# FCC TEST REPORT

For

Shenzhen Yale Electronics Co.Ltd

Magnetic Switch Bluetooth Headset

Test Model: AK1

Additional Model No.: AK2, AK3, AK4, AK5, AK6, AK7, AK8, AK9, AK10, AK11, AK12, AK13, AK14, AK15, AK16, AK17, AK18, AK19, AK20, A920BLS

| | | |
|---|---|---|
| Prepared for | : | Shenzhen Yale Electronics Co.Ltd |
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| Mail | : | webmaster@LCS-cert.com |
| Date of receipt of test sample | : | January 26, 2018 |
| Number of tested samples | : | 2 |
| Serial number | : | Prototype |
| Date of Test | : | January 26, 2018 ~ March 05, 2018 |
| Date of Report | : | March 05, 2018 |

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# FCC TEST REPORT
## FCC CFR 47 PART 15 C(15.247): 2017

| | | |
|---|---|---|
| **Report Reference No.** | : | **LCS180126028AE** |
| Date of Issue | : | March 05, 2018 |
| **Testing Laboratory Name** | : | **Shenzhen LCS Compliance Testing Laboratory Ltd.** |
| Address | : | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China |
| Testing Location/ Procedure | : | Full application of Harmonised standards ■<br>Partial application of Harmonised standards □<br>Other standard testing method □ |
| **Applicant's Name** | : | **Shenzhen Yale Electronics Co.Ltd** |
| Address | : | 4th Floor, Building 2, Yujingtai Industrial Park Dalang, Longhua New District,Shenzhen, Guangdong, China |
| **Test Specification** | | |
| Standard | : | FCC CFR 47 PART 15 C(15.247): 2017 |
| **Test Report Form No.** | : | LCSEMC-1.0 |
| TRF Originator | : | Shenzhen LCS Compliance Testing Laboratory Ltd. |
| Master TRF | : | Dated 2011-03 |

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| | | |
|---|---|---|
| **EUT Description** | : | **Magnetic Switch Bluetooth Headset** |
| Trade Mark | : | AWEI |
| Test Model | : | AK1 |
| Ratings | : | DC 3.7V by Rechargeable Li-ion Battery(130mAh)<br>Recharge Voltage: DC 5V/0.5A |
| Result | : | **Positive** |

| Compiled by: | Supervised by: | Approved by: |
|---|---|---|
| Camille Li | Dick Su | Gavin Liang |
| Camille Li/ File administrators | Dick Su/ Technique principal | Gavin Liang/ Manager |

# FCC -- TEST REPORT

| | |
|---|---|
| **Test Report No. : LCS180126028AE** | March 05, 2018<br>Date of issue |

| | | |
|---|---|---|
| Test Model..... | : | AK1 |
| EUT..... | : | Magnetic Switch Bluetooth Headset |
| **Applicant.....** | **:** | **Shenzhen Yale Electronics Co.Ltd** |
| Address..... | : | 4th Floor, Building 2, Yujingtai Industrial Park Dalang, Longhua New District,Shenzhen, Guangdong, China |
| Telephone..... | : | |
| Fax..... | : | |
| **Manufacturer.....** | **:** | **Shenzhen Yale Electronics Co.Ltd** |
| Address..... | : | 4th Floor, Building 2, Yujingtai Industrial Park Dalang, Longhua New District,Shenzhen, Guangdong, China |
| Telephone..... | : | |
| Fax..... | : | |
| **Factory.....** | **:** | **Shenzhen Yale Electronics Co.Ltd** |
| Address..... | : | 4th Floor, Building 2, Yujingtai Industrial Park Dalang, Longhua New District,Shenzhen, Guangdong, China |
| Telephone..... | : | |
| Fax..... | : | |

| **Test Result** | **Positive** |
|---|---|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 000 | March 05, 2018 | Initial Issue | Gavin Liang |
| | | | |
| | | | |

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# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | Magnetic Switch Bluetooth Headset |
| Test Model | : | AK1 |
| Additional Model No. | : | AK2, AK3, AK4, AK5, AK6, AK7, AK8, AK9, AK10, AK11, AK12, AK13, AK14, AK15, AK16, AK17, AK18, AK19, AK20, A920BLS |
| Model Declaration | : | PCB board, structure and internal of these model(s) are the same, So no additional models were tested. |
| Power Supply | : | DC 3.7V by Rechargeable Li-ion Battery(130mAh)<br>Recharge Voltage: DC 5V/0.5A |
| Hardware Version | : | V1.0 |
| Software Version | : | V1.0 |
| Frequency Range | : | 2402~2480MHz |
| Bluetooth Version | : | V4.2BDR/EDR |
| Channel Spacing | : | 1MHz |
| Channel Number | : | 79 Channels |
| Modulation Technology | : | GFSK, π/4-DQPSK , 8-DPSK |
| Data Rates | : | 1~3Mbps |
| Antenna Type And Gain | : | Internal antenna, 1.2dBi |

## 1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|---|---|---|---|---|
| Lenovo | PC | B470 | -- | DOC |
| Lenovo | AC/DC ADAPTER | ADP-90DDB | -- | DOC |

## 1.3. External I/O Cable

| I/O Port Description | Quantity | Cable |
|---|---|---|
| USB Charge Interface | 1 | N/A |
| -- | -- | -- |

## 1.4. Description of Test Facility

FCC Registration Number. is 254912.
Industry Canada Registration Number. is 9642A-1.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001
NVLAP Registration Code is 600167-0
The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

## 1.5. 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 LCS 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.

## 1.6. Measurement Uncertainty

| Test Item | | Frequency Range | Uncertainty | Note |
|---|---|---|---|---|
| Radiation Uncertainty | : | 9KHz~30MHz | ±3.10dB | (1) |
| | | 30MHz~200MHz | ±2.96dB | (1) |
| | | 200MHz~1000MHz | ±3.10dB | (1) |
| | | 1GHz~26.5GHz | ±3.80dB | (1) |
| | | 26.5GHz~40GHz | ±3.90dB | (1) |
| Conduction Uncertainty | : | 150kHz~30MHz | ±1.63dB | (1) |
| Power disturbance | : | 30MHz~300MHz | ±1.60dB | (1) |

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

## 1.7. Description of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With basic data rate feature, the data rates can be up to 1 Mb/s by modulating the RF carrier using GFSK techniques. The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

| Mode of Operations | Frequency Range (MHz) | Data Rate (Mbps) |
|---|---|---|
| BT V4.2(BDR/EDR) | 2402 | 1/2/3 |
| | 2441 | 1/2/3 |
| | 2480 | 1/2/3 |
| For Conducted Emission | | |
| Test Mode | TX Mode | |
| For Radiated Emission | | |
| Test Mode | TX Mode | |

Worst-case mode and channel used for 150 kHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1Mbps).

Worst-case mode and channel used for 9kHz-1000 MHz radiated emissions was the mode and channel with the highest output power that was determined to be TX(1Mbps-Low Channel).

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worst case.

# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

## 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 2.2. EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

## 2.3. General Test Procedures

### 2.3.1 Conducted Emissions

The EUT is directly placed on the ground. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

### 2.3.2 Radiated Emissions

The EUT is placed on a turntable, which is directly placed on the ground. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

## 2.4. Test Sample

The application provides 2 samples to meet requirement;

| Sample Number | Description |
|---|---|
| Sample 1 | Engineer sample – continuous transmit |
| Sample 2 | Normal sample – Intermittent transmit |

# 3. SYSTEM TEST CONFIGURATION

## 3.1. Justification

The system was configured for testing in a continuous transmits condition.

## 3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (CSR BlueSuite 2.4.8) provided by application.

## 3.3. Special Accessories

| No. | Equipment | Manufacturer | Model No. | Serial No. | Length | shielded/ unshielded | Notes |
|---|---|---|---|---|---|---|---|
| 1 | PC | Lenovo | Ideapad | A131101550 | / | / | DOC |
| 2 | Power adapter | Lenovo | CPA-A090 | 36200414 | 1.00m | unshielded | DOC |

## 3.4. Block Diagram/Schematics

Please refer to the related document

## 3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

## 3.6. Test Setup

Please refer to the test setup photo.

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# 4. SUMMARY OF TEST RESULTS

| Applied Standard: FCC Part 15 Subpart C | | | |
|---|---|---|---|
| FCC Rules | Description of Test | Test Sample | Result |
| §15.247(b)(1) | Maximum Conducted Output Power | Sample 1 | Compliant |
| §15.247(c) | Frequency Separation And 20 dB Bandwidth | Sample 1 | Compliant |
| §15.247(a)(1)(ii) | Number Of Hopping Frequency | Sample 2 | Compliant |
| §15.247(a)(1)(iii) | Time Of Occupancy (Dwell Time) | Sample 2 | Compliant |
| §15.209, §15.205 | Conducted Spurious Emissions and Band Edges Test | Sample 1 | Compliant |
| §15.209, §15.247(d) | Radiated and Conducted Spurious Emissions | Sample 1 | Compliant |
| §15.205 | Emissions at Restricted Band | Sample 1 | Compliant |
| §15.207(a) | Conducted Emissions | Sample 1 | Compliant |
| §15.203 | Antenna Requirements | Sample 1 | Compliant |
| §15.247(i)§2.1093 | RF Exposure | Sample 1 | Compliant |

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# 5. SUMMARY OF TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| 1 | Power Meter | R&S | NRVS | 100444 | 2017-06-17 | 2018-06-16 |
| 2 | Power Sensor | R&S | NRV-Z81 | 100458 | 2017-06-17 | 2018-06-16 |
| 3 | Power Sensor | R&S | NRV-Z32 | 10057 | 2017-06-17 | 2018-06-16 |
| 4 | ESA-E SERIES SPECTRUM ANALYZER | Agilent | E4407B | MY41440754 | 2017-11-17 | 2018-11-16 |
| 5 | MXA Signal Analyzer | Agilent | N9020A | MY49100040 | 2017-06-17 | 2018-06-16 |
| 6 | SPECTRUM ANALYZER | R&S | FSP | 100503 | 2017-06-17 | 2018-06-16 |
| 7 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 2017-06-17 | 2018-06-16 |
| 8 | Positioning Controller | MF | MF-7082 | / | 2017-06-17 | 2018-06-16 |
| 9 | EMI Test Software | AUDIX | E3 | N/A | 2017-06-17 | 2018-06-16 |
| 10 | EMI Test Receiver | R&S | ESR 7 | 101181 | 2017-06-17 | 2018-06-16 |
| 11 | AMPLIFIER | QuieTek | QTK-A2525G | CHM10809065 | 2017-11-17 | 2018-11-16 |
| 12 | Active Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2017-06-23 | 2018-06-22 |
| 13 | By-log Antenna | SCHWARZBECK | VULB9163 | 9163-470 | 2017-05-02 | 2018-05-01 |
| 14 | Horn Antenna | EMCO | 3115 | 6741 | 2017-06-23 | 2018-06-22 |
| 15 | Broadband Horn Antenna | SCHWARZBECK | BBHA 9170 | 791 | 2017-09-21 | 2018-09-20 |
| 16 | Broadband Preamplifier | SCHWARZBECK | BBV 9719 | 9719-025 | 2017-09-21 | 2018-09-20 |
| 17 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 2017-06-17 | 2018-06-16 |
| 18 | RF Cable-HIGH | SUHNER | SUCOFLEX 106 | 03CH03-HY | 2017-06-17 | 2018-06-16 |
| 19 | TEST RECEIVER | R&S | ESCI | 101142 | 2017-06-17 | 2018-06-16 |
| 20 | RF Cable-CON | UTIFLEX | 3102-26886-4 | CB049 | 2017-06-17 | 2018-06-16 |
| 21 | 10dB Attenuator | SCHWARZBECK | MTS-IMP136 | 261115-001-0032 | 2017-06-17 | 2018-06-16 |
| 22 | Artificial Mains | R&S | ENV216 | 101288 | 2017-06-17 | 2018-06-16 |
| 23 | RF Control Unit | Tonscend | JS0806-2 | 178060073 | 2017-10-28 | 2018-10-27 |
| 24 | BT/WIFI Test Software | Tonscend | JS1120-3 | / | N/A | N/A |
| Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD. | | | | | | |

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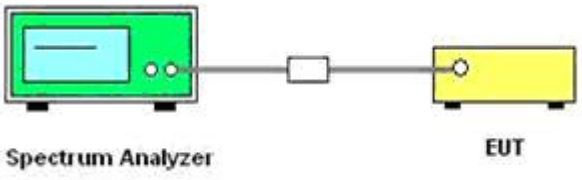
# 6. MEASUREMENT RESULTS

## 6.1. Peak Power

### 6.1.1 Block Diagram of Test Setup




### 6.1.2 Limit

According to §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

### 6.1.3 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer. According to ANSI C63.10:2013 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices; this is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.

2) RBW > 20 dB bandwidth of the emission being measured.

3) VBW ≥ RBW.

4) Sweep: Auto.

5) Detector function: Peak.

6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

### 6.1.4 Test Results

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.5** for Peak Output Power test data.

Remark:

1) Test results including cable loss;

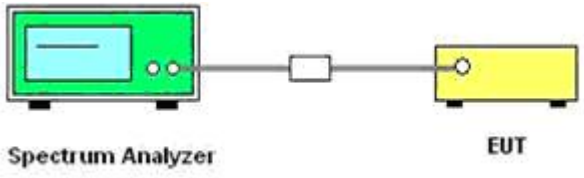
2) Measured output power at difference Packet Type for each mode and recorded worst case for each mode.

## 6.2. Frequency Separation and 20 dB Bandwidth

### 6.2.1 Limit

According to §15.247(c) or A8.1(a), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

### 6.2.2 Block Diagram of Test Setup




### 6.2.3 Test Procedure

Frequency separation test procedure:

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = middle of hopping channel.

4). Set the Spectrum Analyzer as RBW = 100 kHz, VBW = 300 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.

5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure:

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.

2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.

3). Detector function = peak.

4). Trace = max hold.

### 6.2.4 Test Results

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.1** for 20dB Bandwidth test data.

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.3** for Carrier Frequency Separation test data.

Remark:

1) Test results including cable loss;

2) Measured at difference Packet Type for each mode and recorded worst case for each mode.

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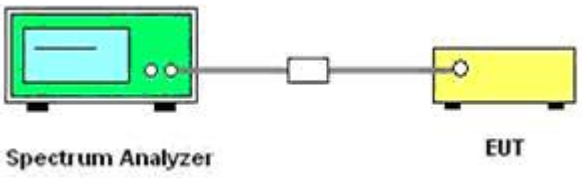
## 6.3. Number of Hopping Frequency

### 6.3.1 Limit

According to §15.247(a)(1)(ii) or A8.1 (d), Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels.

### 6.3.2 Block Diagram of Test Setup




### 6.3.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set Spectrum Analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.

4). Set the Spectrum Analyzer as RBW/VBW=100KHz/300KHz.

5). Max hold, view and count how many channel in the band.

### 6.3.4 Test Results

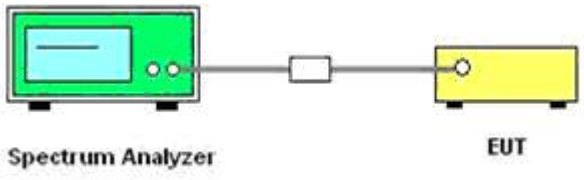
Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.4** for Hopping Channel Number test data.

## 6.4. Time of Occupancy (Dwell Time)

### 6.4.1 Limit

According to §15.247(a)(1)(iii) or A8.1 (d), Frequency hopping systems operating in the 2400MHz- 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

### 6.4.2 Block Diagram of Test Setup




### 6.4.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW/VBW=1MHz/3MHz, Span = 0Hz, Sweep = auto.

5). Repeat above procedures until all frequency measured was complete.

### 6.4.4 Test Results

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.2** for Dwell Time test data.

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:

The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch];

The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.

The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]

The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s];

The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];

The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

Remark:

1) Test results including cable loss;

2) Measured at difference Packet Type for each mode and recorded worst case for each mode.

3) Dwell Time Calculate formula:

DH1: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second

DH3: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second

DH5: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second

4) Measured at low, middle and high channel, recorded the worst case.

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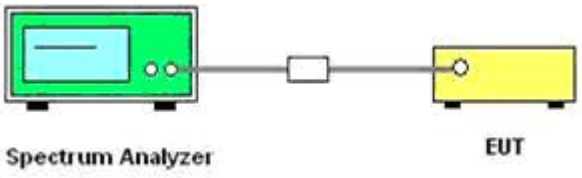
## 6.5. Conducted Spurious Emissions and Band Edges Test

### 6.5.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

### 6.5.2 Block Diagram of Test Setup




### 6.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 9 kHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels

### 6.5.4 Test Results of Conducted Spurious Emissions

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.6** for Band-edge Emissions test data.

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.7** for Conducted Spurious Emissions test data.

Remark:

1) Test results including cable loss;

2) Measured at difference Packet Type for each mode and recorded worst case for each mode.

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## 6.6. Restricted Band Emission Limit

### 6.6.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| \1\ 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293. | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (\2\) |
| 13.36-13.41 | | | |

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 6.6.2. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (Emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average |

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG |
| Start ~ Stop Frequency | 150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB/VB 120kHz/1MHz for QP |

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6.6.3. Test Procedures

**1) Sequence of testing 9 kHz to 30 MHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

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**2) Sequence of testing 30 MHz to 1 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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**3) Sequence of testing 1 GHz to 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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**4) Sequence of testing above 18 GHz**

**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

**Premeasurement:**

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

**Final measurement:**

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

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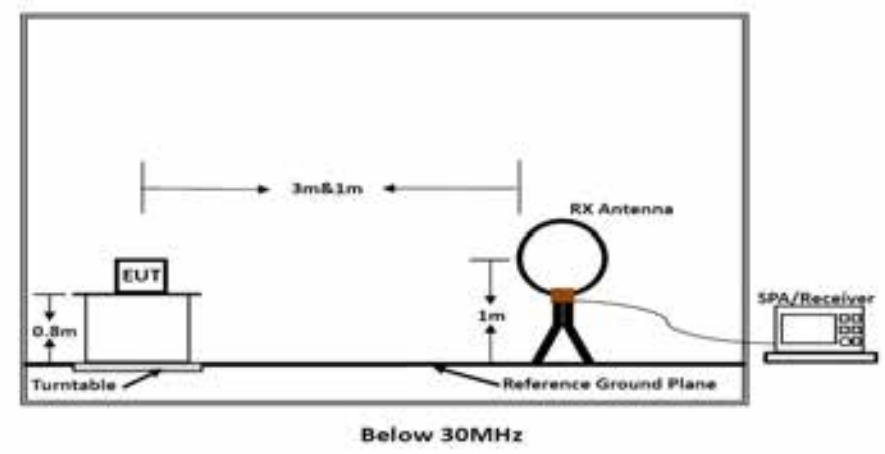
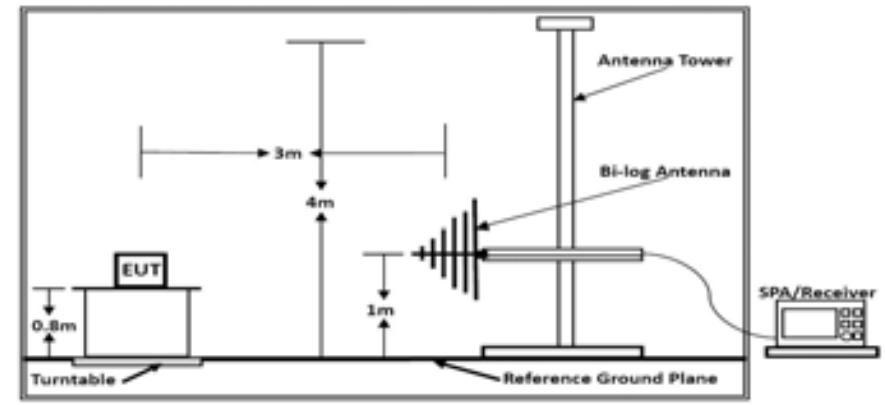
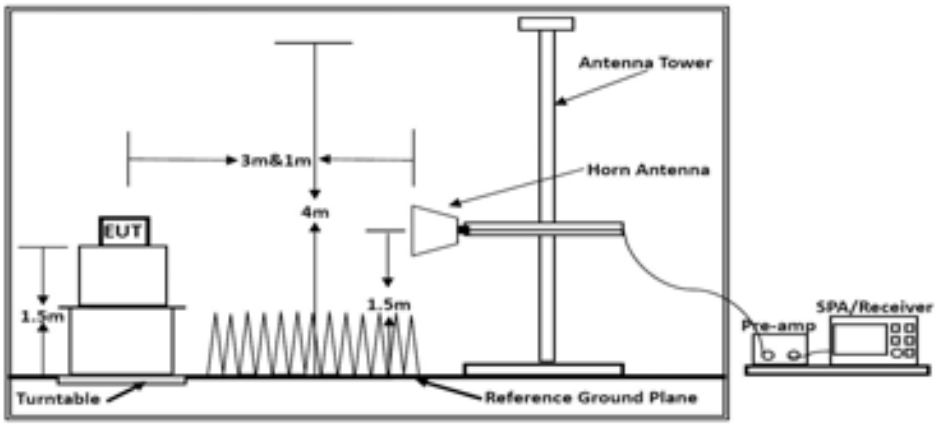
6.6.4. Test Setup Layout




Below 30MHz




Below 1GHz




Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6.6. Results of Radiated Emissions (9 KHz~30MHz)

| Temperature | 24.5℃ | Humidity | 55% |
|---|---|---|---|
| Test Engineer | Wilson Hong | Configurations | BT |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Over Limit (dBuV) | Remark |
|---|---|---|---|---|
| - | - | - | - | See Note |

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

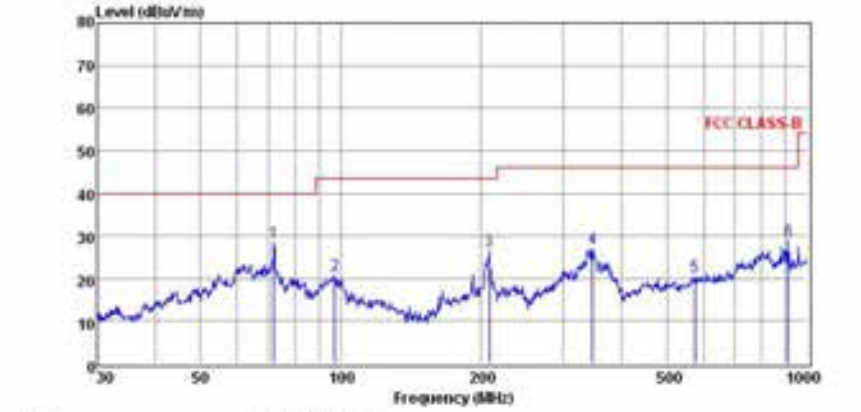
6.6.7. Results of Radiated Emissions (Above 30MHz)

**PASS.**

Only record the worst test result in this report.

The test data please refer to following page.

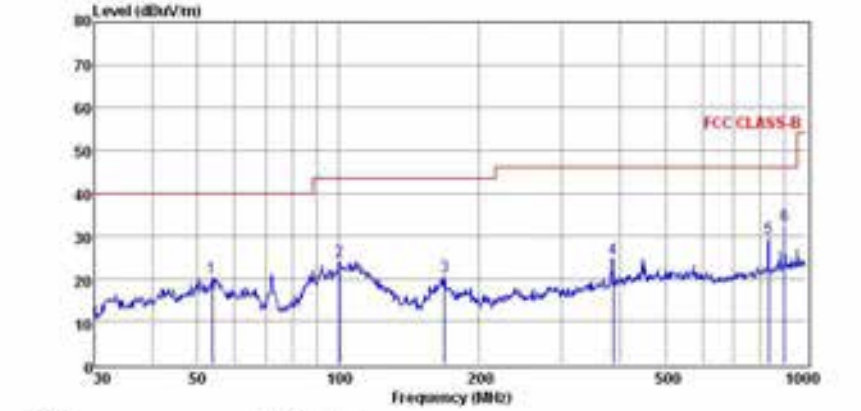
***Below 1GHz***




pol: HORIZONTAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 71.83 | 19.59 | 0.55 | 8.34 | 28.48 | 40.00 | -11.52 | QP |
| 2 | 97.11 | 7.36 | 0.61 | 12.98 | 20.95 | 43.50 | -22.55 | QP |
| 3 | 207.85 | 14.75 | 0.86 | 10.82 | 26.43 | 43.50 | -17.07 | QP |
| 4 | 346.81 | 11.73 | 1.13 | 14.23 | 27.09 | 46.00 | -18.91 | QP |
| 5 | 574.43 | 1.18 | 1.49 | 17.98 | 20.65 | 46.00 | -25.35 | QP |
| 6 | 912.86 | 5.80 | 1.86 | 21.17 | 28.83 | 46.00 | -17.17 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported




pol: VERTICAL

| | Freq | Reading | CabLos | Antfac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB/m | dBuV/m | dBuV/m | dB | |
| 1 | 53.69 | 6.61 | 0.46 | 13.08 | 20.15 | 40.00 | -19.85 | QP |
| 2 | 100.58 | 10.25 | 0.60 | 13.11 | 23.96 | 43.50 | -19.54 | QP |
| 3 | 168.41 | 10.77 | 0.80 | 8.92 | 20.49 | 43.50 | -23.01 | QP |
| 4 | 386.63 | 8.50 | 1.32 | 14.75 | 24.57 | 46.00 | -21.43 | QP |
| 5 | 833.32 | 7.16 | 1.86 | 20.40 | 29.42 | 46.00 | -16.58 | QP |
| 6 | 900.15 | 9.31 | 1.88 | 21.09 | 32.28 | 46.00 | -13.72 | QP |

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

***Note: Pre-scan all modes and recorded the worst case results in this report (1Mbps-Low Channel).

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***Above 1GHz***

*The worst test result for GFSK, Channel 0 / 2402 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 58.46 | 33.06 | 35.04 | 3.94 | 60.42 | 74.00 | -13.58 | Peak | Horizontal |
| 4804.00 | 41.06 | 33.06 | 35.04 | 3.94 | 43.02 | 54.00 | -10.98 | Average | Horizontal |
| 12010.00 | 53.65 | 33.16 | 35.06 | 3.96 | 55.71 | 74.00 | -18.29 | Peak | Horizontal |
| 12010.00 | 41.41 | 33.16 | 35.06 | 3.96 | 43.47 | 54.00 | -10.53 | Average | Horizontal |
| 4804.00 | 50.59 | 33.06 | 35.04 | 3.94 | 52.55 | 74.00 | -21.45 | Peak | Vertical |
| 4804.00 | 41.59 | 33.06 | 35.04 | 3.94 | 43.55 | 54.00 | -10.45 | Average | Vertical |
| 12010.00 | 54.19 | 33.16 | 35.06 | 3.96 | 56.25 | 74.00 | -17.75 | Peak | Vertical |
| 12010.00 | 38.96 | 33.16 | 35.06 | 3.96 | 41.02 | 54.00 | -12.98 | Average | Vertical |

*The worst test result for π/4-DQPSK, Channel 0 / 2402 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 56.92 | 33.06 | 35.04 | 3.94 | 58.88 | 74.00 | -15.12 | Peak | Horizontal |
| 4804.00 | 41.60 | 33.06 | 35.04 | 3.94 | 43.56 | 54.00 | -10.44 | Average | Horizontal |
| 12010.00 | 50.43 | 33.16 | 35.06 | 3.96 | 52.49 | 74.00 | -21.51 | Peak | Horizontal |
| 12010.00 | 42.27 | 33.16 | 35.06 | 3.96 | 44.33 | 54.00 | -9.67 | Average | Horizontal |
| 4804.00 | 50.10 | 33.06 | 35.04 | 3.94 | 52.06 | 74.00 | -21.94 | Peak | Vertical |
| 4804.00 | 41.47 | 33.06 | 35.04 | 3.94 | 43.43 | 54.00 | -10.57 | Average | Vertical |
| 12010.00 | 54.69 | 33.16 | 35.06 | 3.96 | 56.75 | 74.00 | -17.25 | Peak | Vertical |
| 12010.00 | 38.93 | 33.16 | 35.06 | 3.96 | 40.99 | 54.00 | -13.01 | Average | Vertical |

