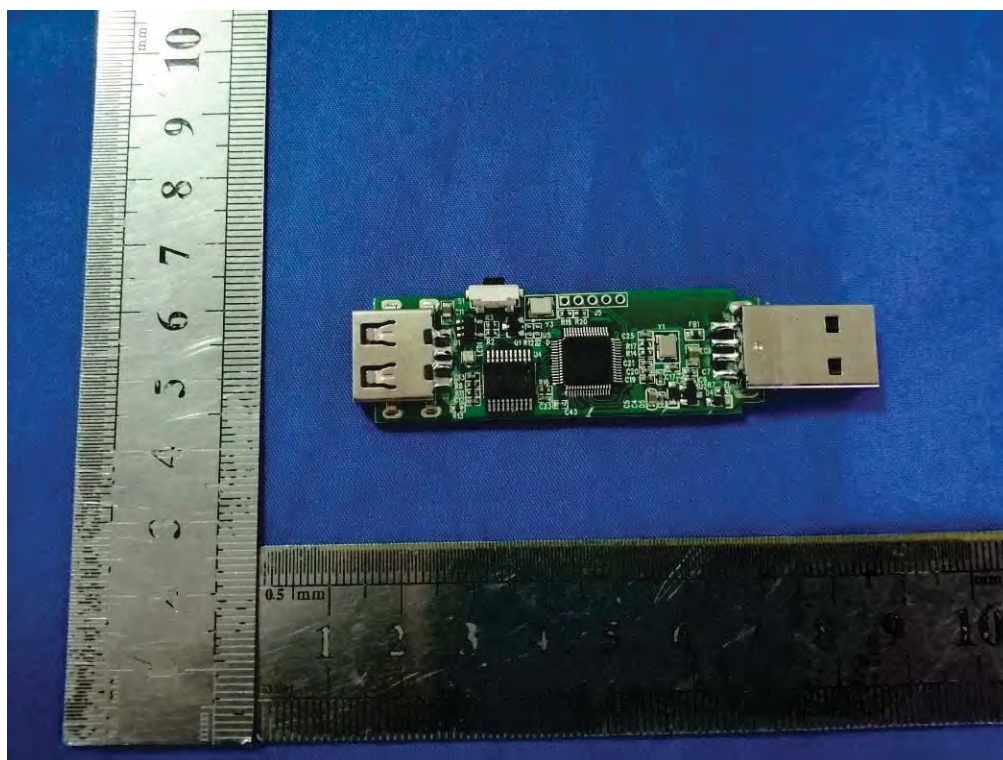
### External Photos of EUT





Internal Photos of EUT





\*\*\*\*\*THE END\*\*\*\*\*