*The worst test result for 8DPSK, Channel 0 / 2402 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4804.00 | 55.76 | 33.06 | 35.04 | 3.94 | 57.72 | 74.00 | -16.28 | Peak | Horizontal |
| 4804.00 | 40.65 | 33.06 | 35.04 | 3.94 | 42.61 | 54.00 | -11.39 | Average | Horizontal |
| 12010.00 | 52.05 | 33.16 | 35.06 | 3.96 | 54.11 | 74.00 | -19.89 | Peak | Horizontal |
| 12010.00 | 41.02 | 33.16 | 35.06 | 3.96 | 43.08 | 54.00 | -10.92 | Average | Horizontal |
| 4804.00 | 53.29 | 33.06 | 35.04 | 3.94 | 55.25 | 74.00 | -18.75 | Peak | Vertical |
| 4804.00 | 41.07 | 33.06 | 35.04 | 3.94 | 43.03 | 54.00 | -10.97 | Average | Vertical |
| 12010.00 | 52.64 | 33.16 | 35.06 | 3.96 | 54.70 | 74.00 | -19.30 | Peak | Vertical |
| 12010.00 | 40.70 | 33.16 | 35.06 | 3.96 | 42.76 | 54.00 | -11.24 | Average | Vertical |

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*The worst test result for GFSK, Channel 39 / 2441 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4882.00 | 57.56 | 33.16 | 35.15 | 3.96 | 59.53 | 74.00 | -14.47 | Peak | Horizontal |
| 4882.00 | 40.38 | 33.16 | 35.15 | 3.96 | 42.35 | 54.00 | -11.65 | Average | Horizontal |
| 12205.00 | 51.20 | 33.26 | 35.17 | 3.98 | 53.27 | 74.00 | -20.73 | Peak | Horizontal |
| 12205.00 | 41.99 | 33.26 | 35.17 | 3.98 | 44.06 | 54.00 | -9.94 | Average | Horizontal |
| 4882.00 | 54.14 | 33.16 | 35.15 | 3.96 | 56.11 | 74.00 | -17.89 | Peak | Vertical |
| 4882.00 | 39.05 | 33.16 | 35.15 | 3.96 | 41.02 | 54.00 | -12.98 | Average | Vertical |
| 12205.00 | 53.75 | 33.26 | 35.17 | 3.98 | 55.82 | 74.00 | -18.18 | Peak | Vertical |
| 12205.00 | 42.28 | 33.26 | 35.17 | 3.98 | 44.35 | 54.00 | -9.65 | Average | Vertical |

*The worst test result for π/4-DQPSK, Channel 39 / 2441 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4882.00 | 55.32 | 33.16 | 35.15 | 3.96 | 57.29 | 74.00 | -16.71 | Peak | Horizontal |
| 4882.00 | 40.88 | 33.16 | 35.15 | 3.96 | 42.85 | 54.00 | -11.15 | Average | Horizontal |
| 12205.00 | 53.31 | 33.26 | 35.17 | 3.98 | 55.38 | 74.00 | -18.62 | Peak | Horizontal |
| 12205.00 | 41.61 | 33.26 | 35.17 | 3.98 | 43.68 | 54.00 | -10.32 | Average | Horizontal |
| 4882.00 | 53.03 | 33.16 | 35.15 | 3.96 | 55.00 | 74.00 | -19.00 | Peak | Vertical |
| 4882.00 | 37.75 | 33.16 | 35.15 | 3.96 | 39.72 | 54.00 | -14.28 | Average | Vertical |
| 12205.00 | 52.79 | 33.26 | 35.17 | 3.98 | 54.86 | 74.00 | -19.14 | Peak | Vertical |
| 12205.00 | 42.40 | 33.26 | 35.17 | 3.98 | 44.47 | 54.00 | -9.53 | Average | Vertical |

*The worst test result for 8DPSK, Channel 39 / 2441 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac. dB | Cab. Loss dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4882.00 | 54.89 | 33.16 | 35.15 | 3.96 | 56.86 | 74.00 | -17.14 | Peak | Horizontal |
| 4882.00 | 40.90 | 33.16 | 35.15 | 3.96 | 42.87 | 54.00 | -11.13 | Average | Horizontal |
| 12205.00 | 52.76 | 33.26 | 35.17 | 3.98 | 54.83 | 74.00 | -19.17 | Peak | Horizontal |
| 12205.00 | 38.98 | 33.26 | 35.17 | 3.98 | 41.05 | 54.00 | -12.95 | Average | Horizontal |
| 4882.00 | 55.87 | 33.16 | 35.15 | 3.96 | 57.84 | 74.00 | -16.16 | Peak | Vertical |
| 4882.00 | 37.45 | 33.16 | 35.15 | 3.96 | 39.42 | 54.00 | -14.58 | Average | Vertical |
| 12205.00 | 54.53 | 33.26 | 35.17 | 3.98 | 56.60 | 74.00 | -17.40 | Peak | Vertical |
| 12205.00 | 41.61 | 33.26 | 35.17 | 3.98 | 43.68 | 54.00 | -10.32 | Average | Vertical |

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*The worst test result for GFSK, Channel 78 / 2480 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac dB | Cab. Los dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | 56.65 | 33.26 | 35.14 | 3.98 | 58.75 | 74.00 | -15.25 | Peak | Horizontal |
| 4960.00 | 42.98 | 33.26 | 35.14 | 3.98 | 45.08 | 54.00 | -8.92 | Average | Horizontal |
| 12400.00 | 50.84 | 33.36 | 35.16 | 4.00 | 53.04 | 74.00 | -20.96 | Peak | Horizontal |
| 12400.00 | 39.37 | 33.36 | 35.16 | 4.00 | 41.57 | 54.00 | -12.43 | Average | Horizontal |
| 4960.00 | 51.14 | 33.26 | 35.14 | 3.98 | 53.24 | 74.00 | -20.76 | Peak | Vertical |
| 4960.00 | 37.40 | 33.26 | 35.14 | 3.98 | 39.50 | 54.00 | -14.50 | Average | Vertical |
| 12400.00 | 52.32 | 33.36 | 35.16 | 4.00 | 54.52 | 74.00 | -19.48 | Peak | Vertical |
| 12400.00 | 38.99 | 33.36 | 35.16 | 4.00 | 41.19 | 54.00 | -12.81 | Average | Vertical |

*The worst test result for π/4-DQPSK, Channel 78 / 2480 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac dB | Cab. Los dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | 55.40 | 33.26 | 35.14 | 3.98 | 57.50 | 74.00 | -16.50 | Peak | Horizontal |
| 4960.00 | 43.26 | 33.26 | 35.14 | 3.98 | 45.36 | 54.00 | -8.64 | Average | Horizontal |
| 12400.00 | 52.93 | 33.36 | 35.16 | 4.00 | 55.13 | 74.00 | -18.87 | Peak | Horizontal |
| 12400.00 | 41.07 | 33.36 | 35.16 | 4.00 | 43.27 | 54.00 | -10.73 | Average | Horizontal |
| 4960.00 | 53.56 | 33.26 | 35.14 | 3.98 | 55.66 | 74.00 | -18.34 | Peak | Vertical |
| 4960.00 | 39.15 | 33.26 | 35.14 | 3.98 | 41.25 | 54.00 | -12.75 | Average | Vertical |
| 12400.00 | 50.89 | 33.36 | 35.16 | 4.00 | 53.09 | 74.00 | -20.91 | Peak | Vertical |
| 12400.00 | 39.07 | 33.36 | 35.16 | 4.00 | 41.27 | 54.00 | -12.73 | Average | Vertical |

*The worst test result for 8DPSK,, Channel 78 / 2480 MHz*

| Freq. MHz | Reading dBuv | Ant. Fac dB/m | Pre. Fac dB | Cab. Los dB | Measured dBuv/m | Limit dBuv/m | Margin dB | Remark | Pol. |
|---|---|---|---|---|---|---|---|---|---|
| 4960.00 | 53.53 | 33.26 | 35.14 | 3.98 | 55.63 | 74.00 | -18.37 | Peak | Horizontal |
| 4960.00 | 43.94 | 33.26 | 35.14 | 3.98 | 46.04 | 54.00 | -7.96 | Average | Horizontal |
| 12400.00 | 50.94 | 33.36 | 35.16 | 4.00 | 53.14 | 74.00 | -20.86 | Peak | Horizontal |
| 12400.00 | 42.13 | 33.36 | 35.16 | 4.00 | 44.33 | 54.00 | -9.67 | Average | Horizontal |
| 4960.00 | 52.99 | 33.26 | 35.14 | 3.98 | 55.09 | 74.00 | -18.91 | Peak | Vertical |
| 4960.00 | 37.95 | 33.26 | 35.14 | 3.98 | 40.05 | 54.00 | -13.95 | Average | Vertical |
| 12400.00 | 54.48 | 33.36 | 35.16 | 4.00 | 56.68 | 74.00 | -17.32 | Peak | Vertical |
| 12400.00 | 38.27 | 33.36 | 35.16 | 4.00 | 40.47 | 54.00 | -13.53 | Average | Vertical |

*Notes:*

*1). Measuring frequencies from 9 KHz~10$^{th}$ harmonic (ex. 26GHz), No emission found between lowest internal used/generated frequency to 30 MHz.*

*2). Radiated emissions measured in frequency range from 9 KHz~10$^{th}$ harmonic (ex. 26GHz) were made with an instrument using Peak detector mode.*

*3). 18~25GHz at least have 20dB margin. No recording in the test report.*

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## 6.7. AC Power line conducted emissions

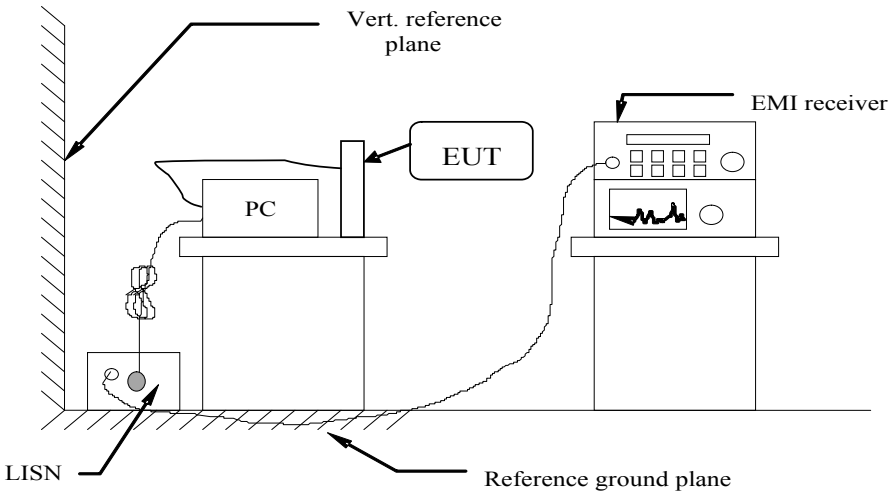
### 6.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

### 6.7.2 Block Diagram of Test Setup

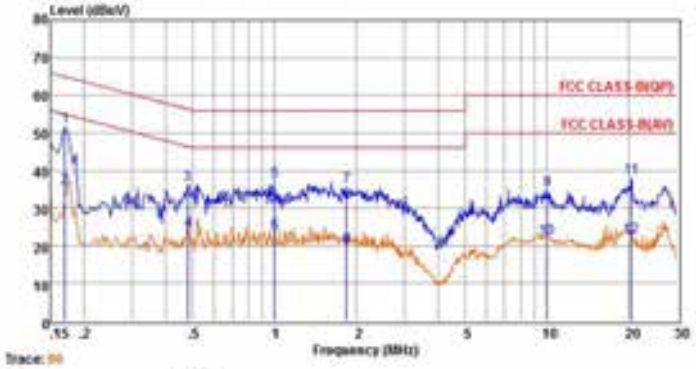



### 6.7.3 Test Results

**PASS.**

The test data please refer to following page.

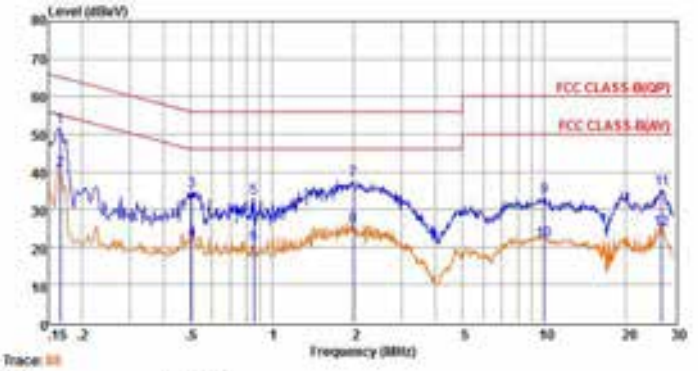
***AC Conducted Emission of charge from PC mode @ AC 120V/60Hz (worst case)***




Trace: 88
Pol: LINE

| | Freq | Reading | LISNFac | CabLos | Aux2Fac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.17 | 32.09 | 9.60 | 0.02 | 10.00 | 51.71 | 64.94 | -13.23 | QP |
| 2 | 0.17 | 15.85 | 9.60 | 0.02 | 10.00 | 35.47 | 54.94 | -19.47 | Average |
| 3 | 0.48 | 16.54 | 9.62 | 0.04 | 10.00 | 36.20 | 56.32 | -20.12 | QP |
| 4 | 0.48 | 4.36 | 9.62 | 0.04 | 10.00 | 24.02 | 46.32 | -22.30 | Average |
| 5 | 1.00 | 17.42 | 9.63 | 0.05 | 10.00 | 37.10 | 56.00 | -18.90 | QP |
| 6 | 1.00 | 3.79 | 9.63 | 0.05 | 10.00 | 23.47 | 46.00 | -22.53 | Average |
| 7 | 1.84 | 16.12 | 9.64 | 0.05 | 10.00 | 35.81 | 56.00 | -20.19 | QP |
| 8 | 1.84 | 0.02 | 9.64 | 0.05 | 10.00 | 19.71 | 46.00 | -26.29 | Average |
| 9 | 10.02 | 15.01 | 9.69 | 0.08 | 10.00 | 34.78 | 60.00 | -25.22 | QP |
| 10 | 10.02 | 2.19 | 9.69 | 0.08 | 10.00 | 21.96 | 50.00 | -28.04 | Average |
| 11 | 20.38 | 18.20 | 9.75 | 0.12 | 10.00 | 38.07 | 60.00 | -21.93 | QP |
| 12 | 20.38 | 2.57 | 9.75 | 0.12 | 10.00 | 22.44 | 50.00 | -27.56 | Average |

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.




Trace: 88
Pol: NEUTRAL

| | Freq | Reading | LISNFac | CabLos | Aux2Fac | Measured | Limit | Over | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.17 | 31.93 | 9.66 | 0.02 | 10.00 | 51.61 | 65.16 | -13.55 | QP |
| 2 | 0.17 | 20.83 | 9.66 | 0.02 | 10.00 | 40.51 | 55.16 | -14.65 | Average |
| 3 | 0.50 | 15.10 | 9.62 | 0.04 | 10.00 | 34.76 | 56.00 | -21.24 | QP |
| 4 | 0.50 | 2.26 | 9.62 | 0.04 | 10.00 | 21.94 | 46.00 | -24.06 | Average |
| 5 | 0.86 | 13.33 | 9.63 | 0.04 | 10.00 | 33.00 | 56.00 | -23.00 | QP |
| 6 | 0.86 | 1.06 | 9.63 | 0.04 | 10.00 | 20.73 | 46.00 | -25.27 | Average |
| 7 | 1.99 | 18.11 | 9.63 | 0.05 | 10.00 | 37.79 | 56.00 | -18.21 | QP |
| 8 | 1.99 | 6.02 | 9.63 | 0.05 | 10.00 | 25.70 | 46.00 | -20.30 | Average |
| 9 | 10.02 | 13.44 | 9.72 | 0.08 | 10.00 | 33.24 | 60.00 | -26.76 | QP |
| 10 | 10.02 | 1.85 | 9.72 | 0.08 | 10.00 | 21.65 | 50.00 | -28.35 | Average |
| 11 | 27.13 | 15.45 | 9.83 | 0.13 | 10.00 | 35.41 | 60.00 | -24.59 | QP |
| 12 | 27.13 | 4.74 | 9.83 | 0.13 | 10.00 | 24.70 | 50.00 | -25.30 | Average |

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

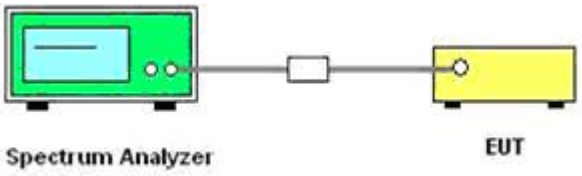
****Note: Pre-scan all modes and recorded the worst case results in this report (GFSK Modulation).*

## 6.8. Restrict-band band-edge measurements

### 6.8.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 6.8.2. Test Setup Layout




### 6.8.3. Measuring Instruments and Setting

Please refer to section 6 of equipment list in this report. The following table is the setting of Spectrum Analyzer.

### 6.8.4. Test Procedures

According to KDB 412172 section 1.1 Field Strength Approach (linear terms):
eirp = $p_t$ x $g_t$ = $(E \times d)^2/30$
Where:
$p_t$ = transmitter output power in watts,
$g_t$ = numeric gain of the transmitting antenna (unit less),
E = electric field strength in V/m,
d = measurement distance in meters (m).
erp = eirp/1.64 = $(E \times d)^2/(30 \times 1.64)$
Where all terms are as previously defined.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for Peak detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

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7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Compare the resultant electric field strength level to the applicable regulatory limit.
11. Perform radiated spurious emission test duress until all measured frequencies were complete.

6.8.5. Test Results

Please see **Appendix A RF Test Data for BT V4.2(BDR/EDR) (Conducted Measurement)_A.8** for Restrict-band band-edge measurements test data.

Remark:

1) Measured at difference Packet Type for each mode and recorded worst case for each mode.

2) Measured at Hopping and Non-Hopping mode, recorded worst at Non-Hopping mode.

3) The other emission levels were very low against the limit.

4) The average measurement was not performed when the peak measured data under the limit of average detection.

5) Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=10Hz/Sweep time=Auto/Detector=Peak.

6) Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

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## 6.9. Pseudorandom frequency hopping sequence

### 6.9.1 Standard Applicable

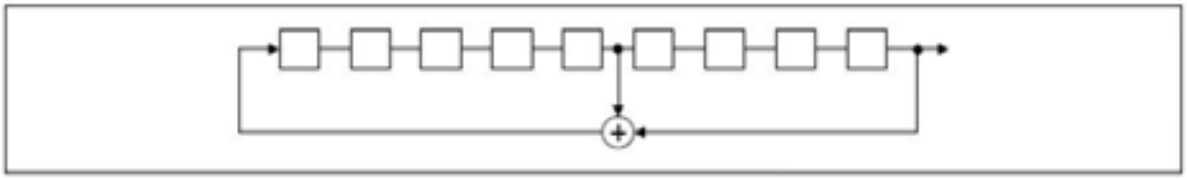
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

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

### 6.9.2 EUT Pseudorandom Frequency Hopping Sequence Requirement

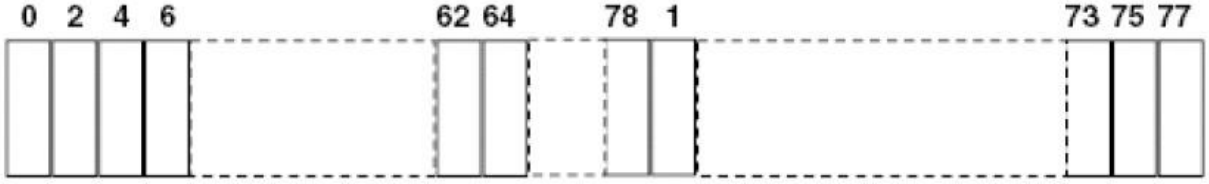
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



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

An example of pseudorandom frequency hopping sequence as follows:




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

## 6.10. Antenna Requirement

### 6.10.1 Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### 6.10.2 Antenna Connected Construction

#### 6.10.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

#### 6.10.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.2dBi, and the antenna is a PCB antenna and no consideration of replacement. Please see EUT photo for details.

#### 6.10.2.3. Results: Compliance.

# 7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

# 8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

# 9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------

# Environmental Conditions

| | |
|---|---|
| Temperature: | 21.9 ° C |
| Relative Humidity: | 51.2% |
| ATM Pressure: | 100.0 kPa |
| Test Engineer: | Mina.xu |
| Supervised by: | Tom.Liu |

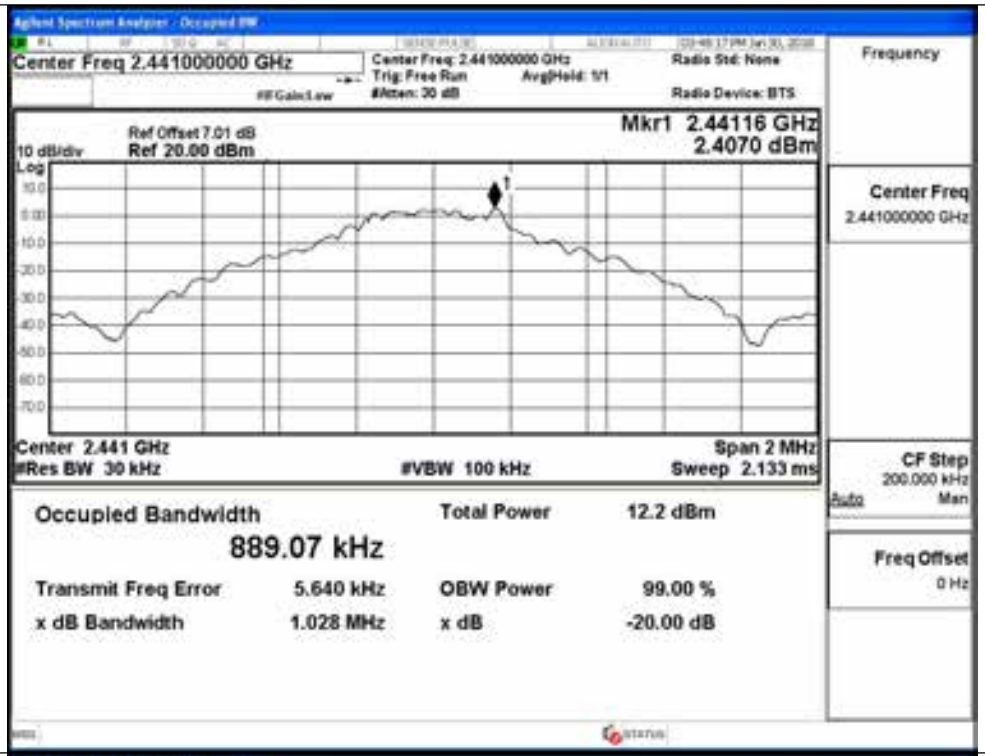
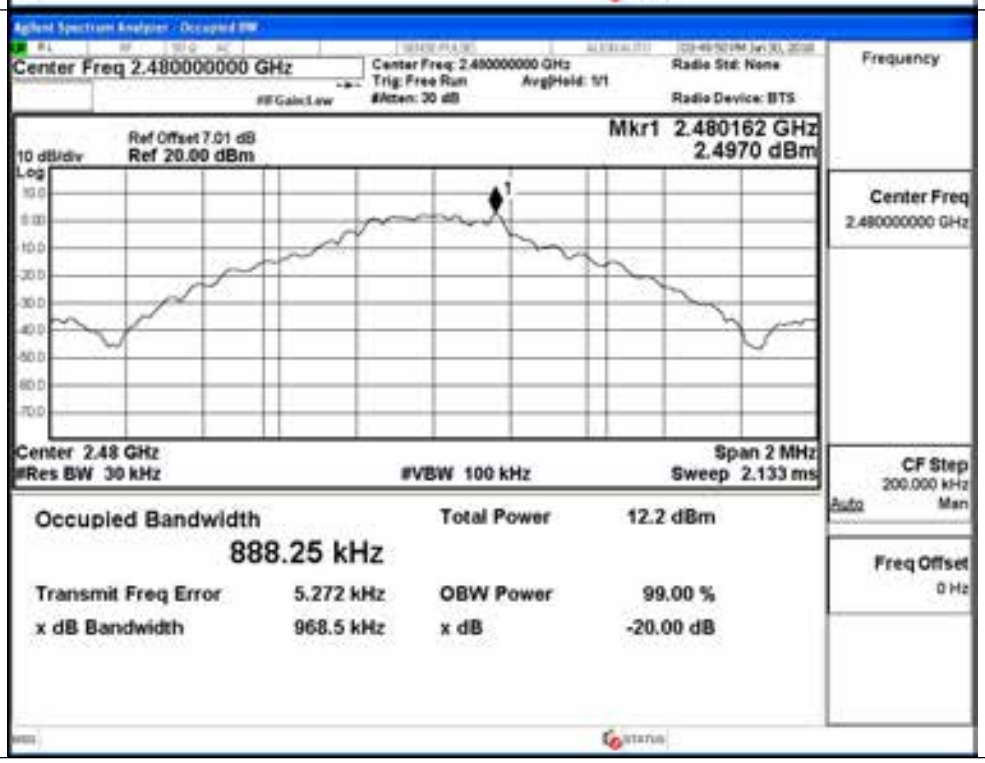
## A.1 20 dB Bandwidth

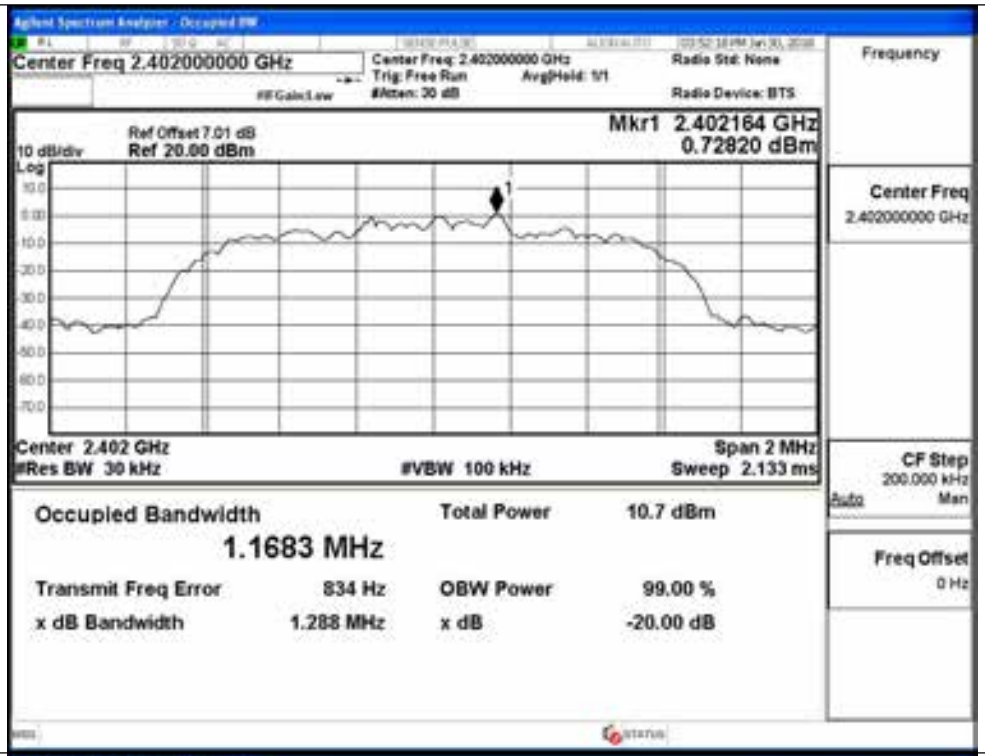
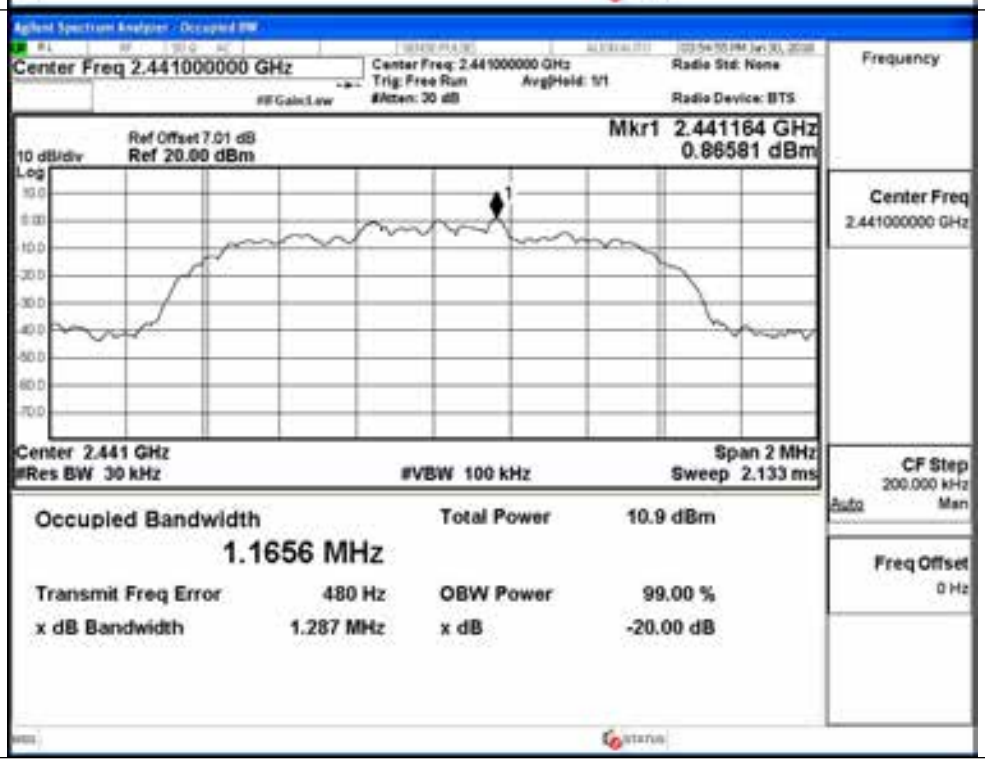
**Test Result**

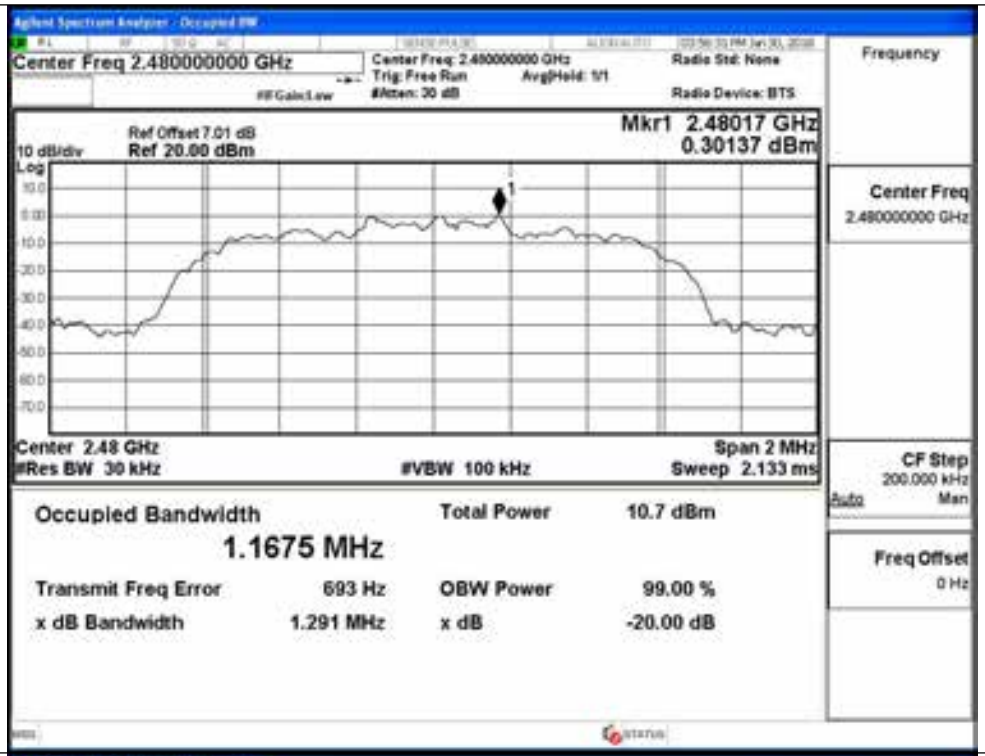
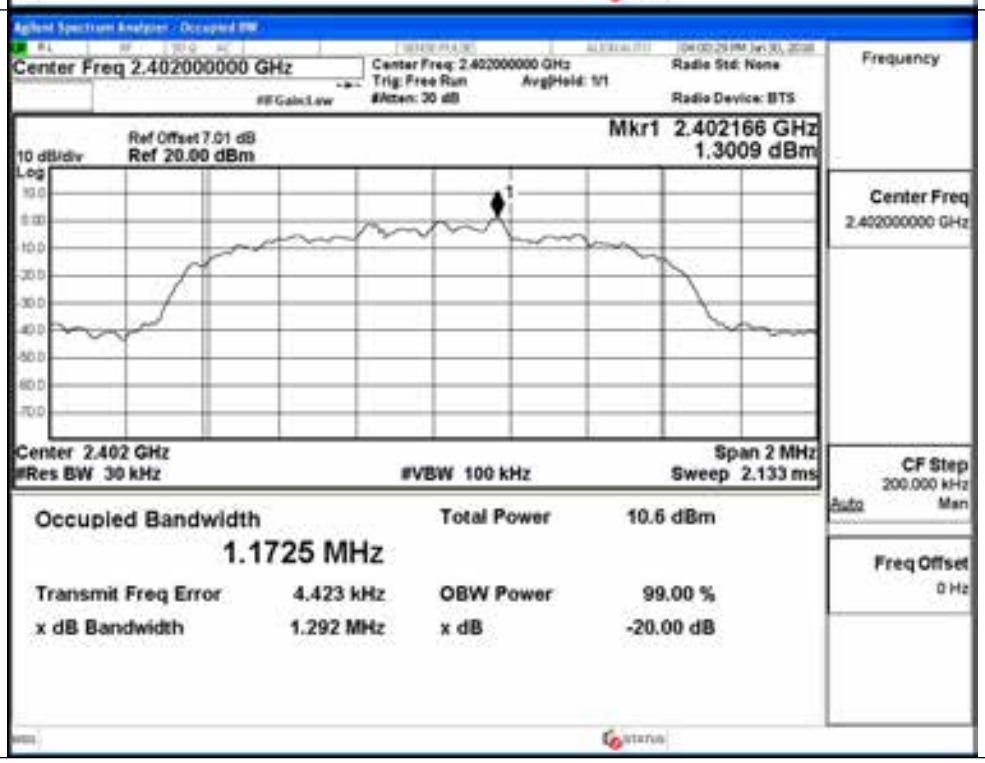
| Mode | Channel. | 20dB Bandwidth [MHz] | Limit [MHz] | Verdict |
|---|---|---|---|---|
| GFSK | LCH | 1.021 | Not Specified | PASS |
| GFSK | MCH | 1.028 | Not Specified | PASS |
| GFSK | HCH | 0.9685 | Not Specified | PASS |
| π/4DQPSK | LCH | 1.288 | Not Specified | PASS |
| π/4DQPSK | MCH | 1.287 | Not Specified | PASS |
| π/4DQPSK | HCH | 1.291 | Not Specified | PASS |
| 8DPSK | LCH | 1.292 | Not Specified | PASS |
| 8DPSK | MCH | 1.290 | Not Specified | PASS |
| 8DPSK | HCH | 1.291 | Not Specified | PASS |

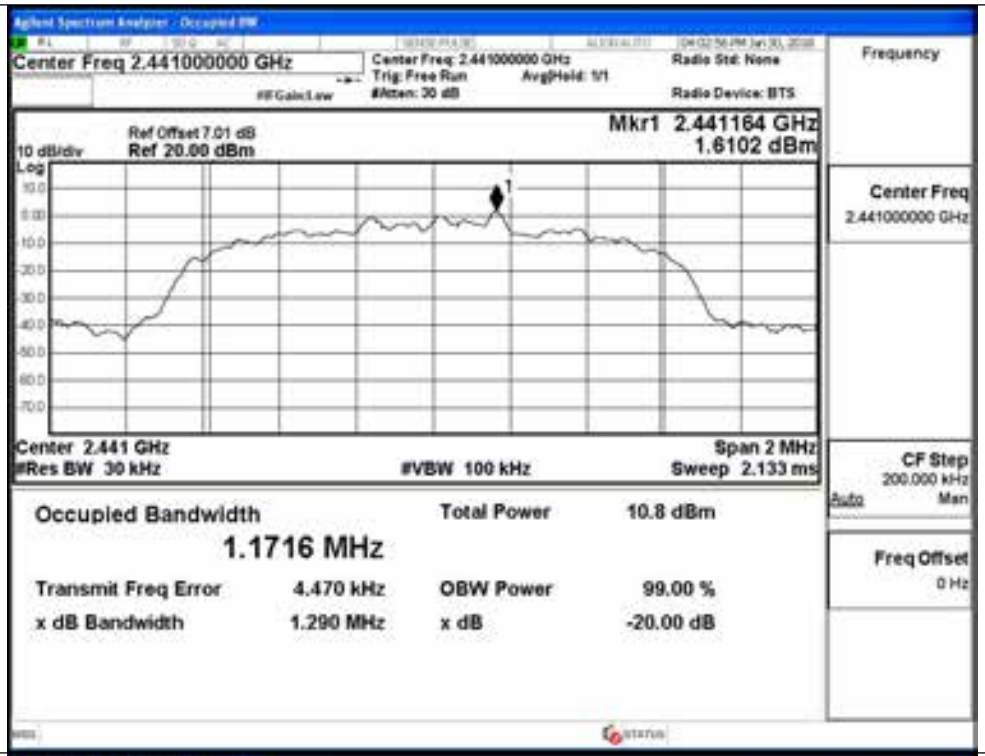
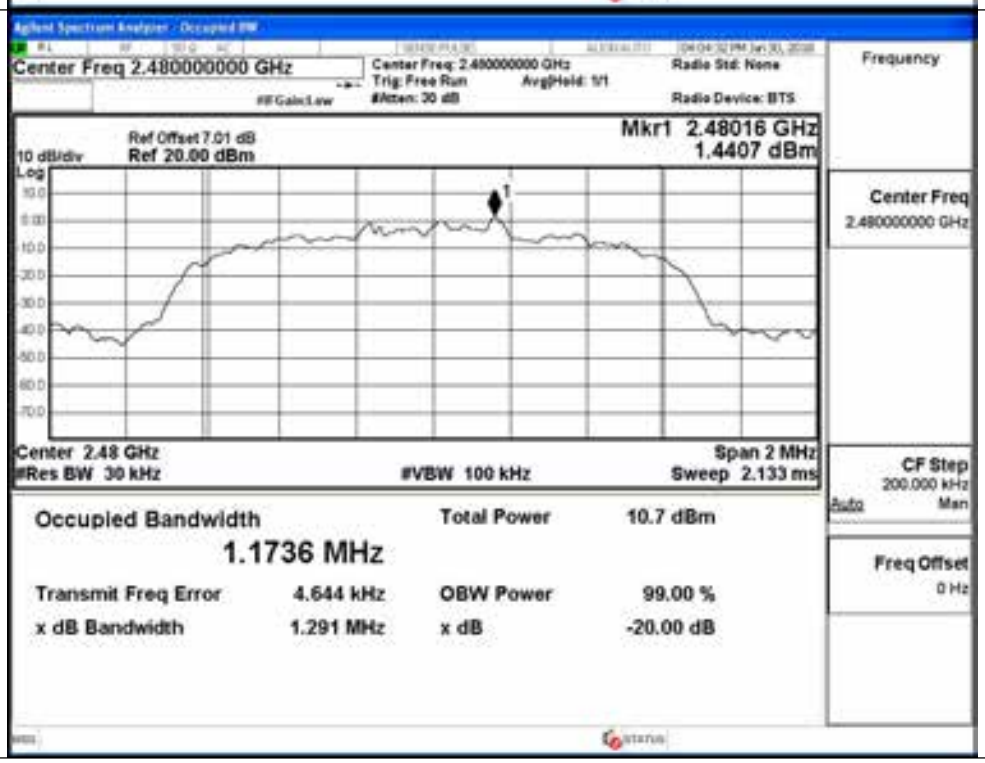
**Test Graph**

| Graphs | |
|---|---|
| GFSK/LCH | |

| | | |
|---|---|---|
| GFSK/MCH | |  |
| GFSK/HCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/LCH | |  |
| π/4DQPSK/MCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/HCH | |  |
| 8DPSK/LCH | |  |

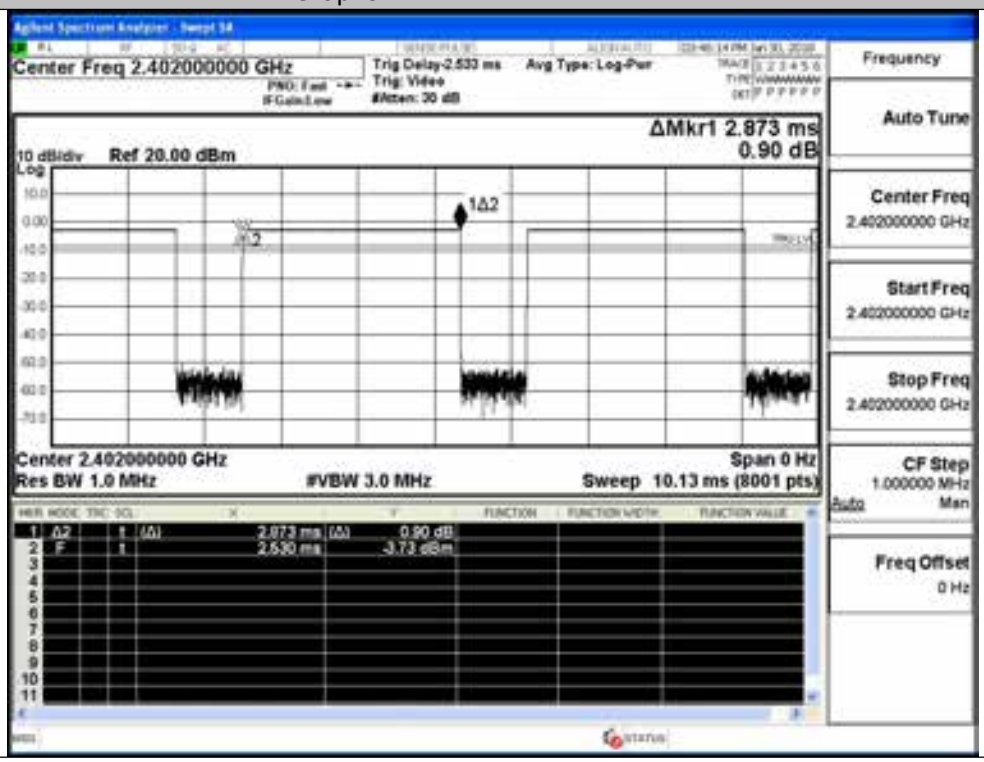
| | | |
|---|---|---|
| 8DPSK/MCH | |  |
| 8DPSK/HCH | |  |

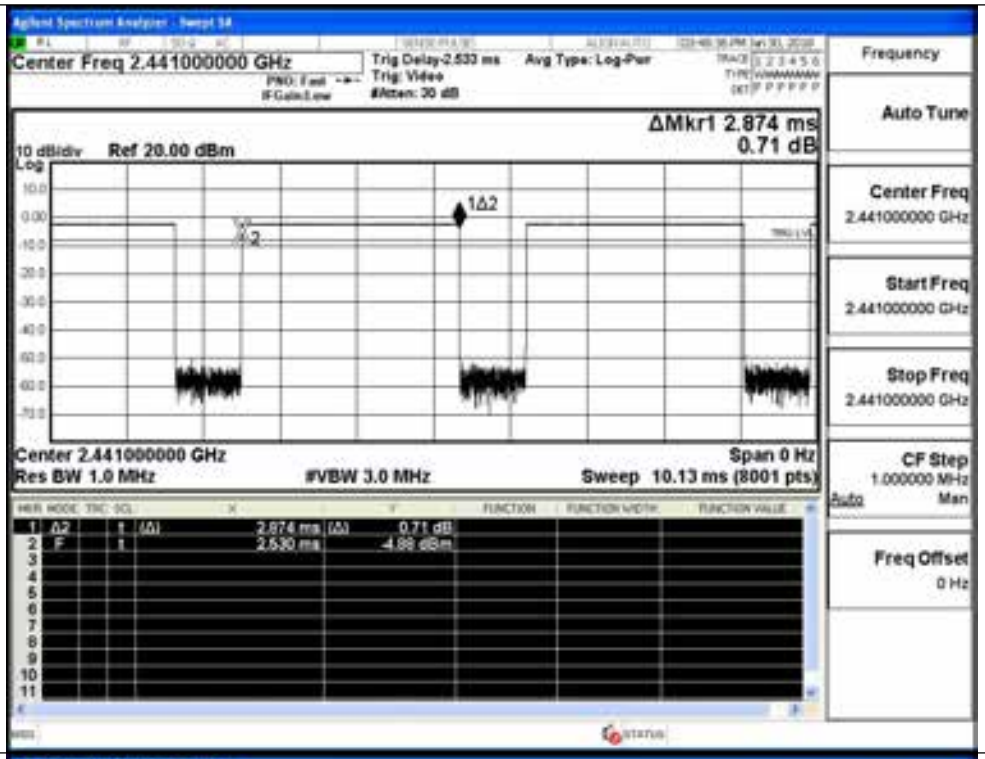
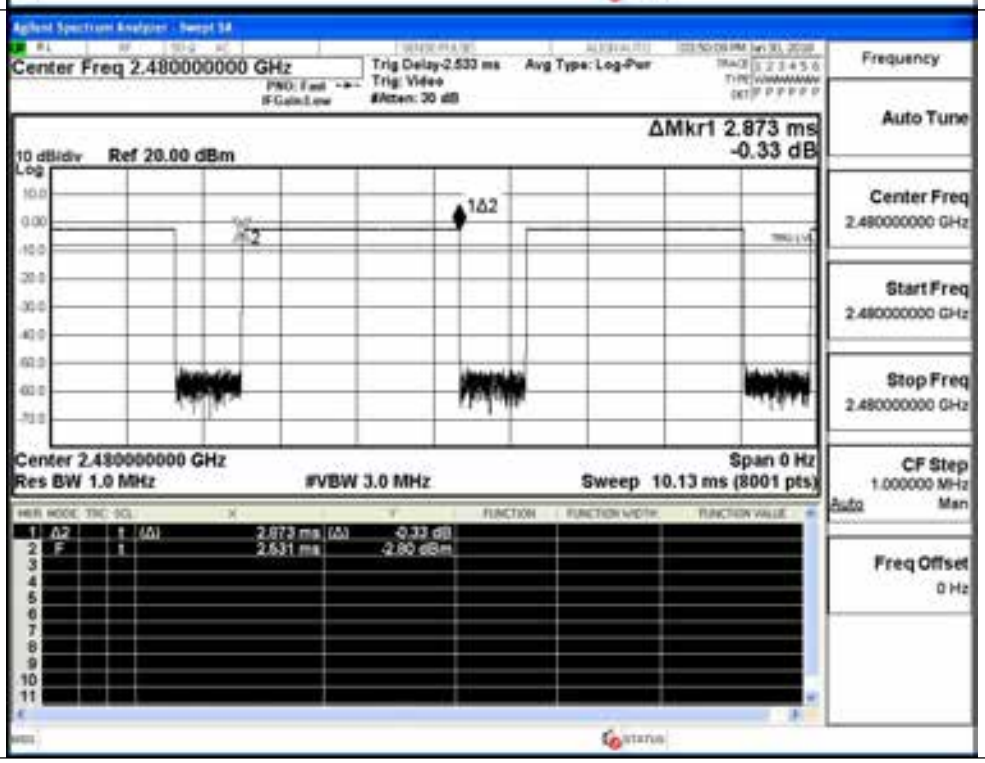
## A.2 Dwell Time

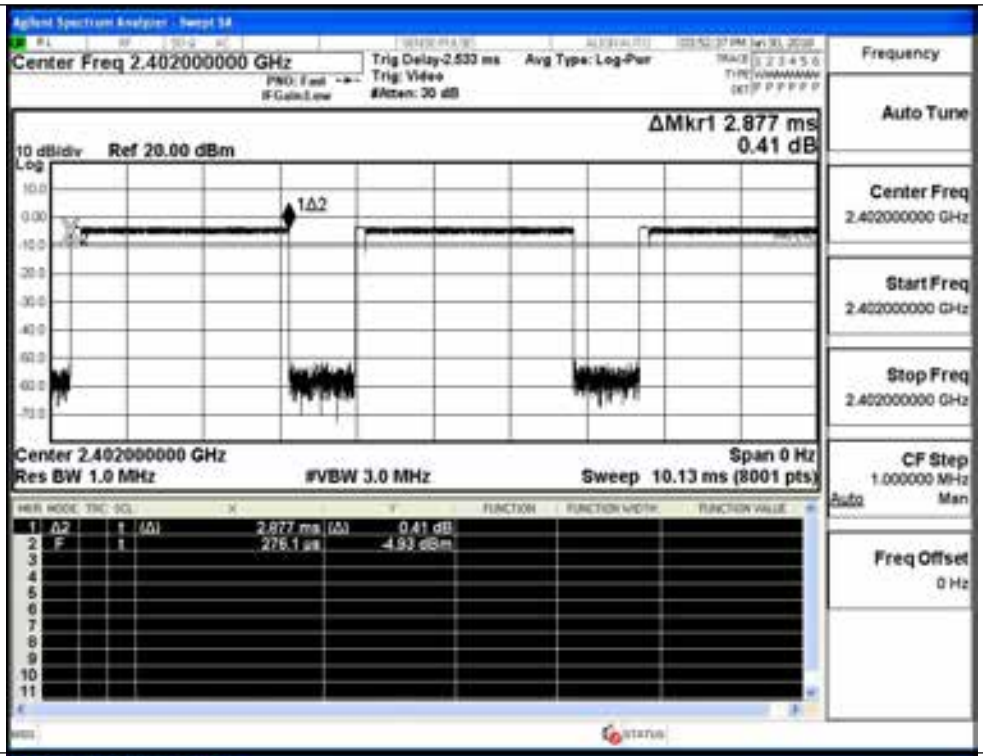
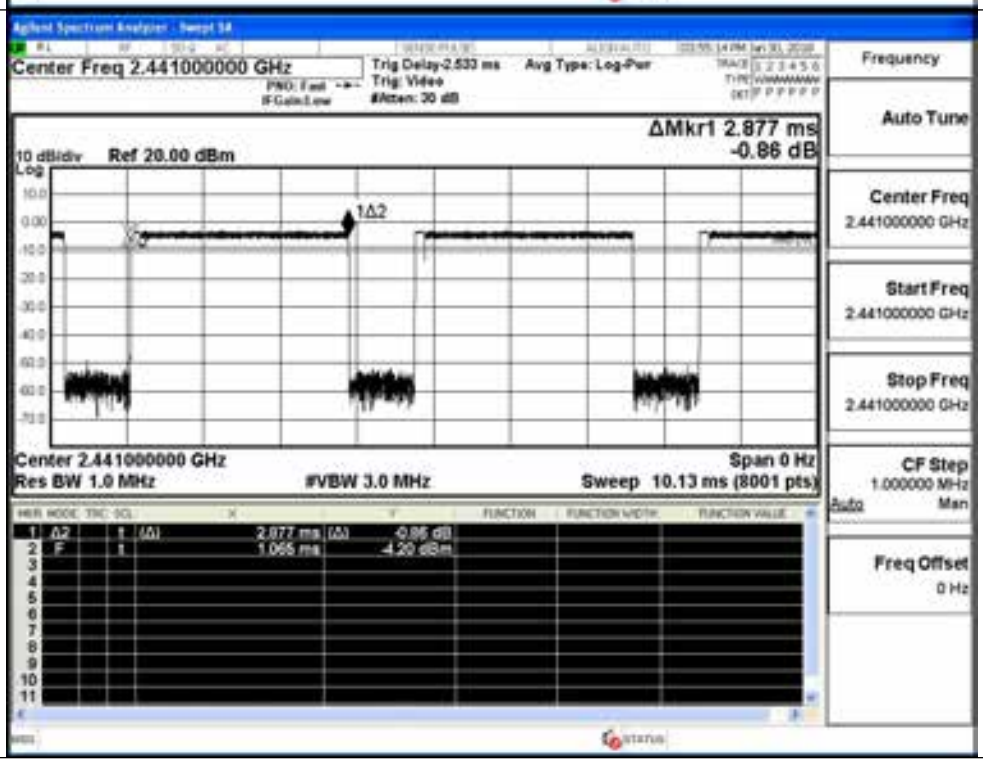
### Result Table

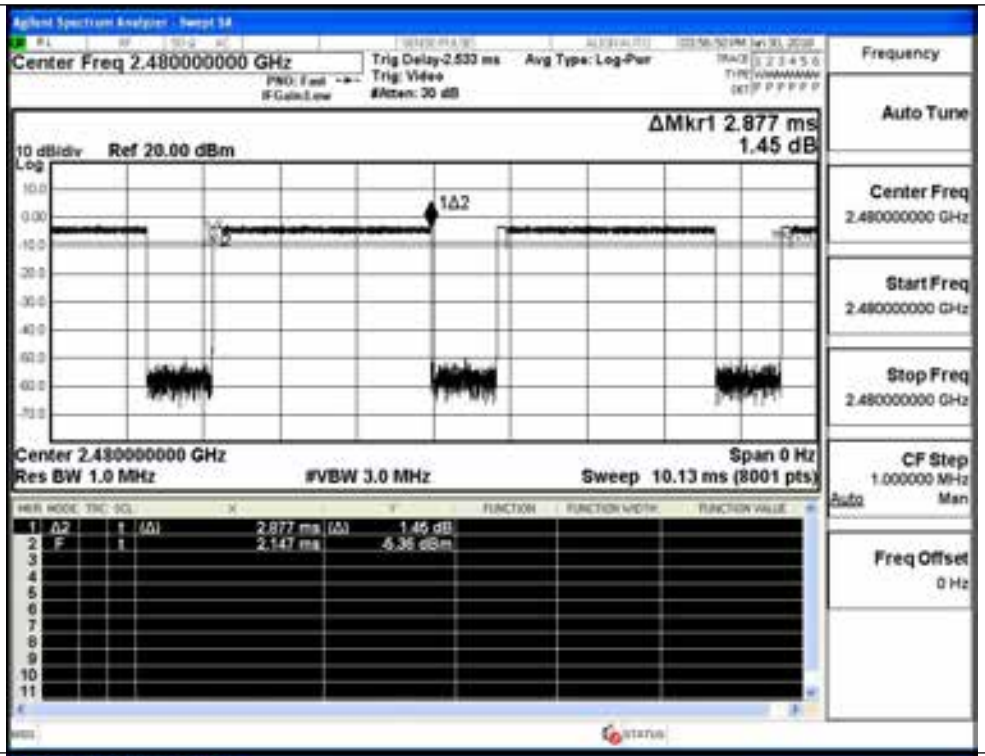
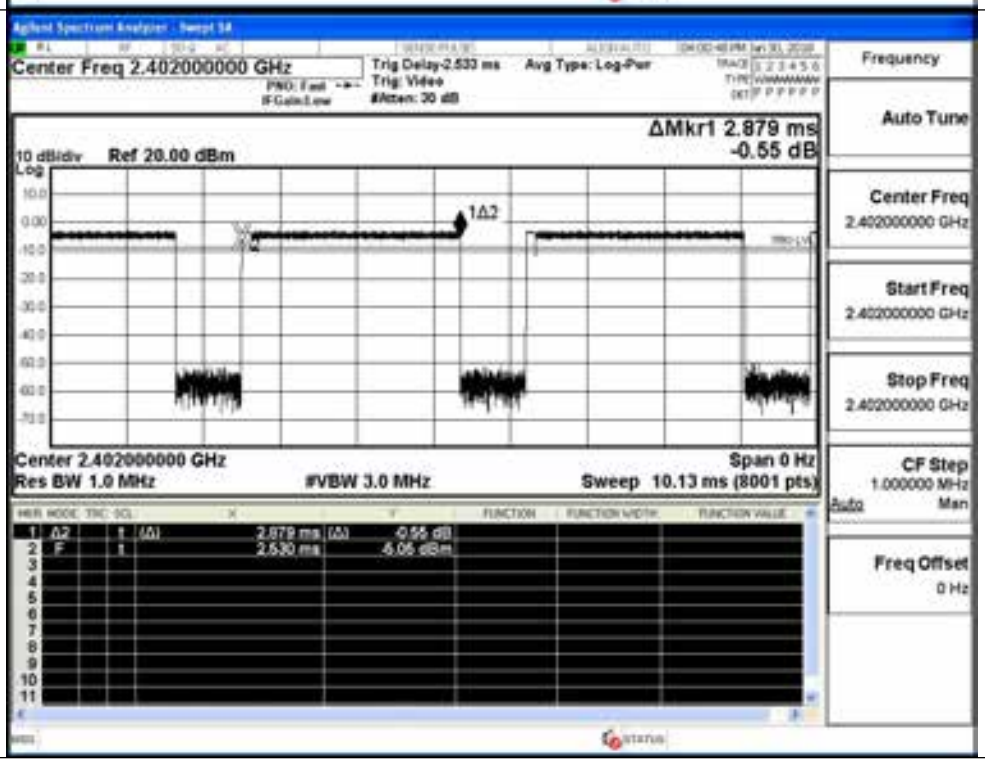
| Mode | Packet | Channel | Burst Width [ms/hop/ch] | Total Hops[hop*ch] | Dwell Time[s] | Limit [s] | Verdict |
|---|---|---|---|---|---|---|---|
| GFSK | DH5 | LCH | 2.87 | 106.7 | 0.306 | 0.4 | PASS |
| GFSK | DH5 | MCH | 2.87 | 106.7 | 0.306 | 0.4 | PASS |
| GFSK | DH5 | HCH | 2.87 | 106.7 | 0.306 | 0.4 | PASS |
| π/4DQPSK | 2DH5 | LCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |
| π/4DQPSK | 2DH5 | MCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |
| π/4DQPSK | 2DH5 | HCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |
| 8DPSK | 3DH5 | LCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |
| 8DPSK | 3DH5 | MCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |
| 8DPSK | 3DH5 | HCH | 2.87 | 106.7 | 0.307 | 0.4 | PASS |

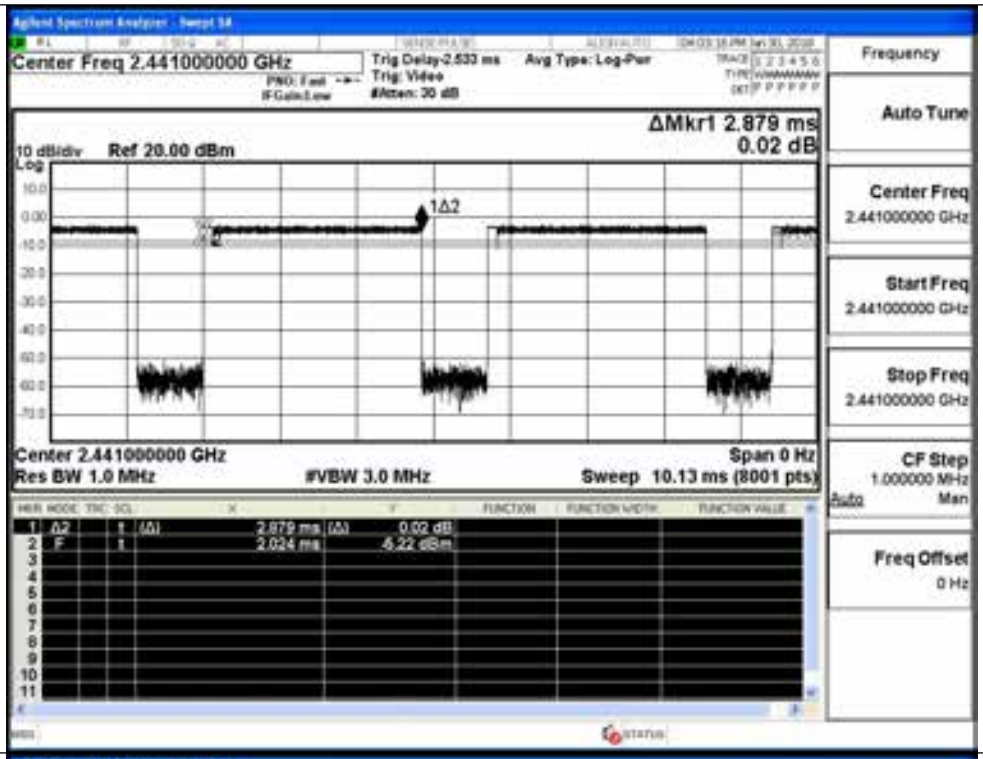
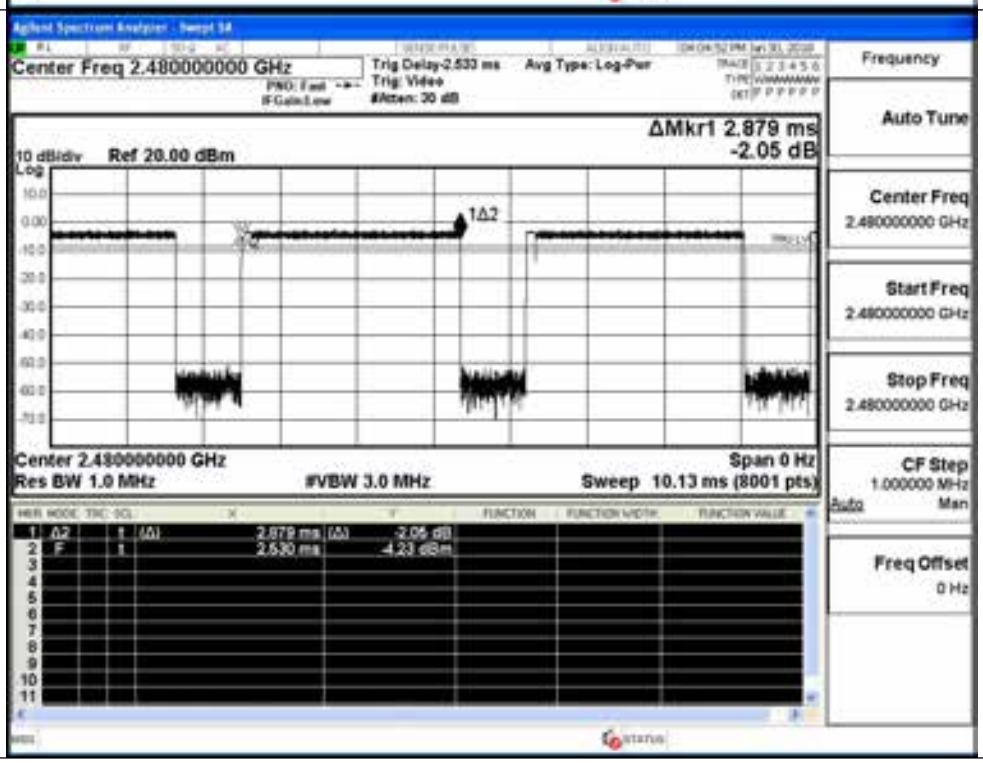
### Test Graph

| Graphs | |
|---|---|
| GFSK_DH5/LCH |  |

| | |
|---|---|
| GFSK_DH5/MCH |  |
| GFSK_DH5/HCH |  |

| | |
|---|---|
| π/4DQPSK<br>_2DH5/LCH |  |
| π/4DQPSK<br>_2DH5/MCH |  |

| | |
|---|---|
| π/4DQPSK<br>_2DH5/HCH |  |
| 8DPSK _3DH5/LCH |  |

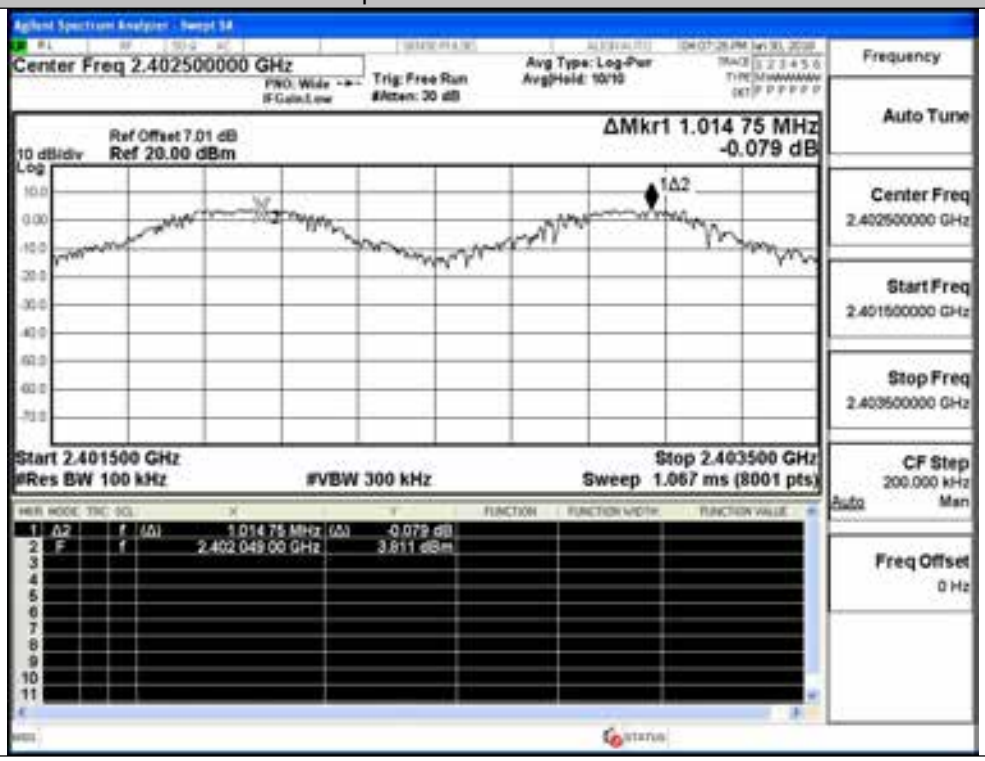
| | |
|---|---|
| 8DPSK _3DH5/MCH |  |
| 8DPSK _3DH5/HCH |  |

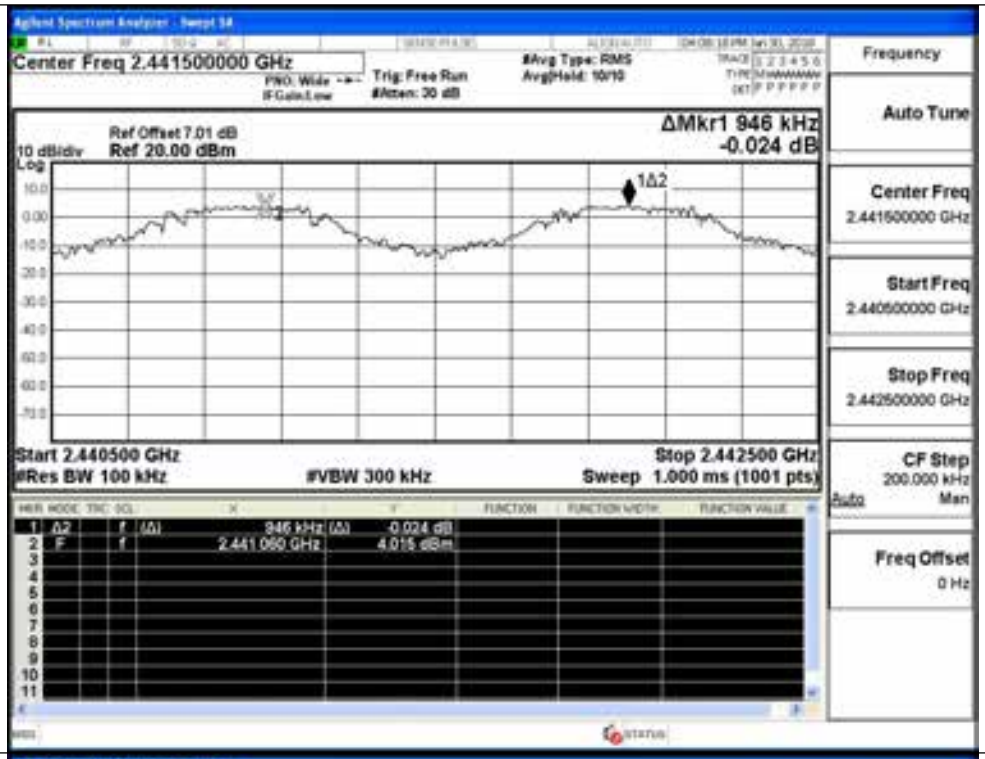
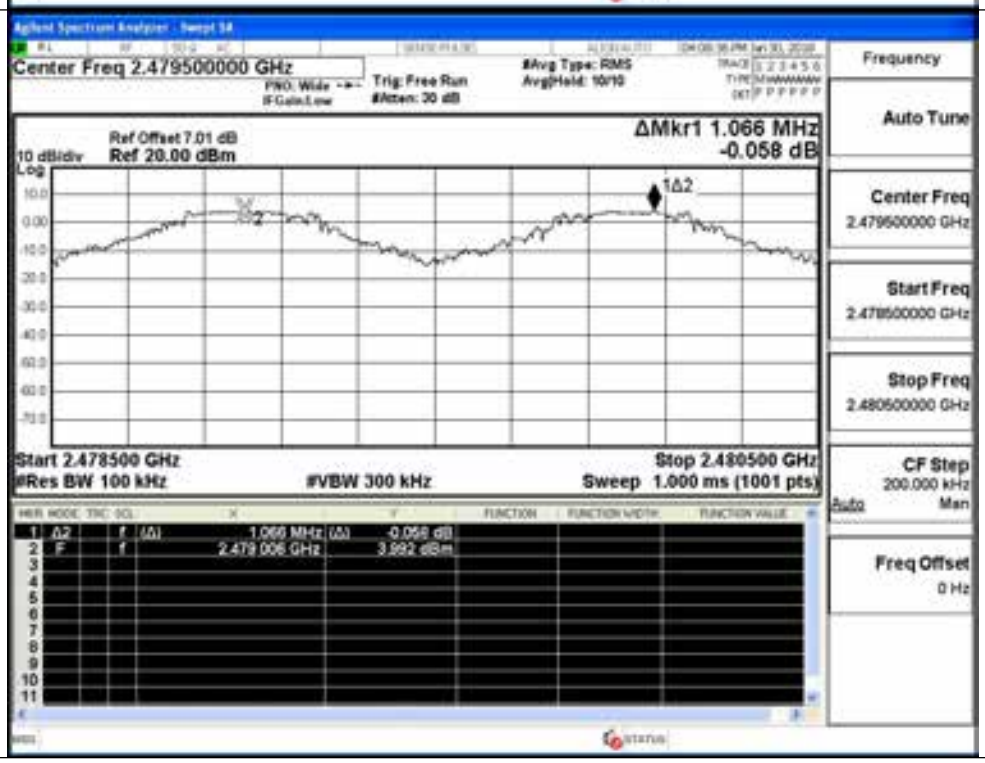
## A.3 Carrier Frequency Separation

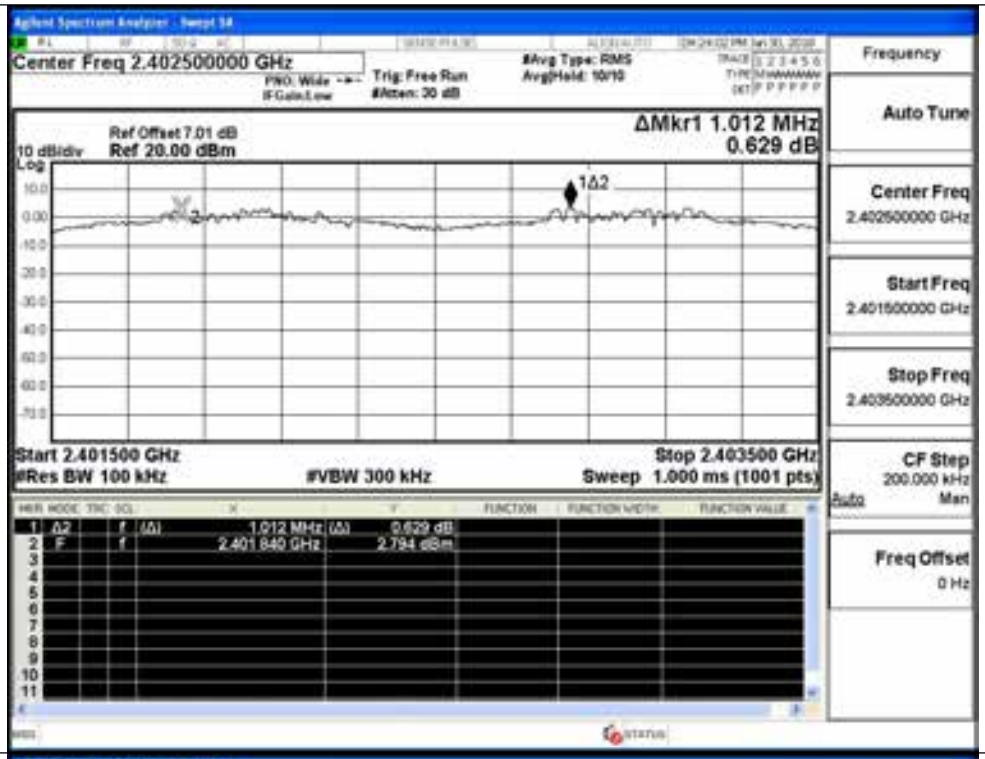
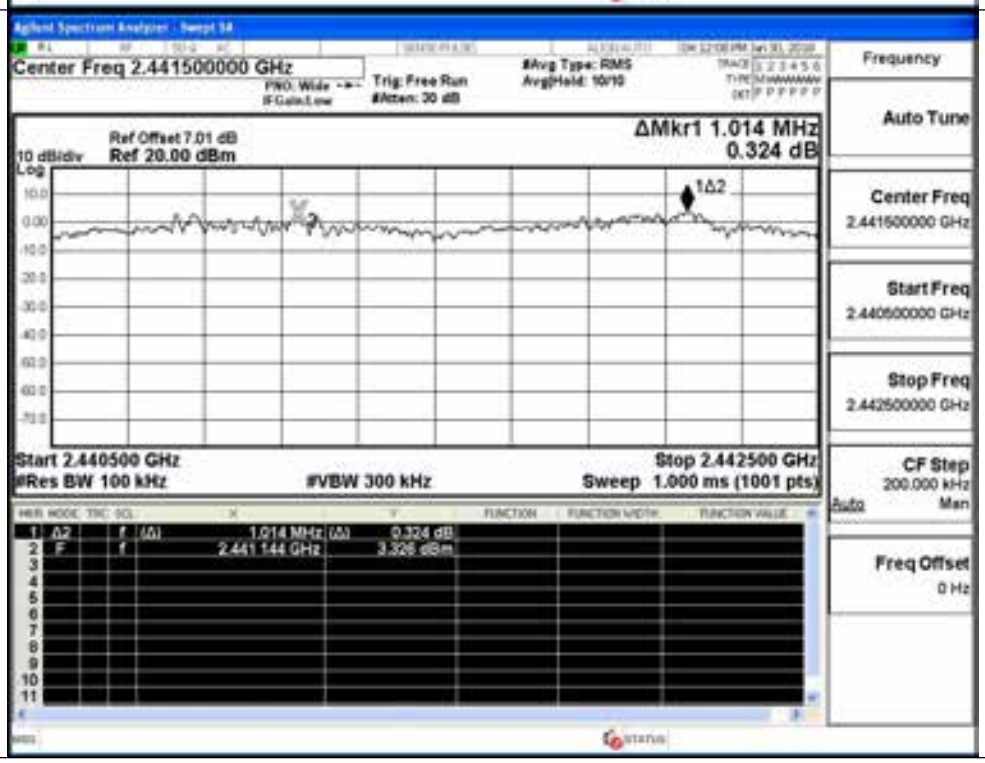
### Result Table

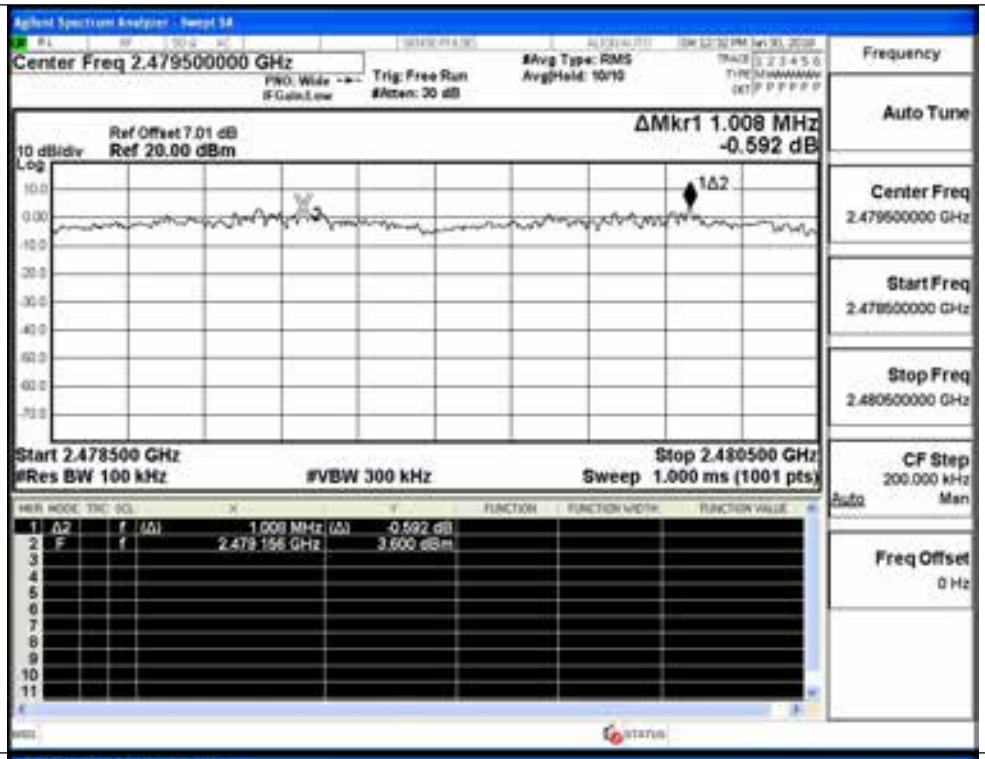
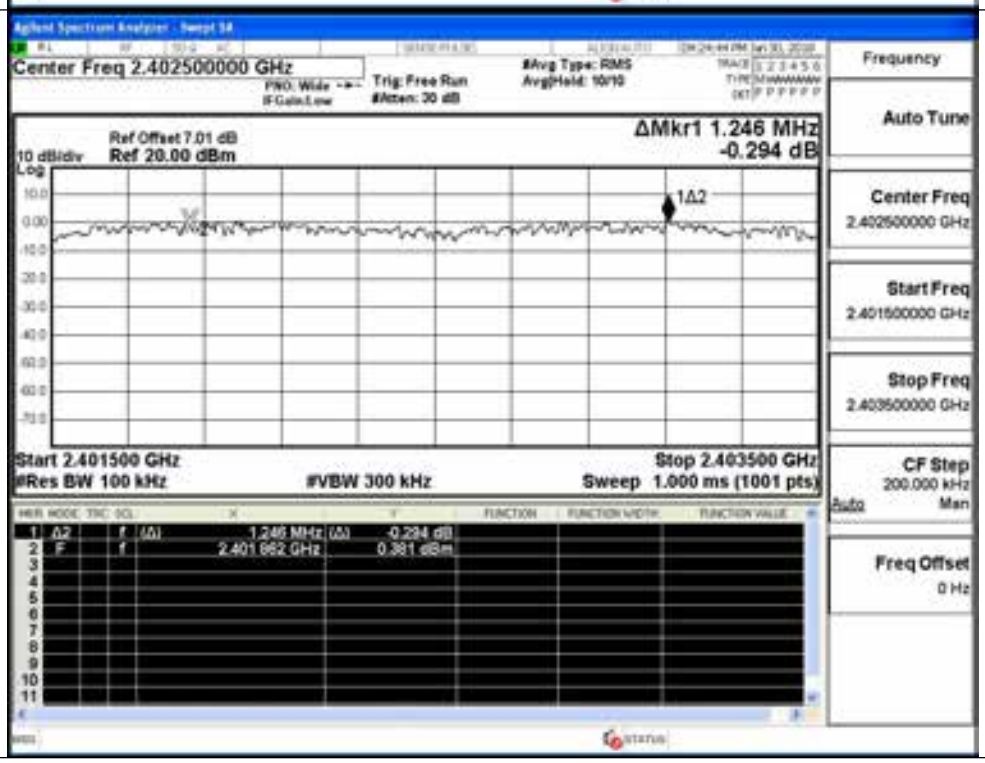
| Mode | Channel. | Carrier Frequency Separation [MHz] | Limit [MHz] | Verdict |
|---|---|---|---|---|
| GFSK | LCH | 1.015 | 0.6807 | PASS |
| GFSK | MCH | 0.946 | 0.6853 | PASS |
| GFSK | HCH | 1.066 | 0.9685 | PASS |
| π/4DQPSK | LCH | 1.012 | 0.8587 | PASS |
| π/4DQPSK | MCH | 1.014 | 0.8580 | PASS |
| π/4DQPSK | HCH | 1.008 | 0.8607 | PASS |
| 8DPSK | LCH | 1.246 | 0.8613 | PASS |
| 8DPSK | MCH | 0.824 | 0.8600 | PASS |
| 8DPSK | HCH | 1.114 | 0.8607 | PASS |

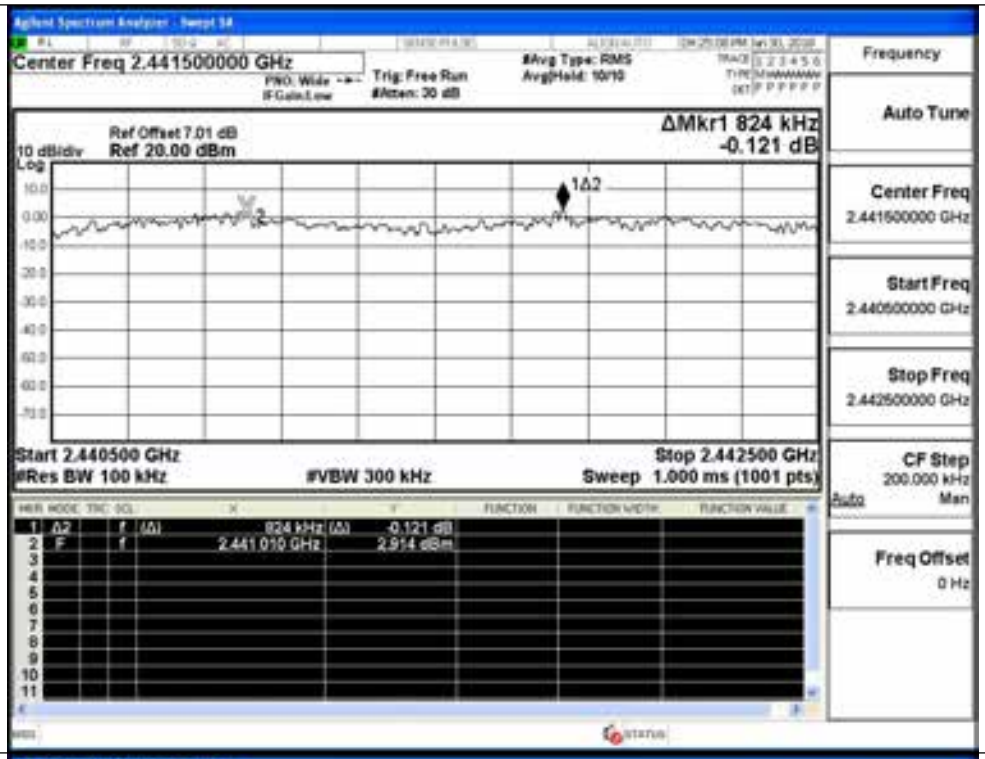
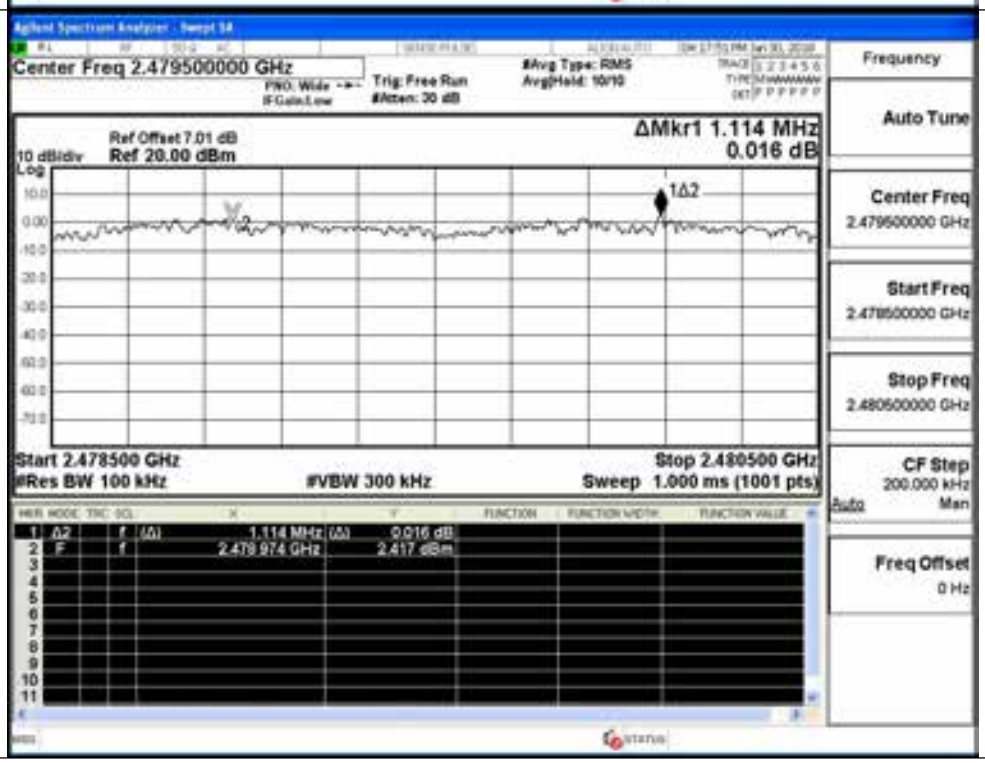
### Test Graph

| Graphs | |
|---|---|
| GFSK/LCH |  |

| | | |
|---|---|---|
| GFSK/MCH | |  |
| GFSK/HCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/LCH | |  |
| π/4DQPSK/MCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/HCH | |  |
| 8DPSK/LCH | |  |

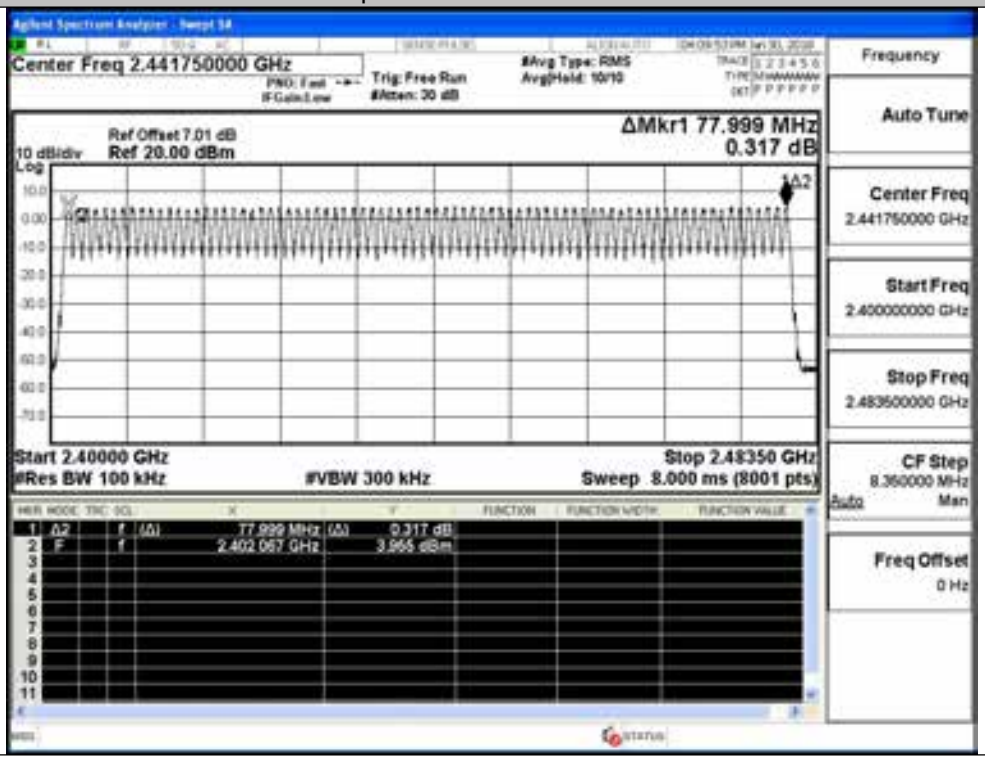
| | | |
|---|---|---|
| 8DPSK/MCH | |  |
| 8DPSK/HCH | |  |

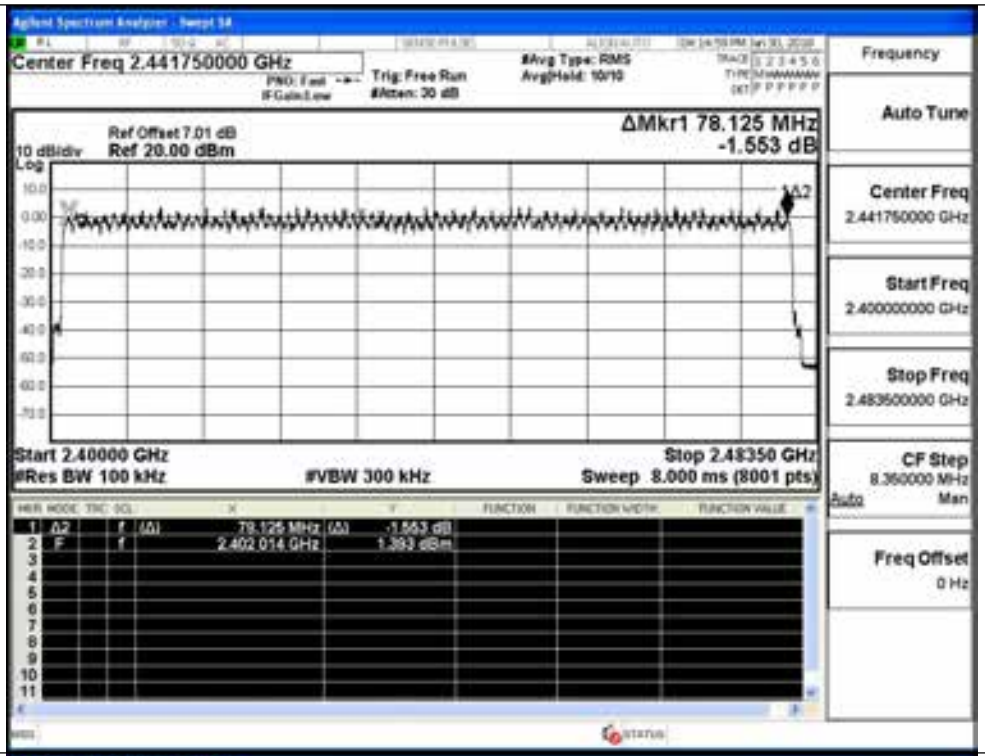
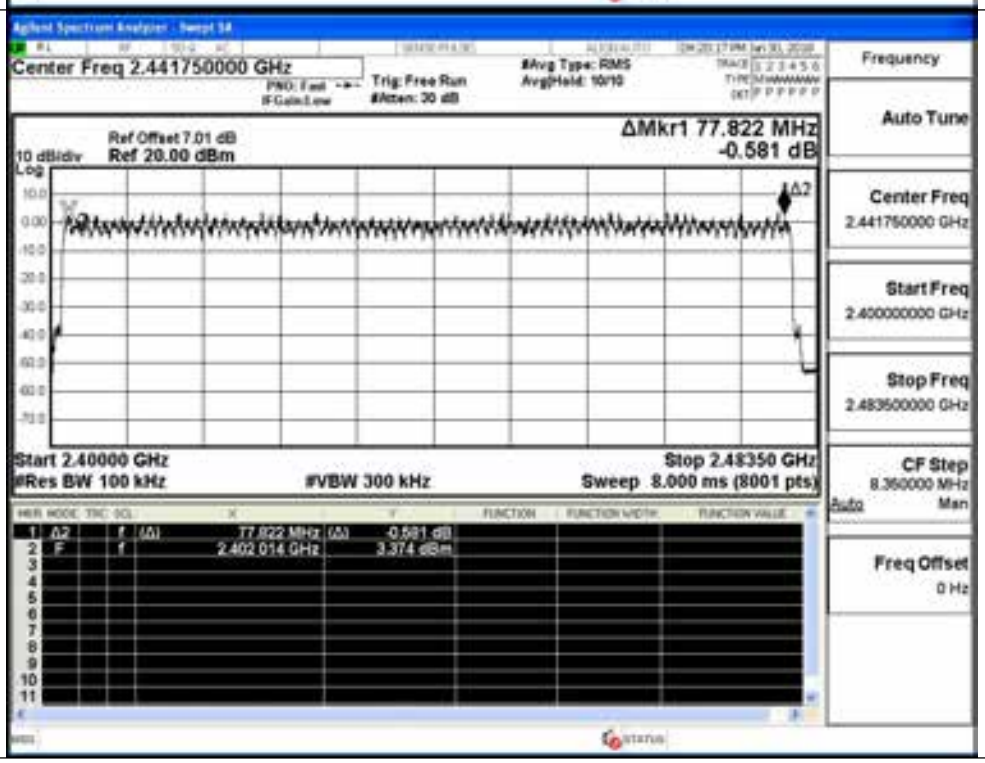
## A.4 Hopping Channel Number

## Result Table

| Mode | Channel. | Number of Hopping Channel | Limit [N] | Verdict |
|---|---|---|---|---|
| GFSK | Hop | 79 | >=15 | PASS |
| π/4DQPSK | Hop | 79 | >=15 | PASS |
| 8DPSK | Hop | 79 | >=15 | PASS |

## Test Graph

| Graphs | |
|---|---|
| GFSK/Hop |  |

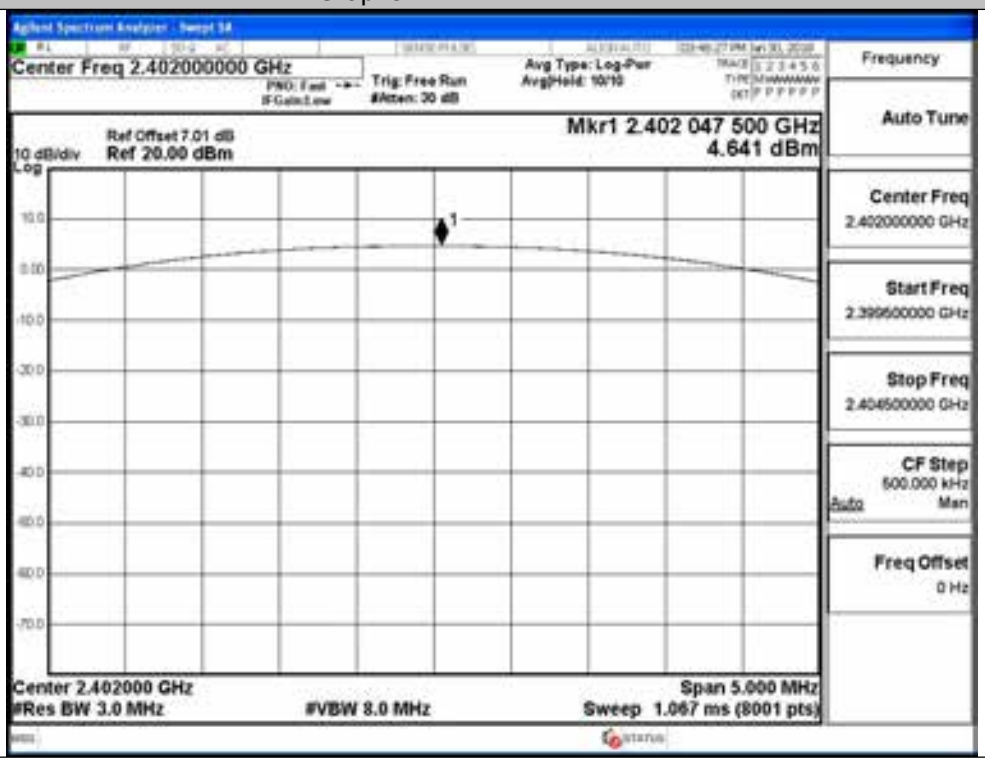
| | | |
|---|---|---|
| π/4DQPSK/Hop | |  |
| 8DPSK/Hop | |  |

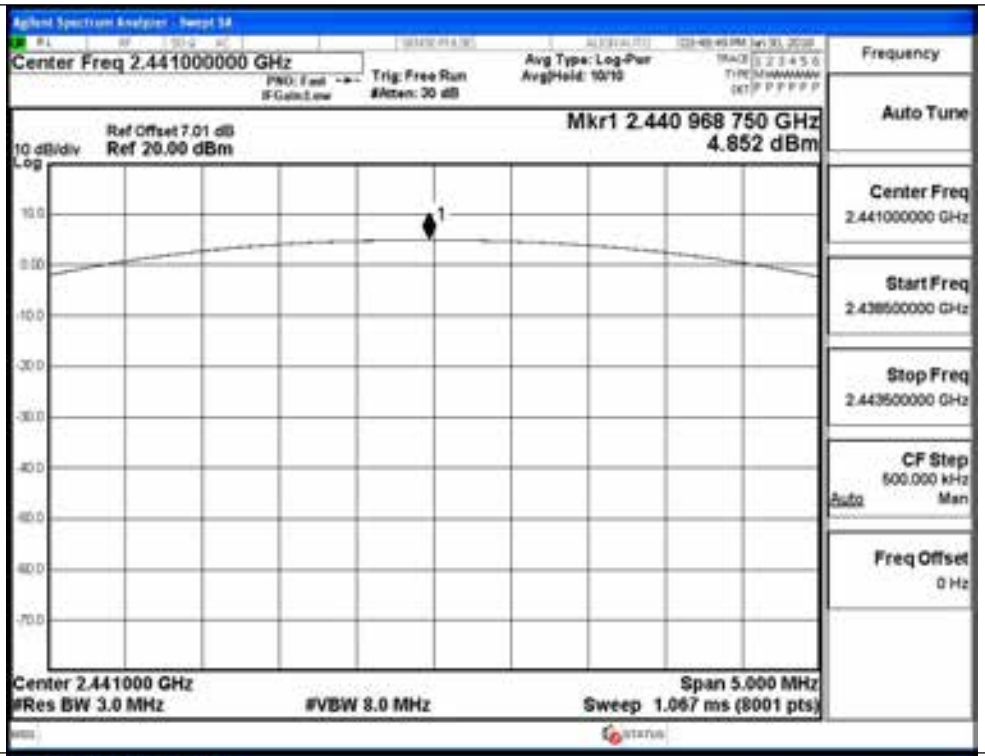
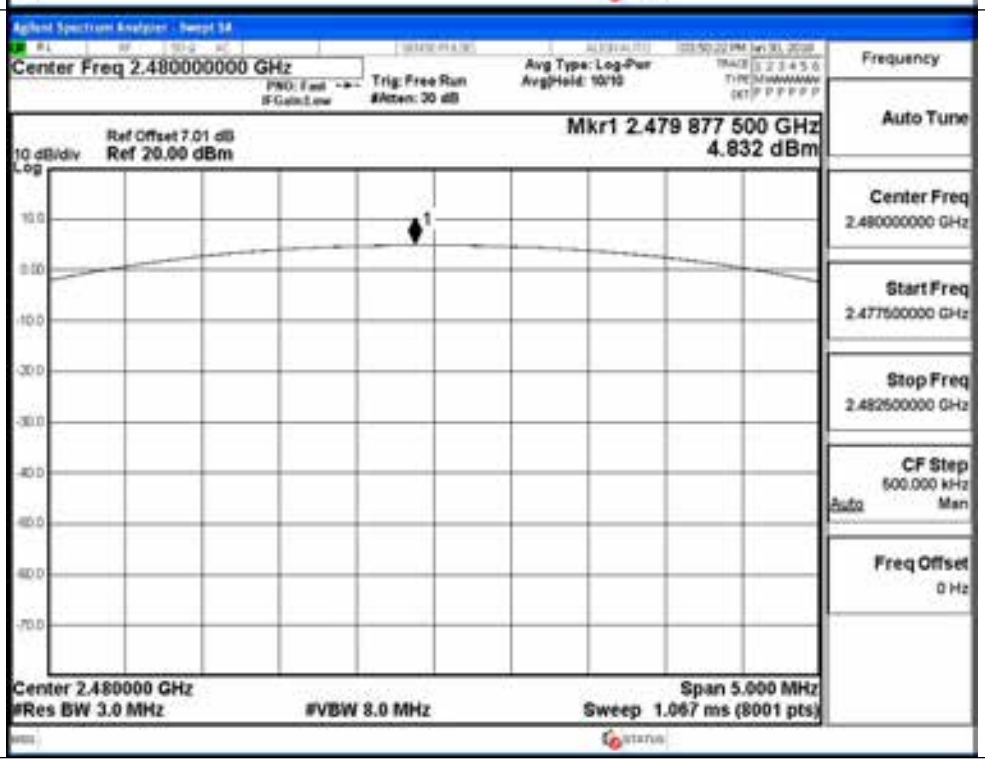
## A.5 Conducted Peak Output Power

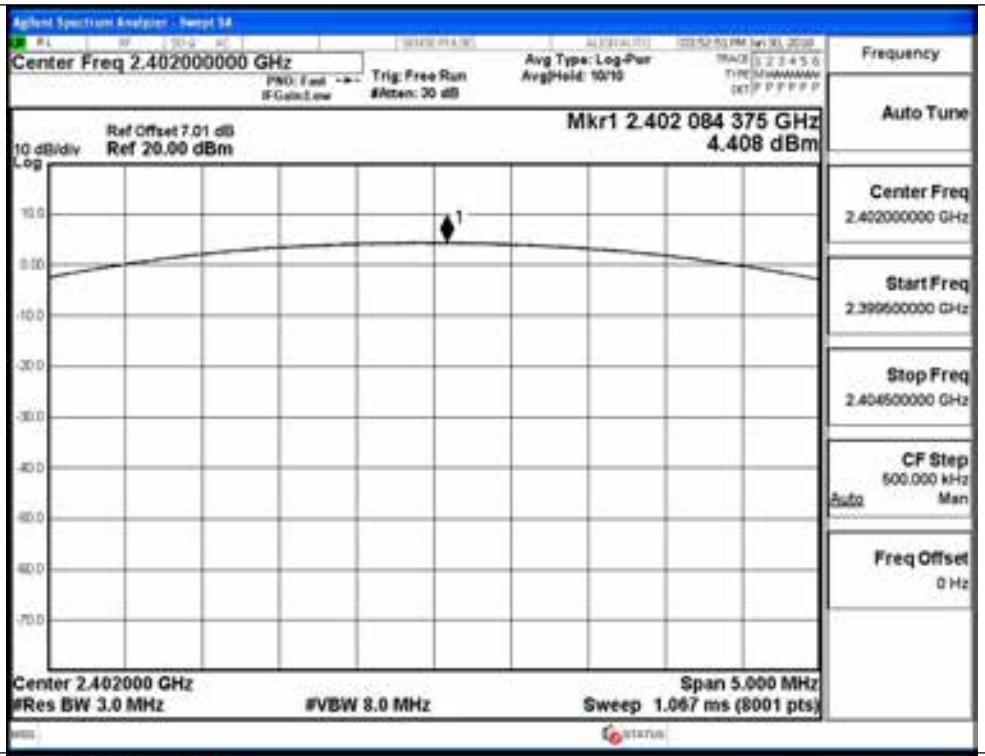
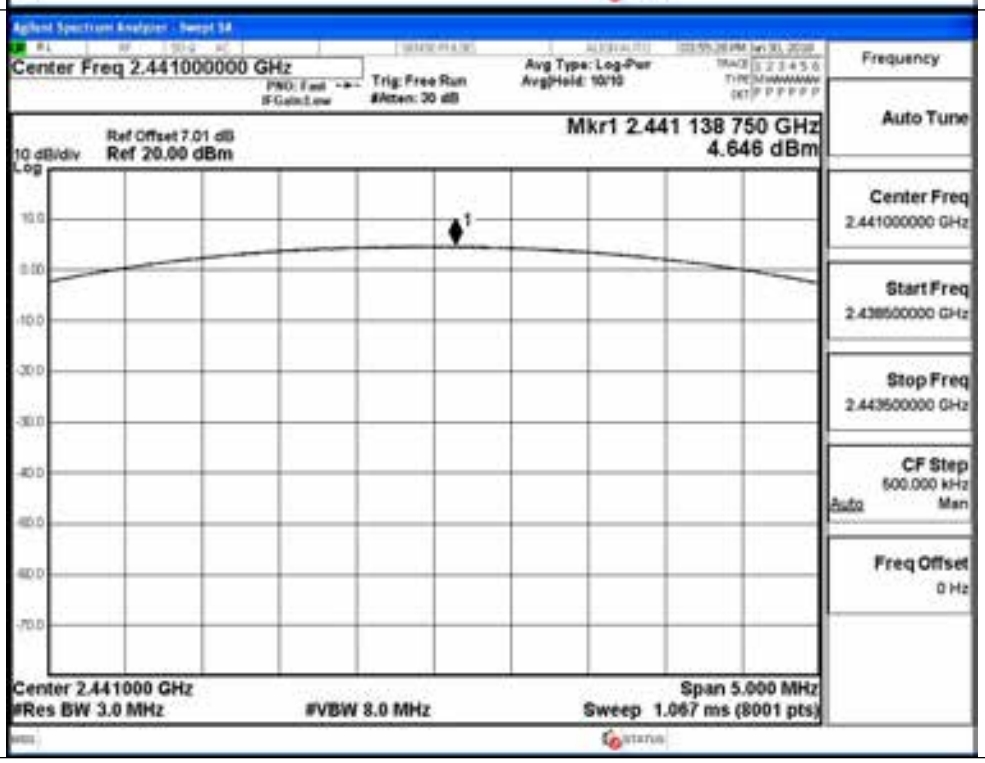
### Result Table

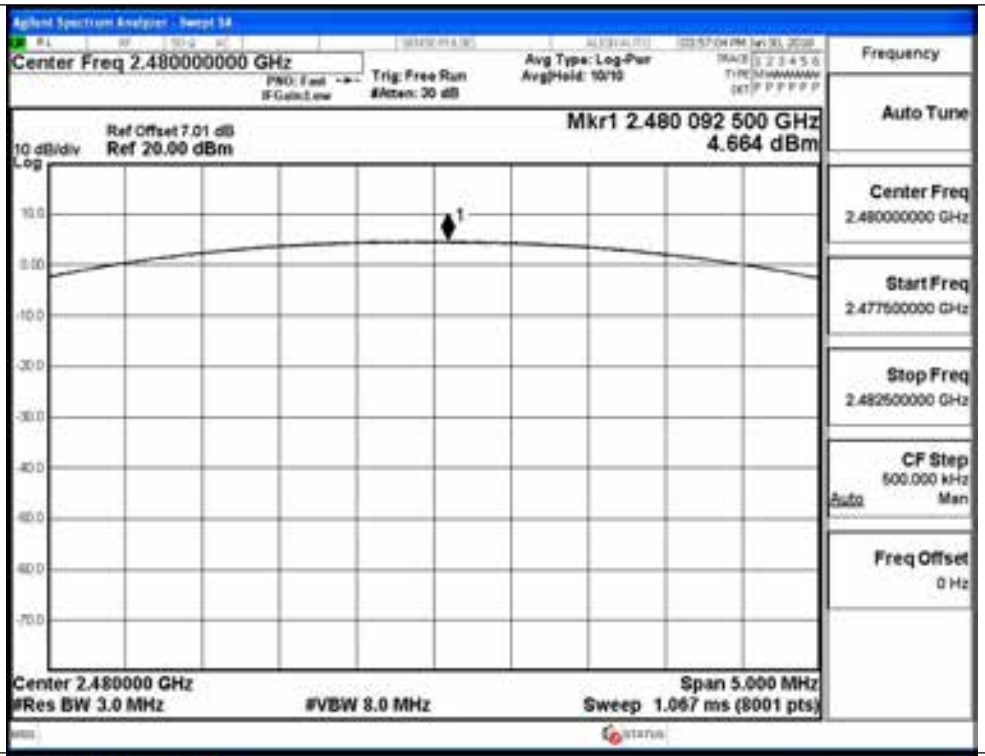
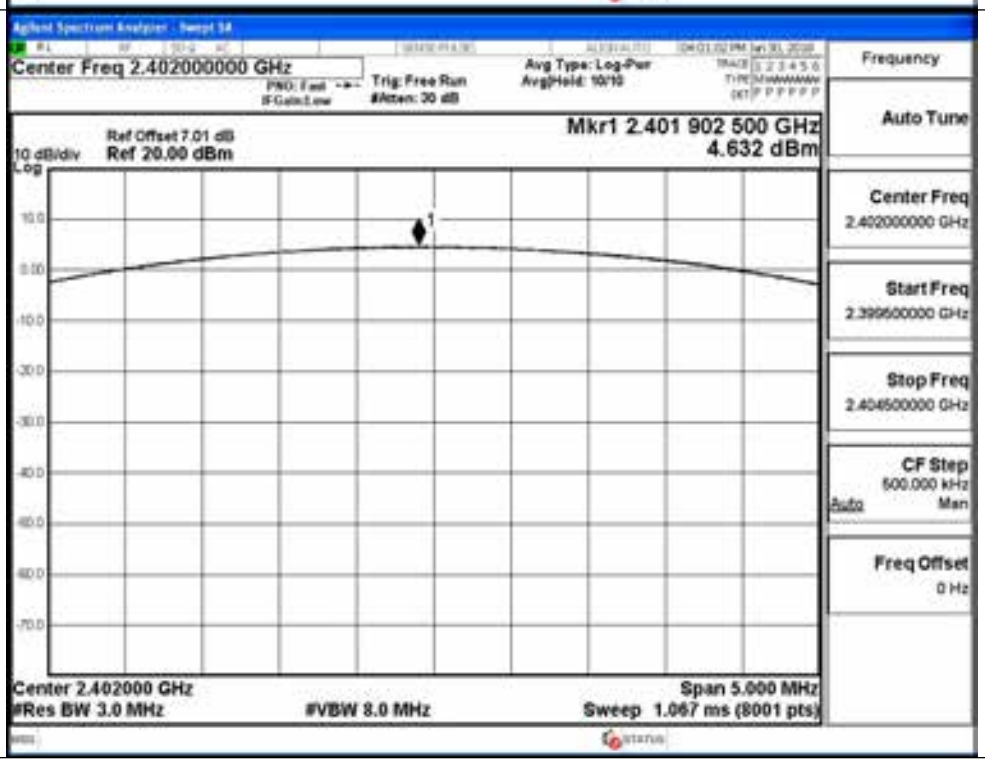
| Mode | Channel. | Maximum Peak Output Power [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|
| GFSK | LCH | 4.641 | 21 | PASS |
| GFSK | MCH | 4.852 | 21 | PASS |
| GFSK | HCH | 4.832 | 21 | PASS |
| π/4DQPSK | LCH | 4.408 | 21 | PASS |
| π/4DQPSK | MCH | 4.646 | 21 | PASS |
| π/4DQPSK | HCH | 4.664 | 21 | PASS |
| 8DPSK | LCH | 4.632 | 21 | PASS |
| 8DPSK | MCH | 4.872 | 21 | PASS |
| 8DPSK | HCH | 4.833 | 21 | PASS |

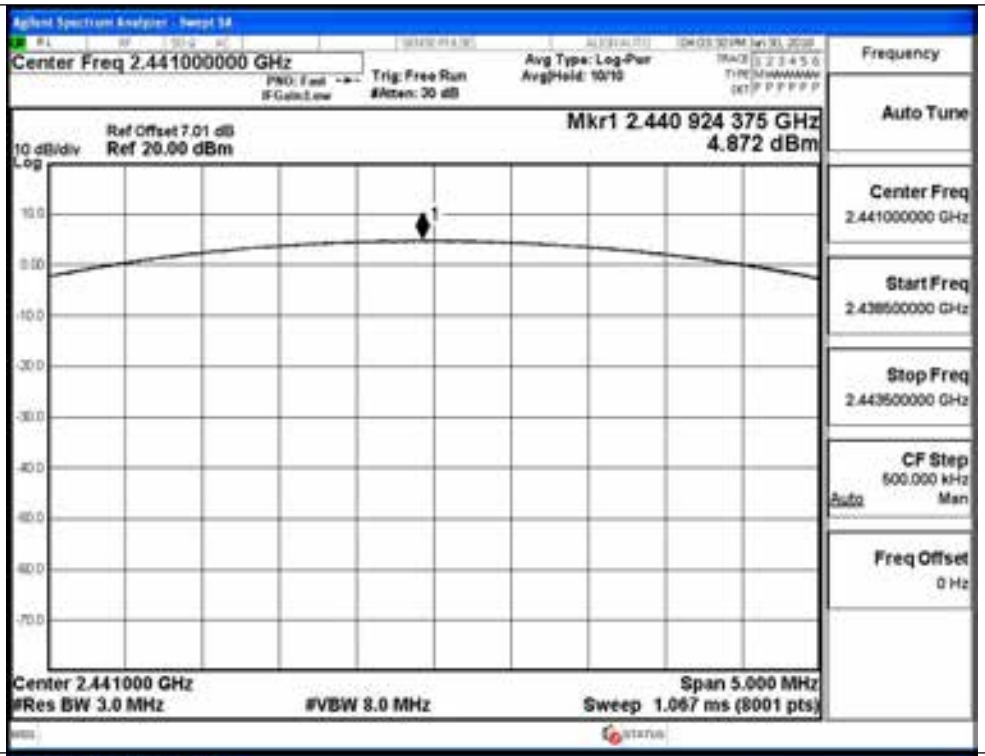
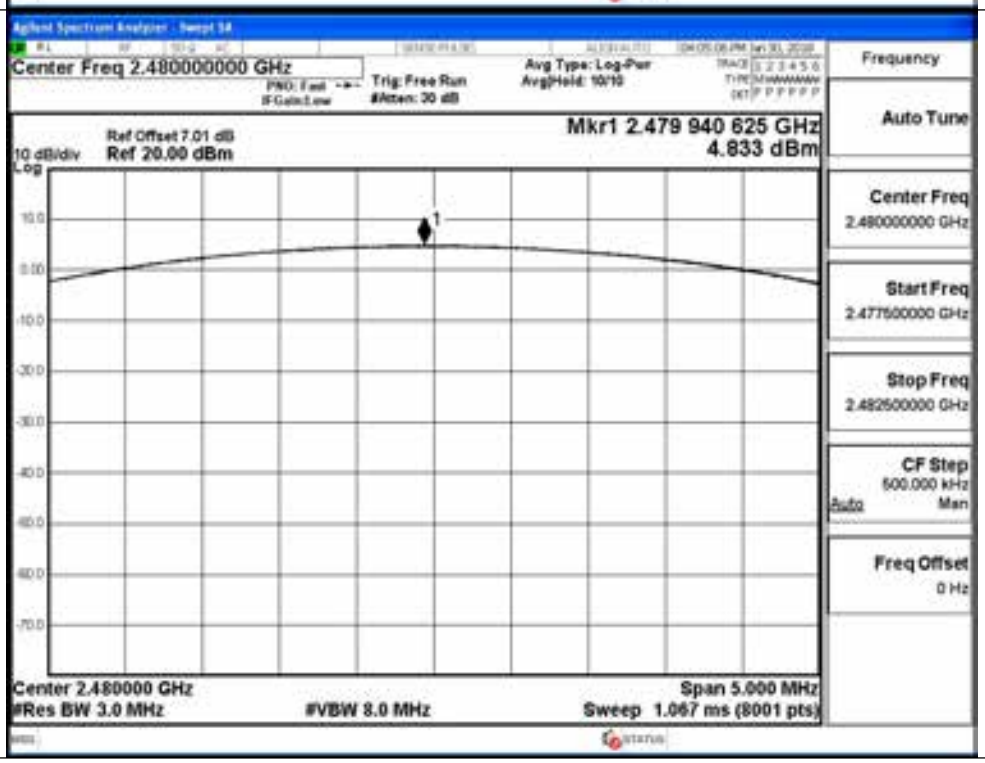
### Test Graph

| Graphs | |
|---|---|
| GFSK/LCH |  |

| | | |
|---|---|---|
| GFSK/MCH | |  |
| GFSK/HCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/LCH | |  |
| π/4DQPSK/MCH | |  |

| | | |
|---|---|---|
| π/4DQPSK/HCH | |  |
| 8DPSK/LCH | |  |

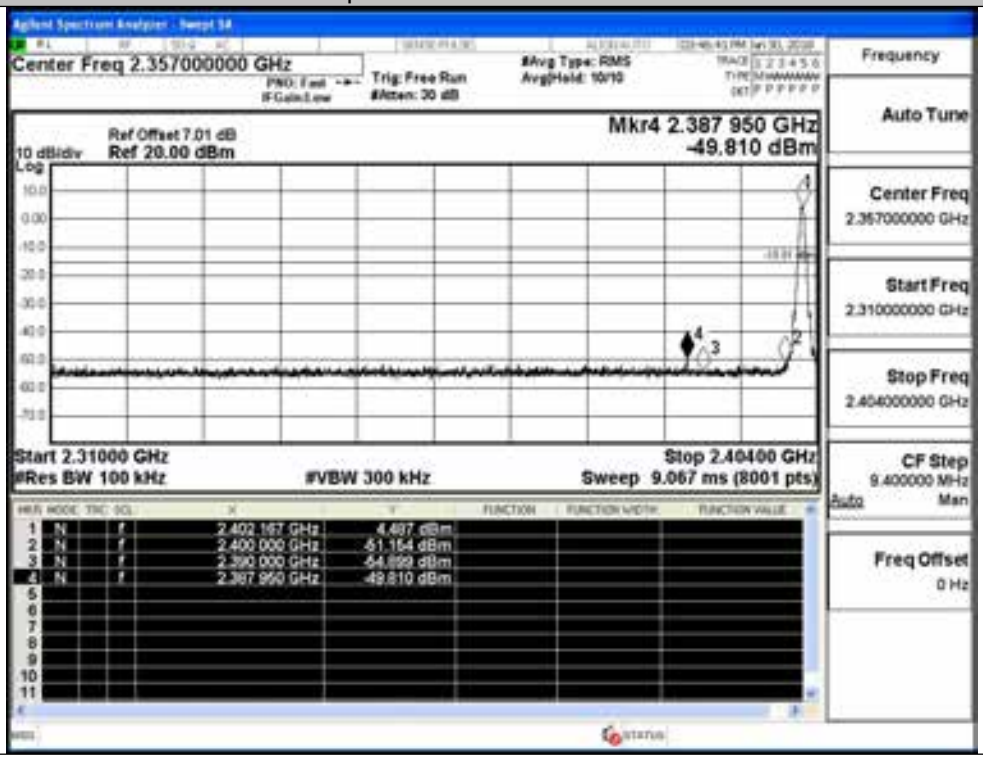
| | | |
|---|---|---|
| 8DPSK/MCH | |  |
| 8DPSK/HCH | |  |

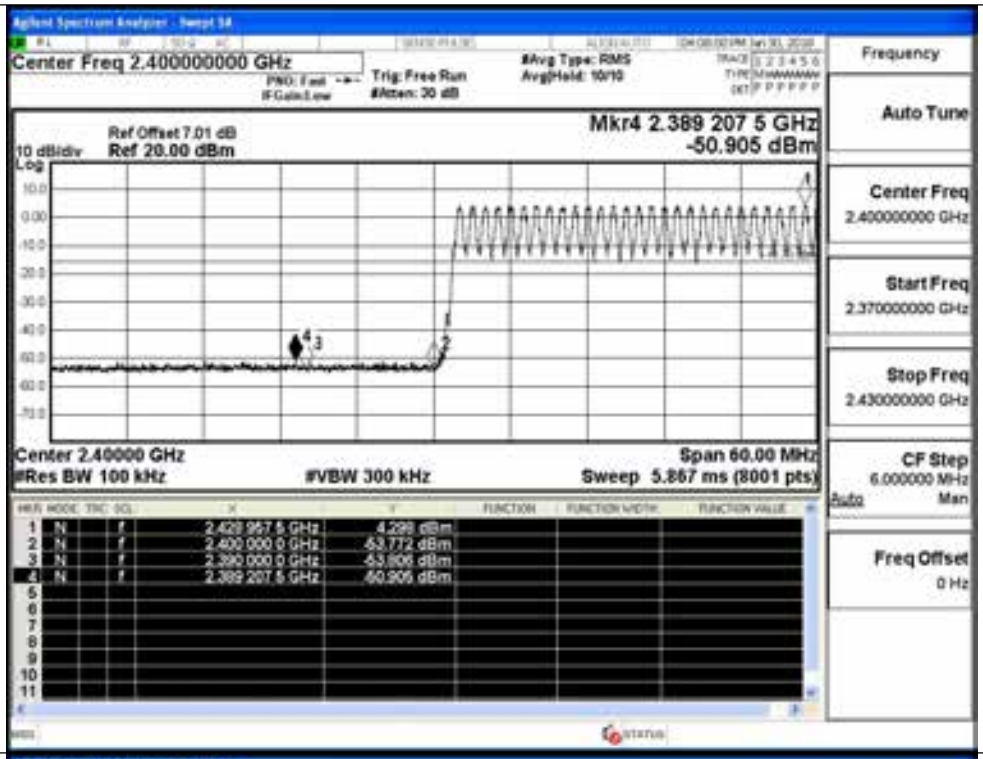
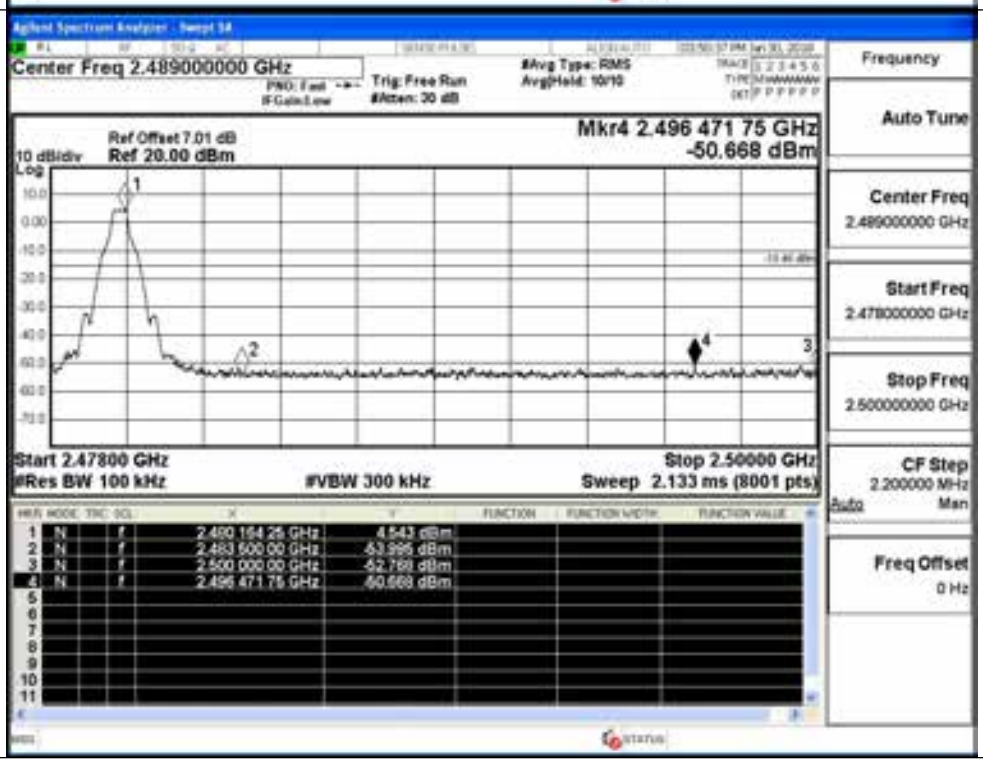
## A.6 Band-edge for RF Conducted Emissions

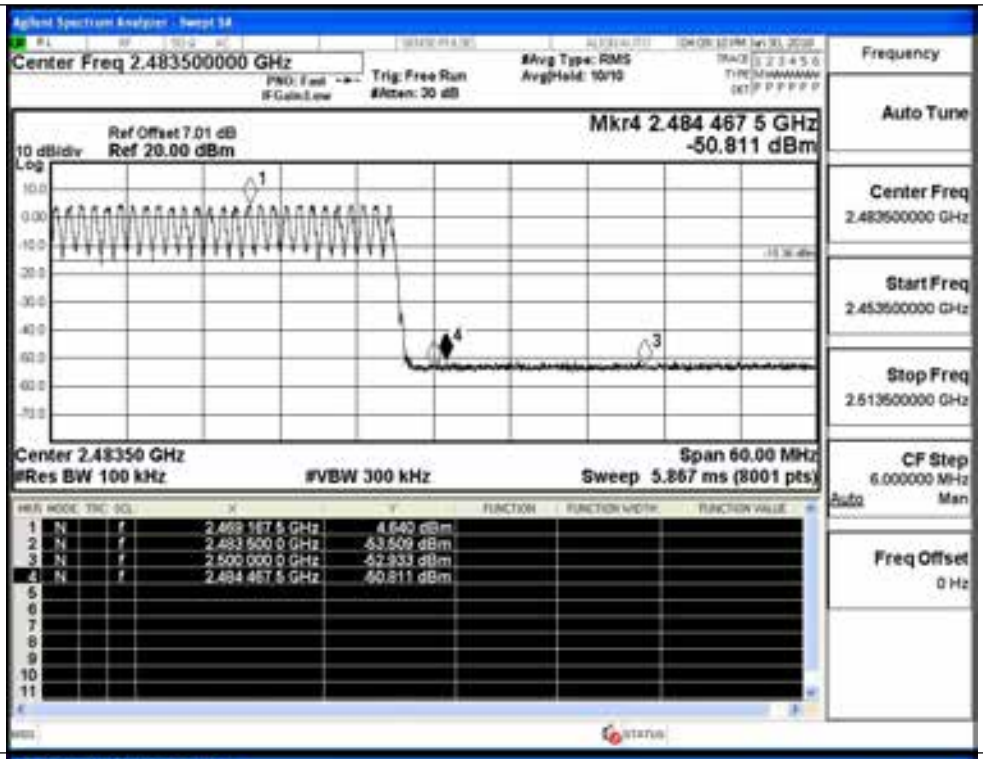
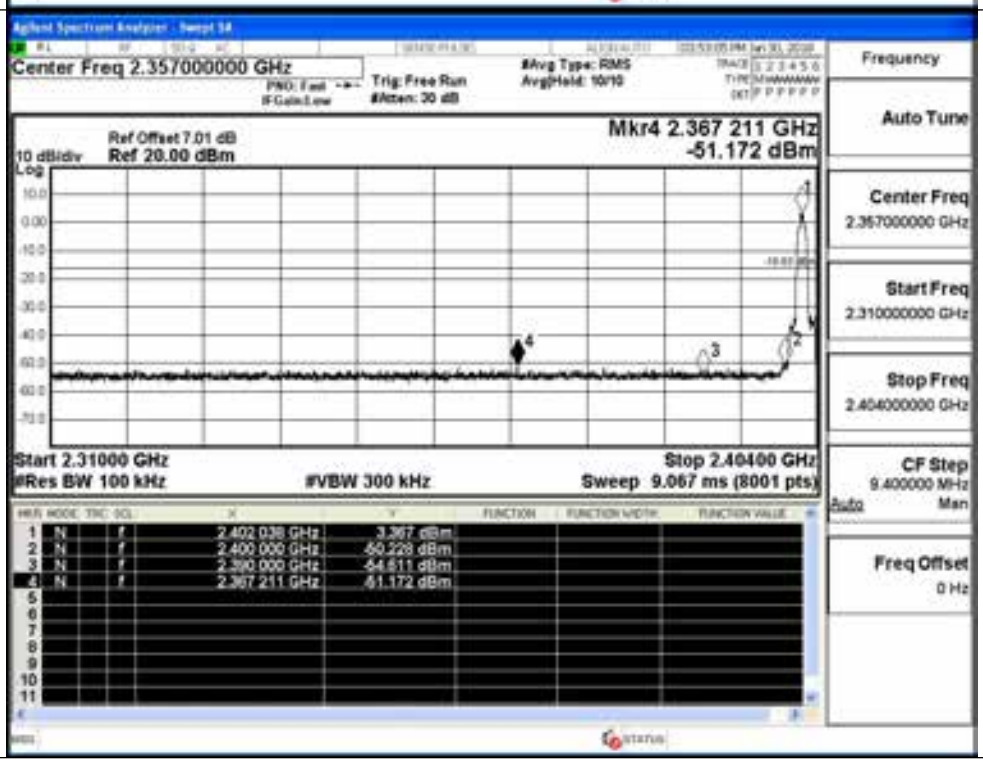
### Result Table

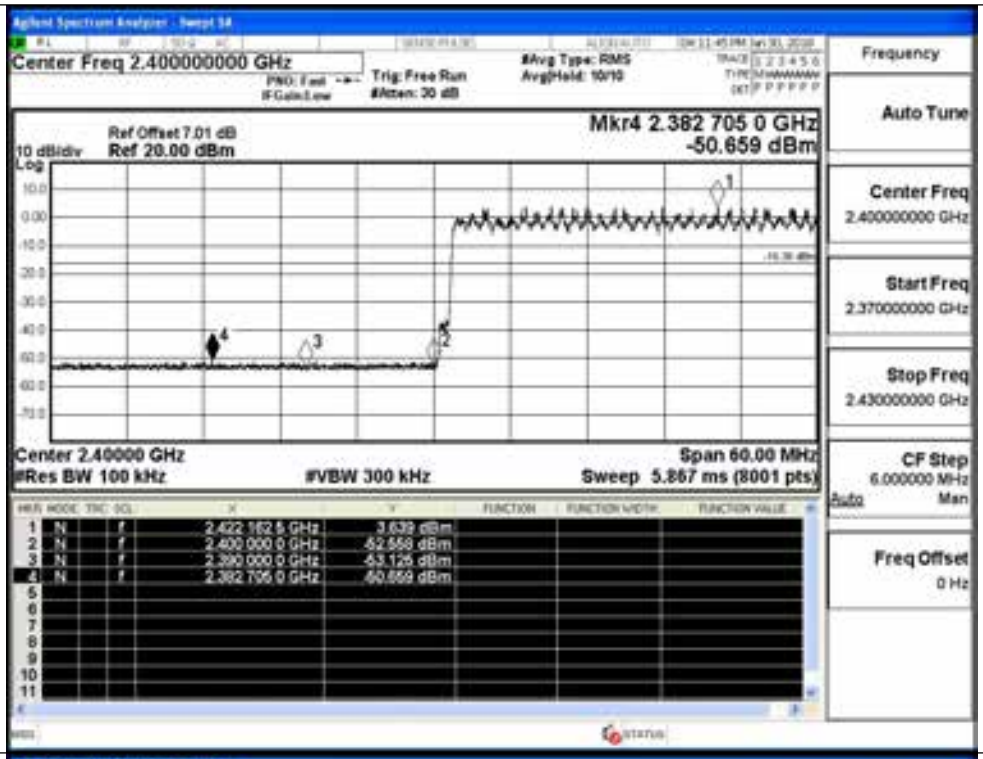
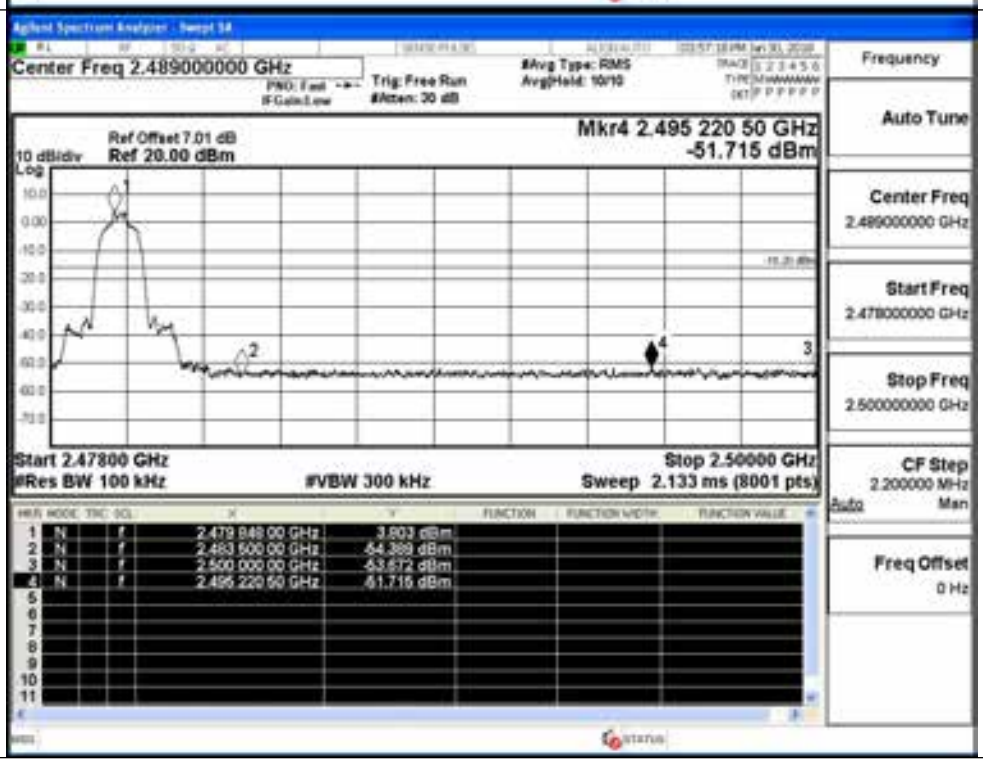
| Mode | Channel | Carrier Frequency [MHz] | Carrier Power [dBm] | Frequency Hopping | Max Spurious Level [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| GFSK | LCH | 2402 | 4.487 | Off | -49.810 | -15.51 | PASS |
| | | | 4.298 | On | -50.905 | -15.7 | PASS |
| GFSK | HCH | 2480 | 4.543 | Off | -50.668 | -15.46 | PASS |
| | | | 4.640 | On | -50.811 | -15.36 | PASS |
| π/4DQPSK | LCH | 2402 | 3.367 | Off | -51.172 | -16.63 | PASS |
| | | | 3.639 | On | -50.659 | -16.36 | PASS |
| π/4DQPSK | HCH | 2480 | 3.803 | Off | -51.715 | -16.2 | PASS |
| | | | 3.733 | On | -50.558 | -16.27 | PASS |
| 8DPSK | LCH | 2402 | 2.910 | Off | -51.174 | -17.09 | PASS |
| | | | 3.584 | On | -50.892 | -16.42 | PASS |
| 8DPSK | HCH | 2480 | 3.709 | Off | -51.155 | -16.29 | PASS |
| | | | 3.717 | On | -50.530 | -16.28 | PASS |

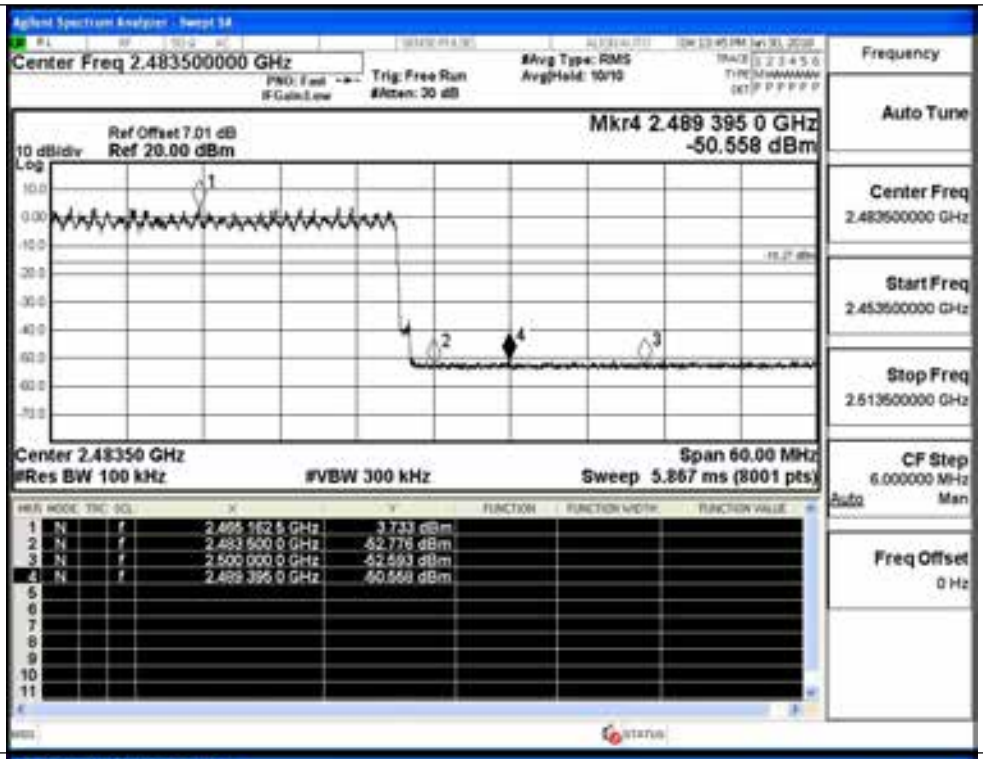
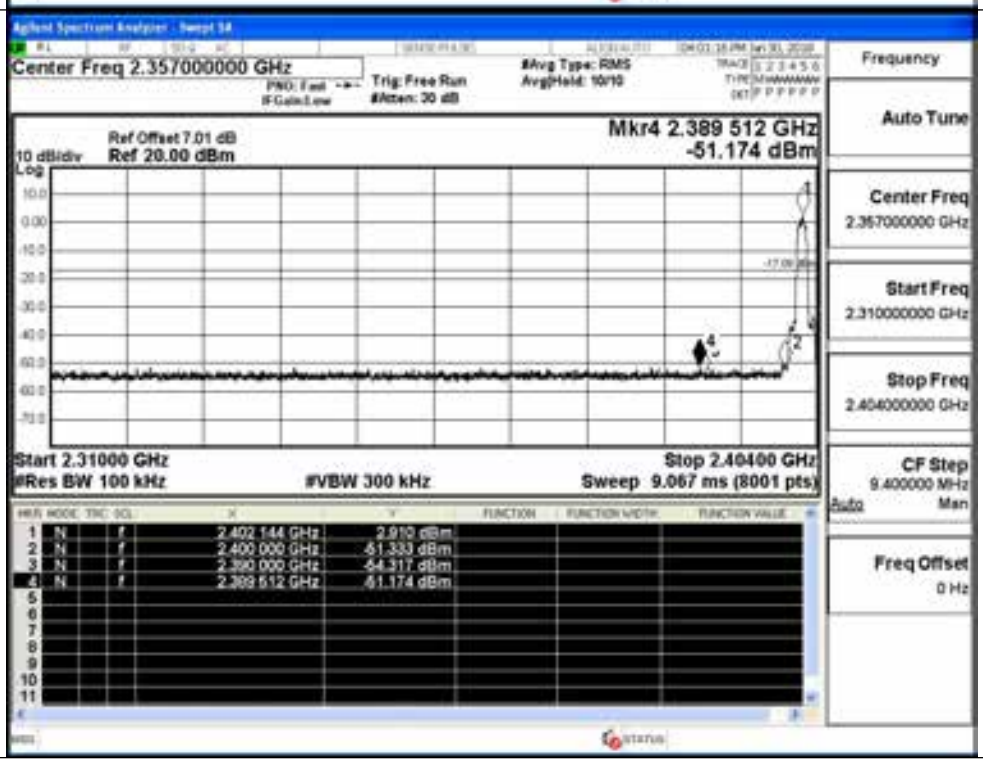
### Test Graph

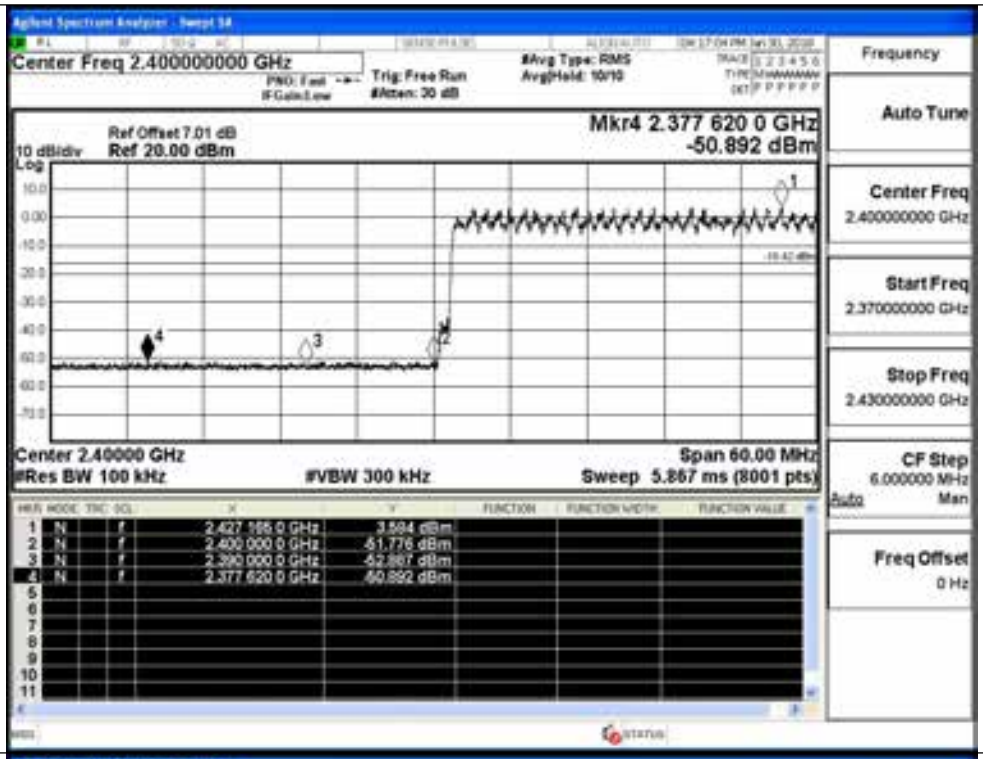
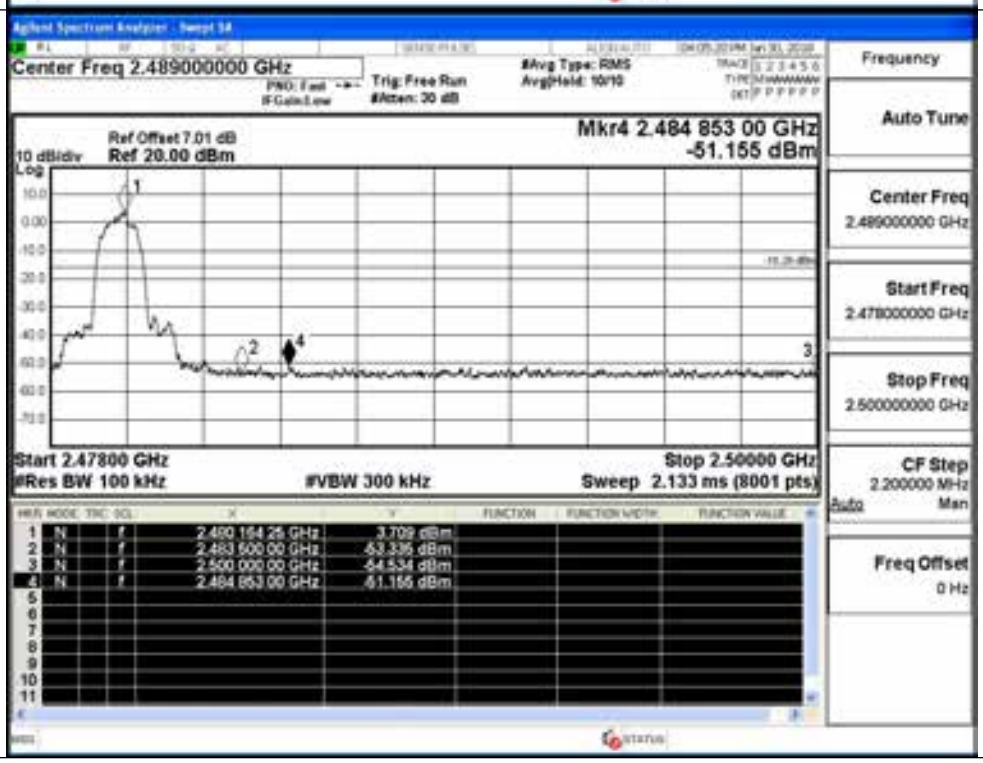
| Graphs | |
|---|---|
| GFSK/LCH/No Hop |  |

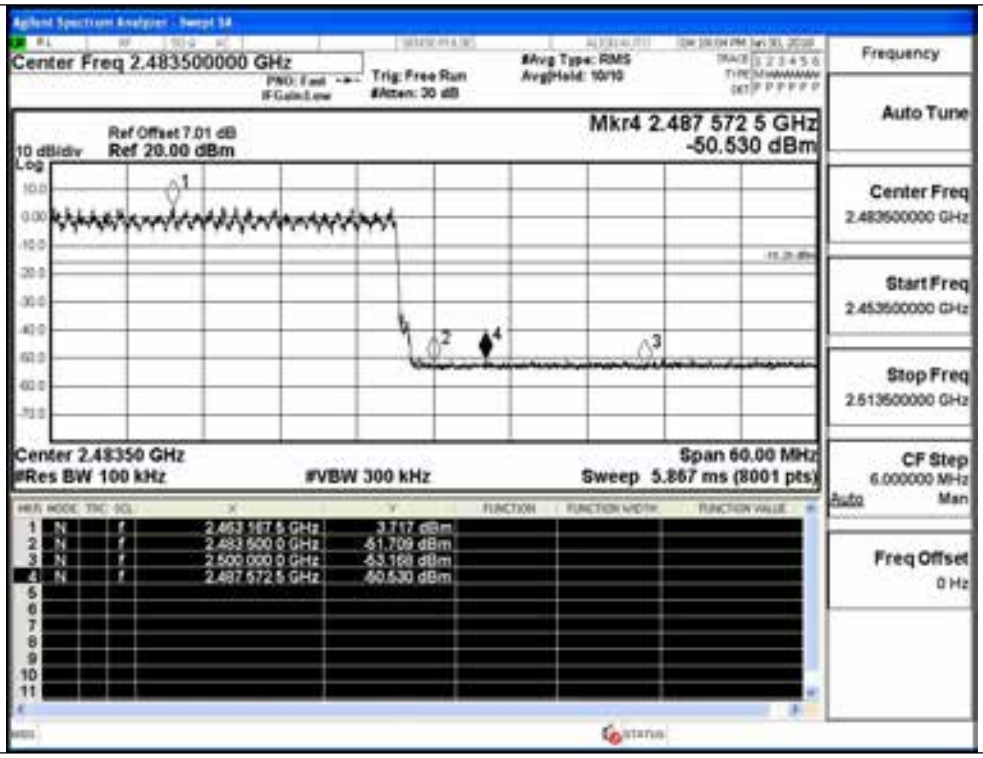
| | |
|---|---|
| GFSK/LCH/Hop |  |
| GFSK/HCH/No Hop |  |

| | |
|---|---|
| GFSK/HCH/Hop |  |
| π/4DQPSK/LCH/No Hop |  |

| | |
|---|---|
| π/4DQPSK/LCH/Hop |  |
| π/4DQPSK/HCH/No Hop |  |

| | |
|---|---|
| π/4DQPSK/HCH/Hop |  |
| 8DPSK/LCH/No Hop |  |

| | |
|---|---|
| 8DPSK/LCH/Hop |  |
| 8DPSK/HCH/No Hop |  |

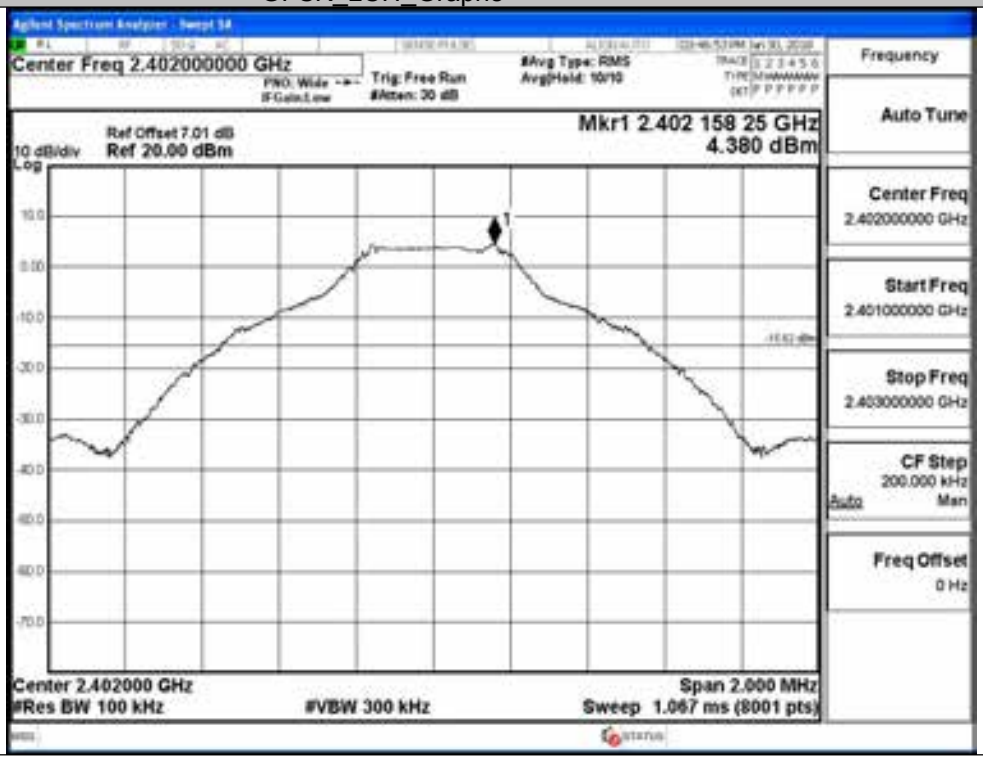
| | |
|---|---|
| 8DPSK/HCH/Hop |  |

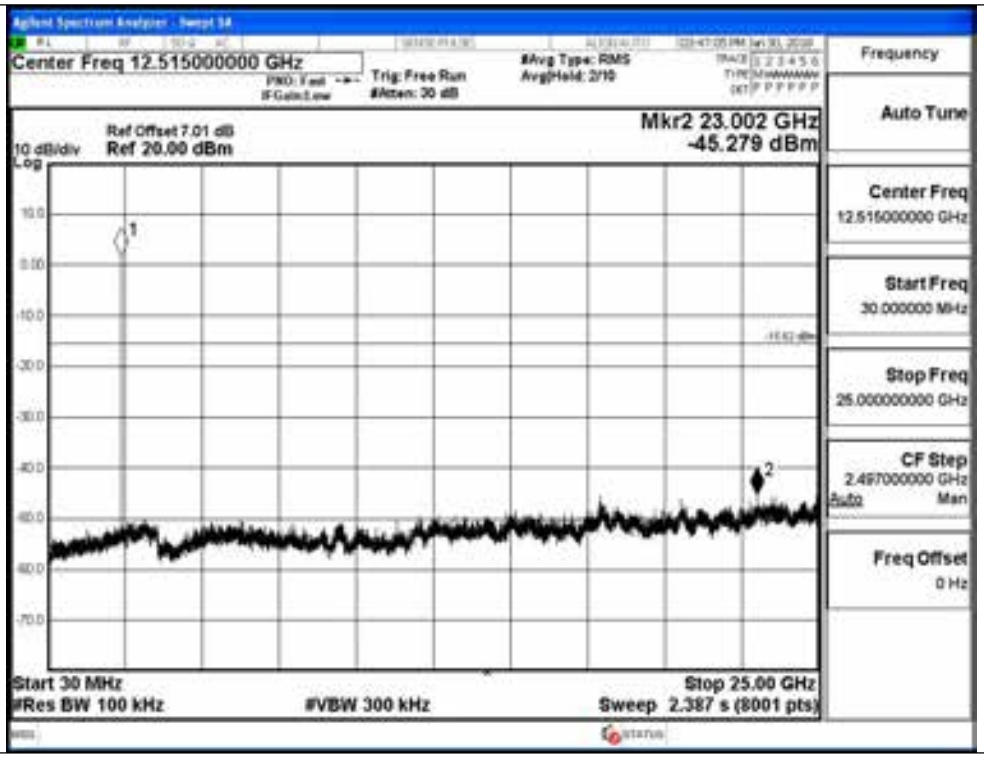
## A.7 RF Conducted Spurious Emissions

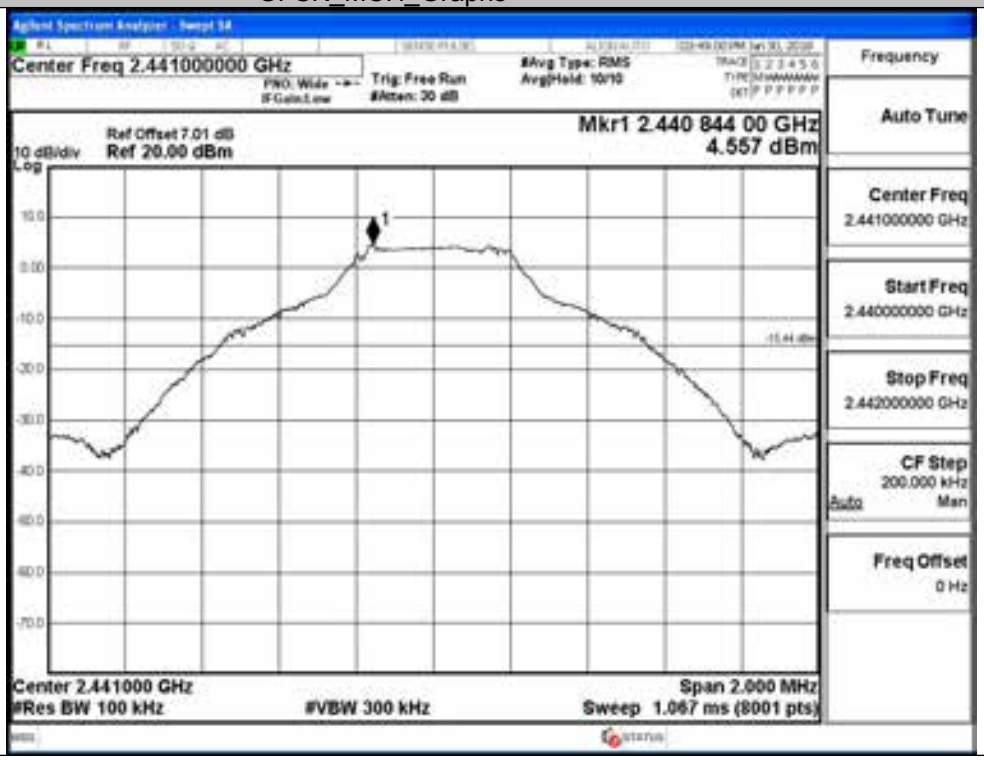
### Result Table

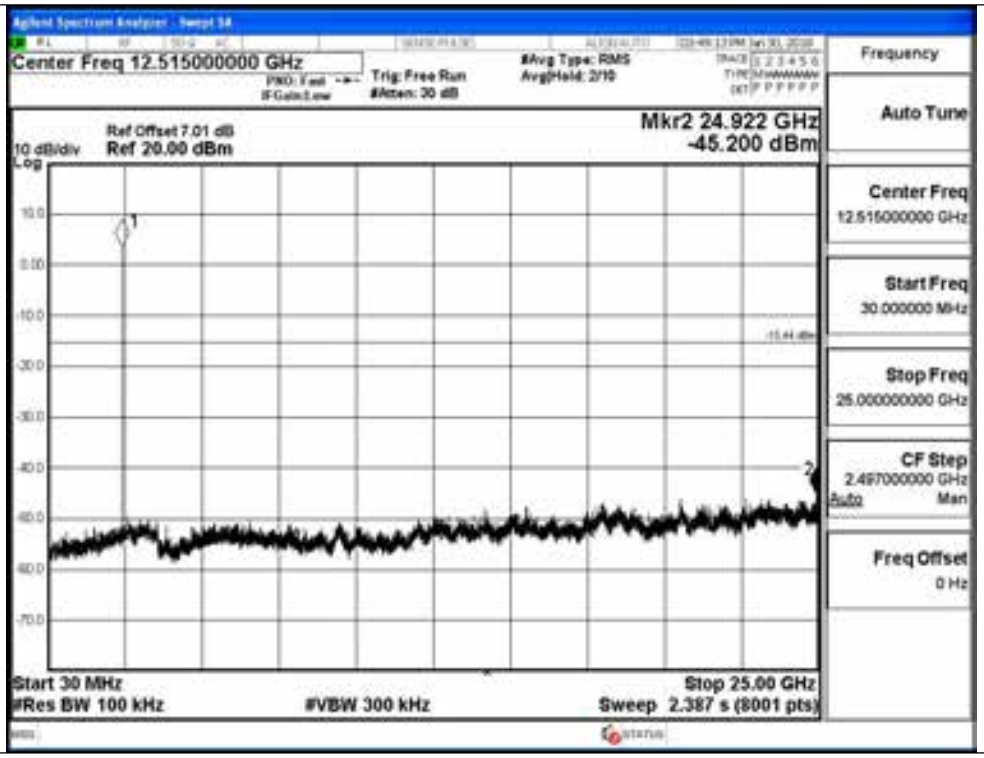
| Mode | Channel | Pref [dBm] | Max. Level [dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| GFSK | LCH | 4.380 | -45.279 | -15.620 | PASS |
| GFSK | MCH | 4.557 | -45.200 | -15.443 | PASS |
| GFSK | HCH | 4.442 | -45.445 | -15.558 | PASS |
| π/4DQPSK | LCH | 3.378 | -45.553 | -16.622 | PASS |
| π/4DQPSK | MCH | 3.304 | -45.265 | -16.696 | PASS |
| π/4DQPSK | HCH | 3.579 | -45.911 | -16.421 | PASS |
| 8DPSK | LCH | 2.837 | -45.489 | -17.163 | PASS |
| 8DPSK | MCH | 3.072 | -45-750 | -16.928 | PASS |
| 8DPSK | HCH | 3.658 | -45.545 | -16.342 | PASS |

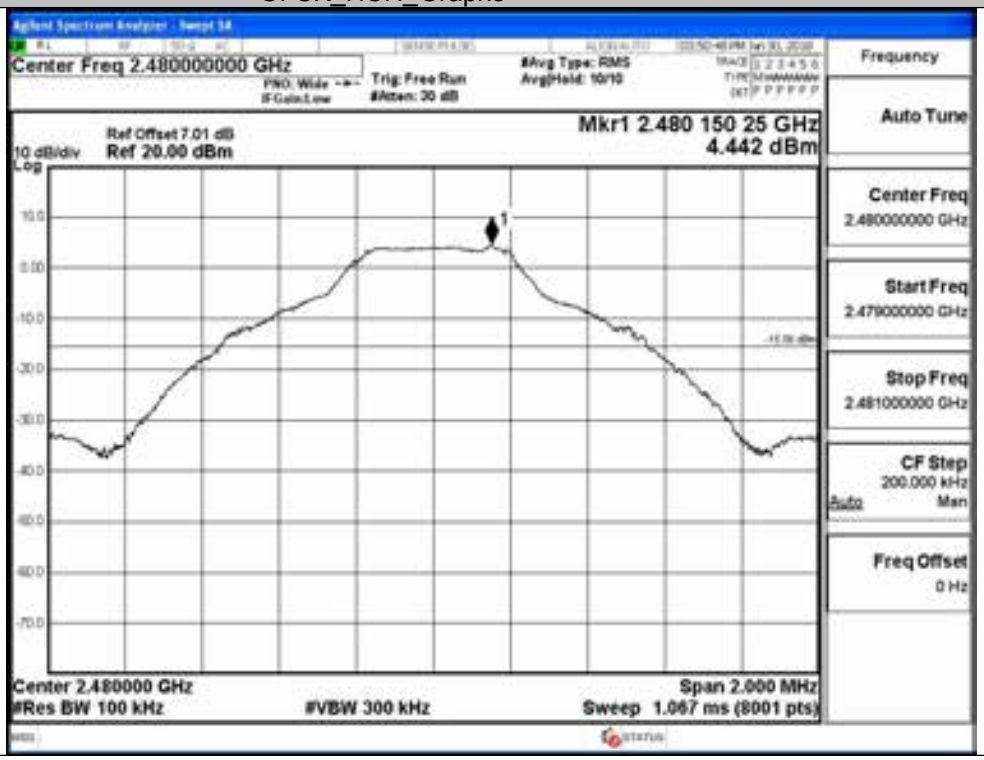
### Test Graph

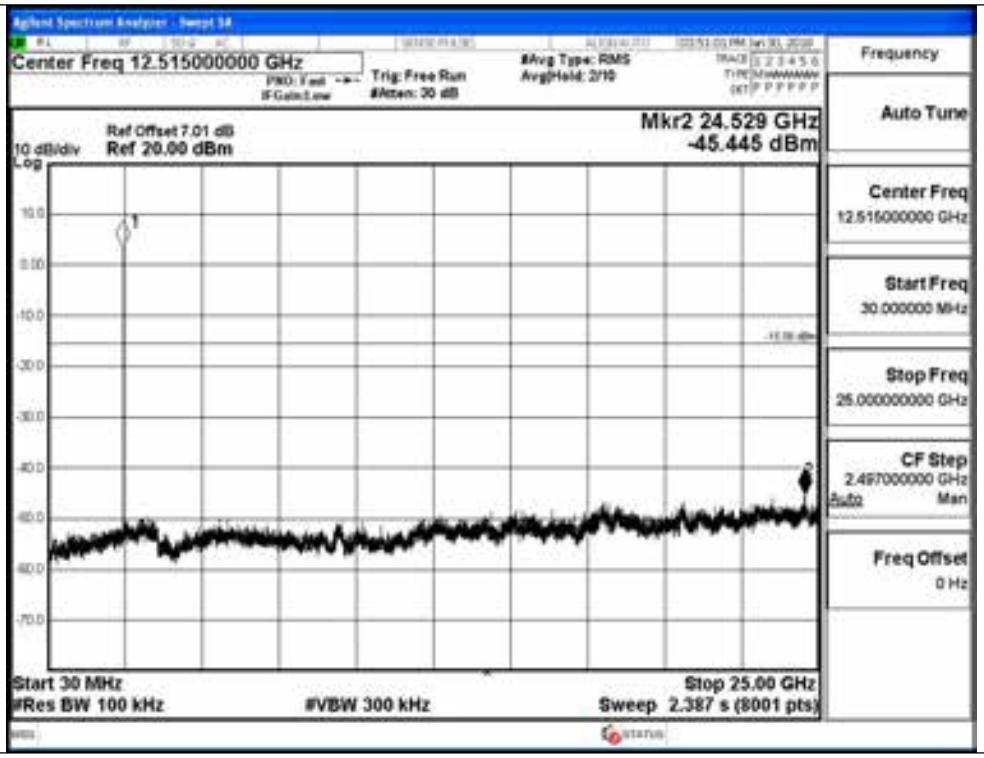
| GFSK_LCH_Graphs | | |
|---|---|---|
| Pref | |  |

| | | |
|---|---|---|
| Puw | |  |

| GFSK_MCH_Graphs | | |
|---|---|---|
| Pref | |  |

| | | |
|---|---|---|
| Puw | |  |

| GFSK_HCH_Graphs | | |
|---|---|---|
| Pref | |  |

| | | |
|---|---|---|
| Puw | |  |

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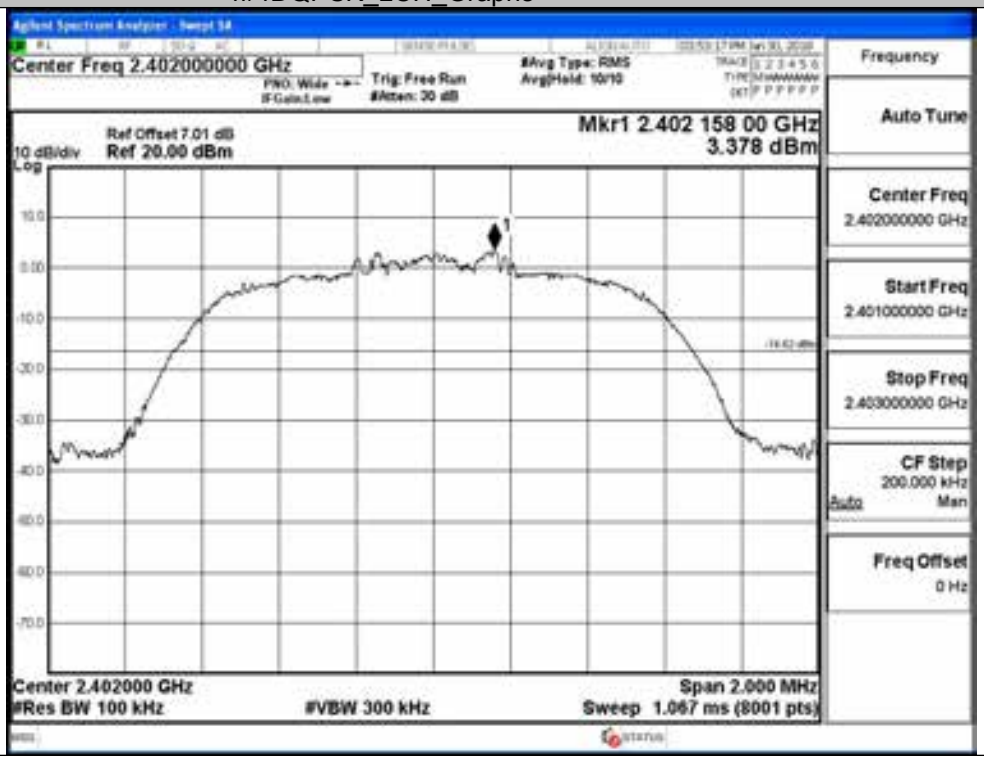
| Pref | |  |

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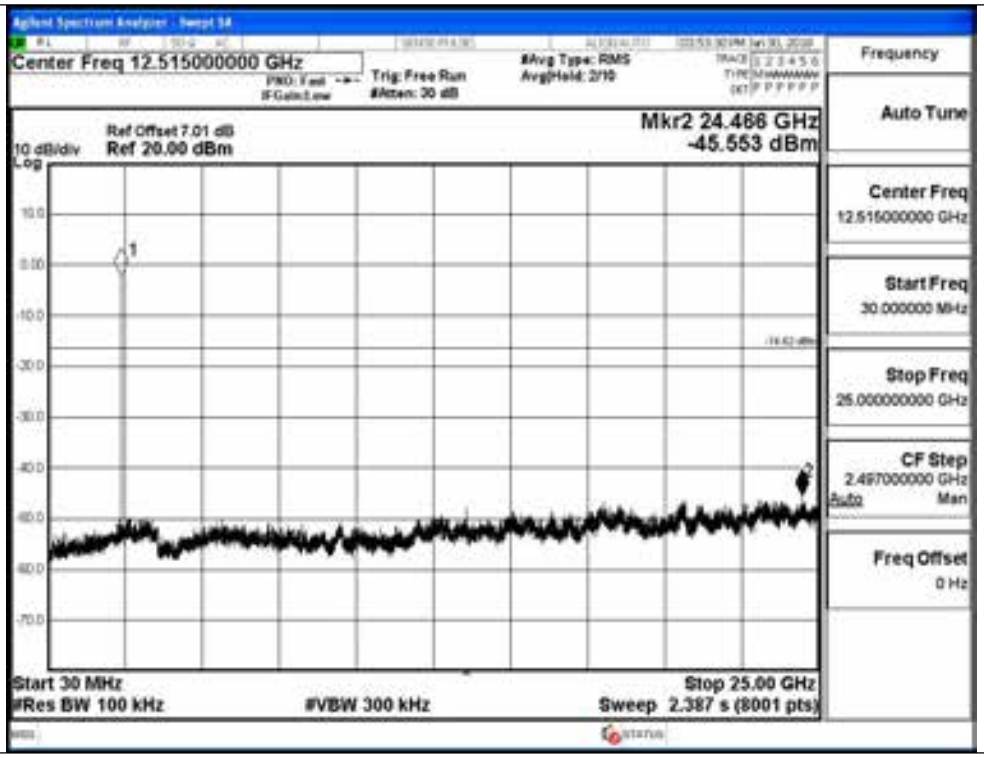
| Puw | |  |

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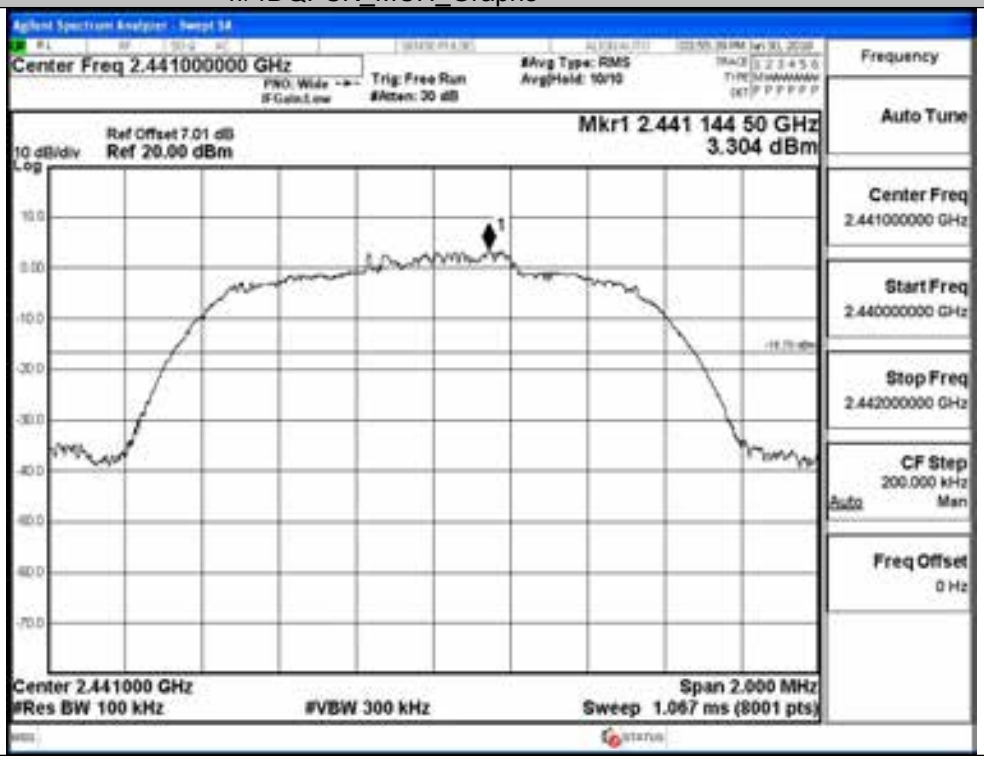
| Pref | |  |

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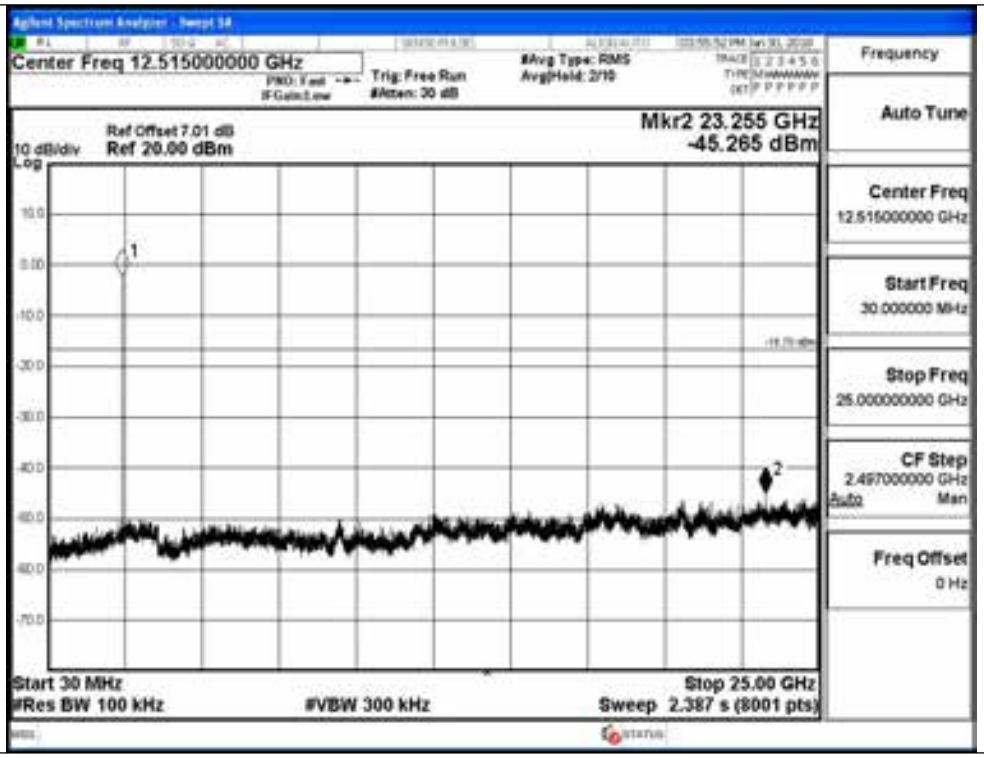
| Puw | |  |

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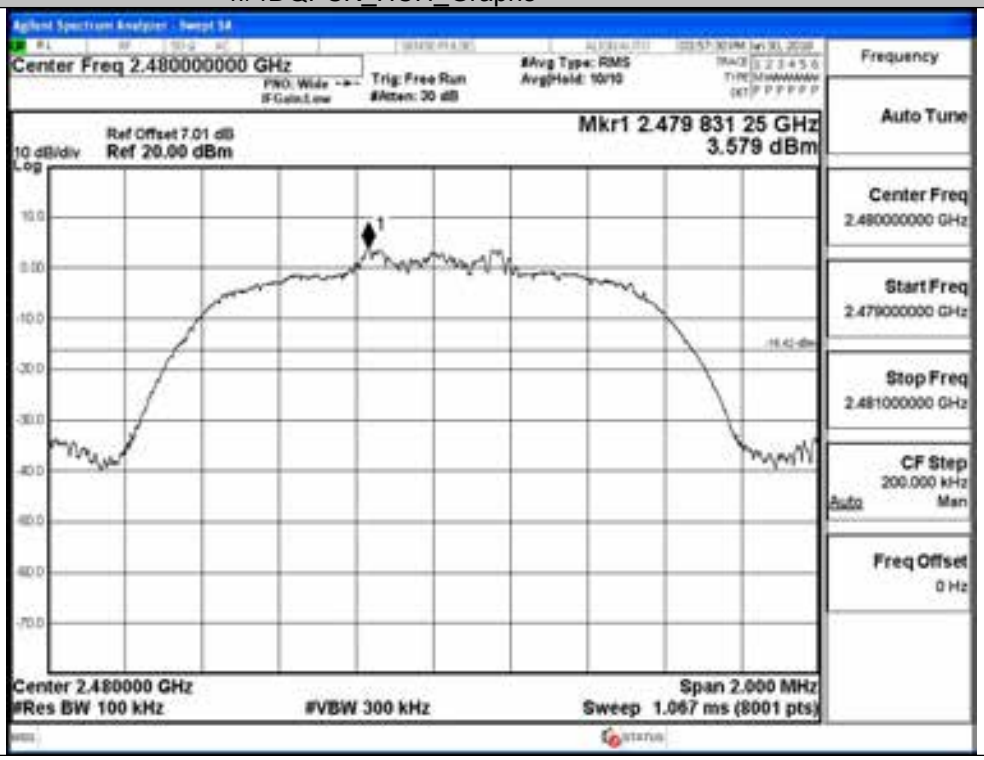
| Pref | |  |

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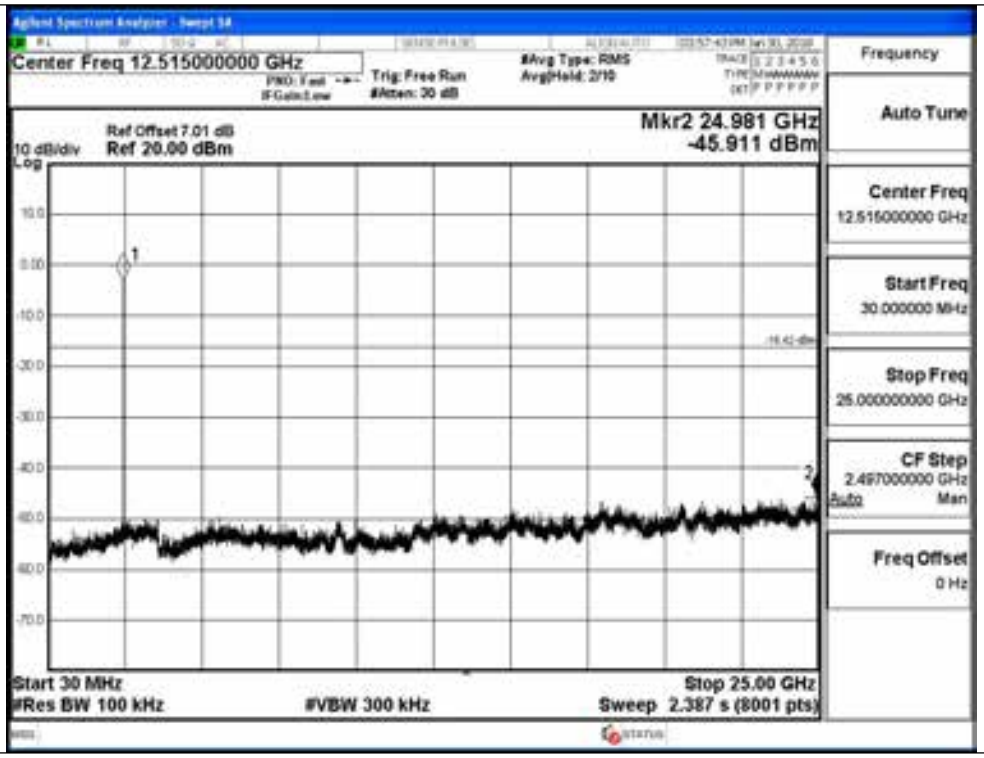
| Puw | |  |

| 8DPSK_LCH_Graphs | | |
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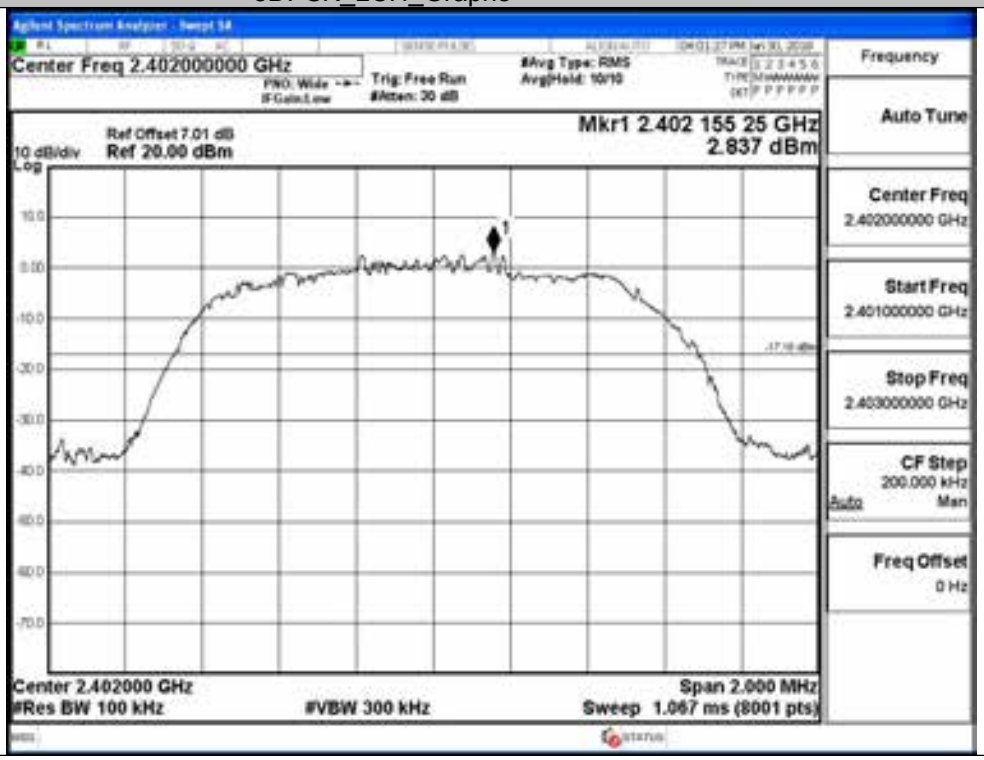
| Pref | |  |

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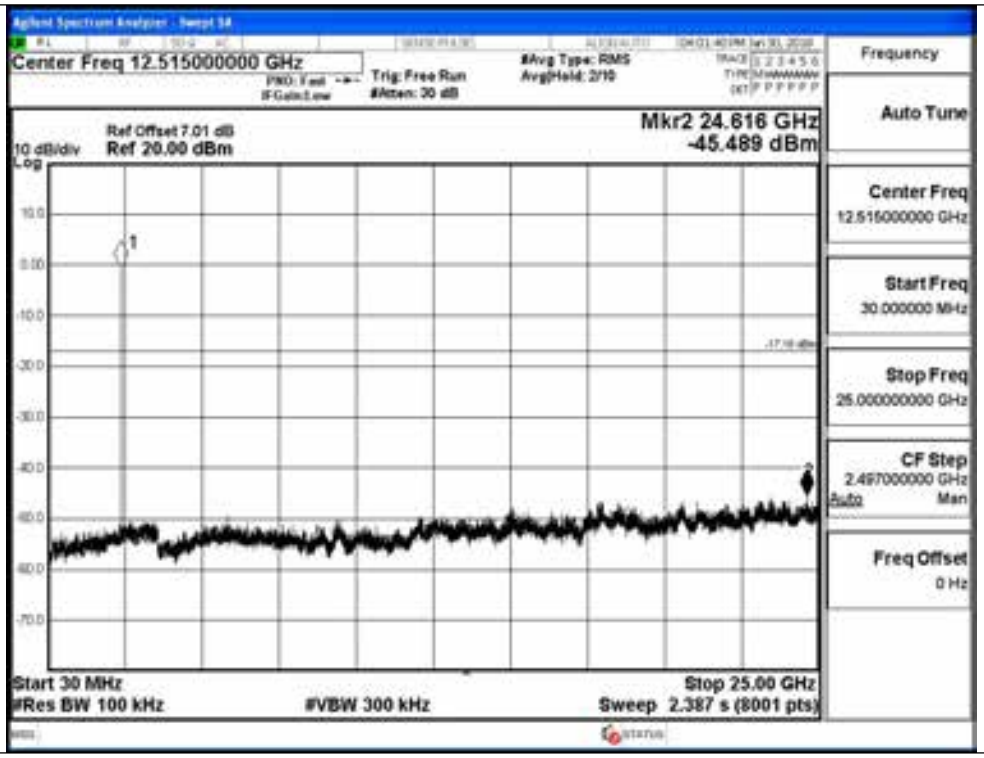
| Puw | |  |

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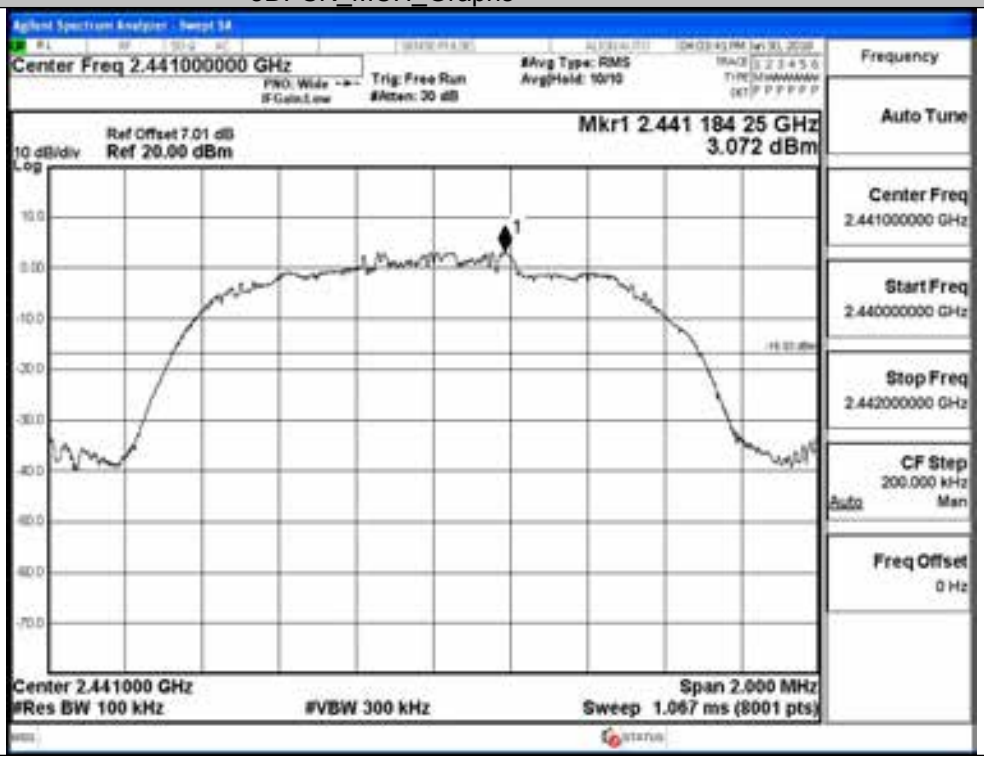
| Pref | |  |

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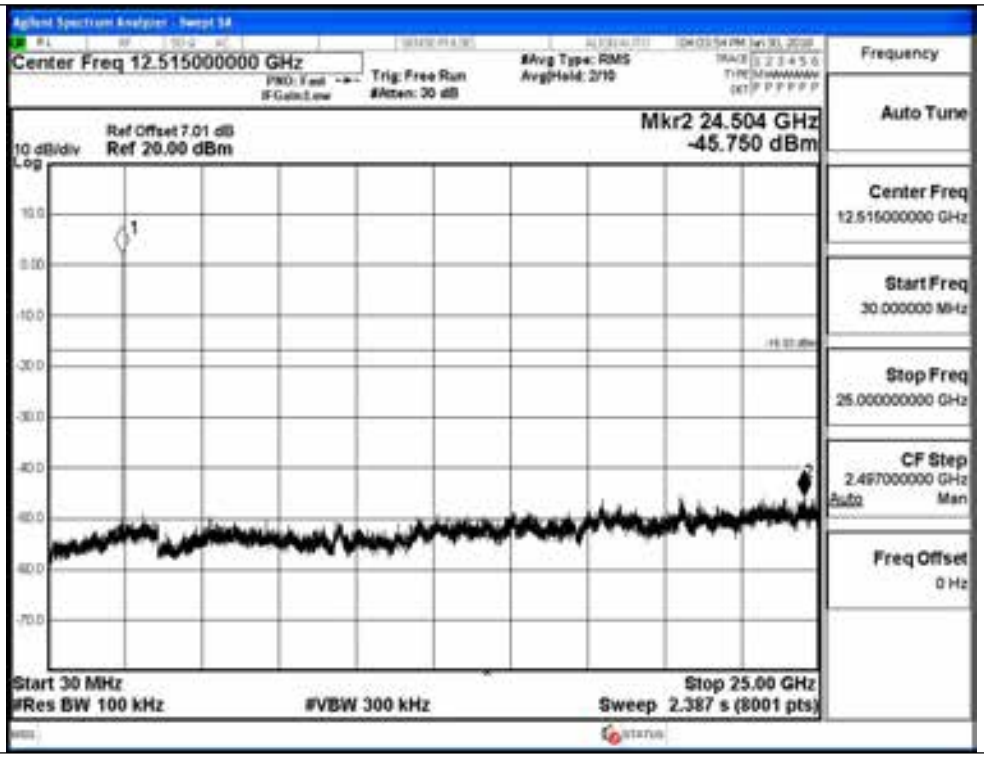
| Puw | |  |

| 8DPSK_HCH_Graphs | | |
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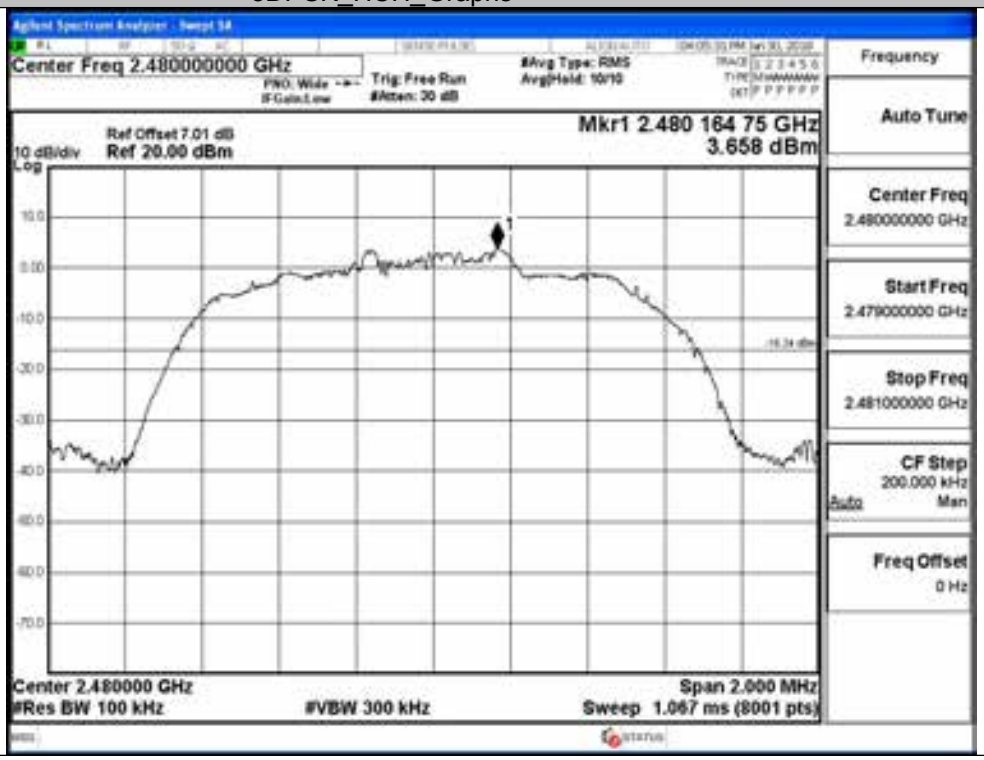
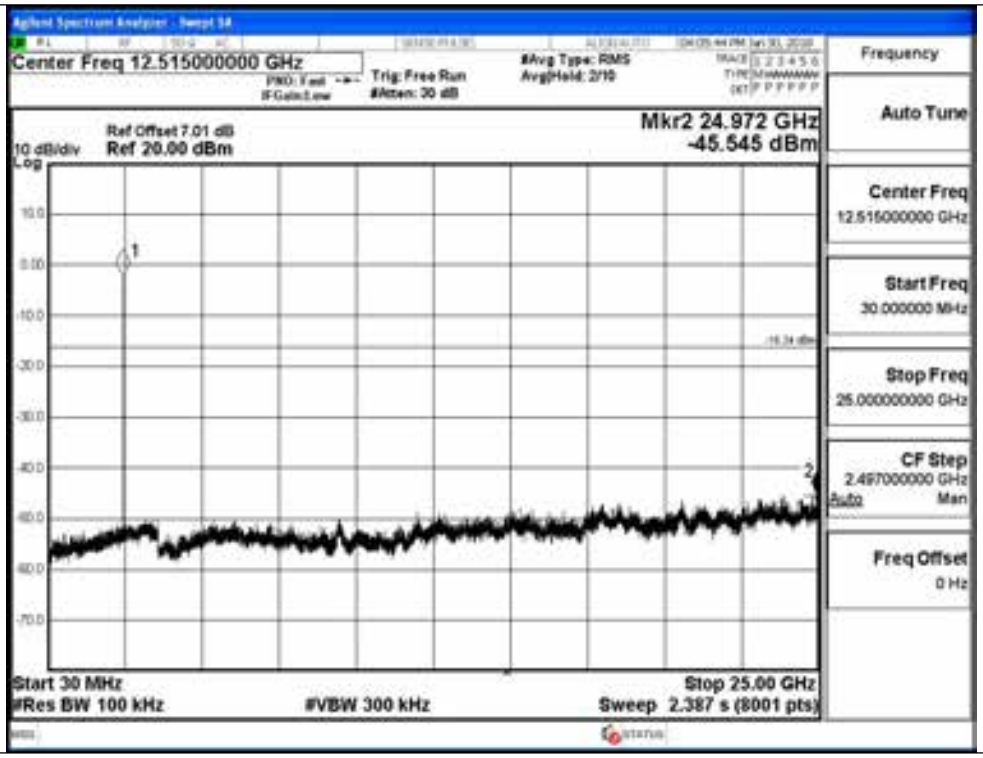
| Pref | |  |

| | | |
|---|---|---|
| Puw | | Agilent Spectrum Analyzer - Swept SA<br>Center Freq 12.515000000 GHz<br>PNO: Fast<br>IFGain:Low<br>Trig: Free Run<br>#Atten: 30 dB<br>#Avg Type: RMS<br>Avg\|Hold: 2/10<br>Ref Offset 7.01 dB<br>10 dB/div Ref 20.00 dBm<br>Log<br>Mkr2 24.972 GHz<br>-45.545 dBm<br>Start 30 MHz<br>#Res BW 100 kHz<br>#VBW 300 kHz<br>Stop 25.00 GHz<br>Sweep 2.387 s (8001 pts)<br>Frequency<br>Auto Tune<br>Center Freq<br>12.515000000 GHz<br>Start Freq<br>30.000000 MHz<br>Stop Freq<br>25.000000000 GHz<br>CF Step<br>2.497000000 GHz<br>Auto<br>Man<br>Freq Offset<br>0 Hz |

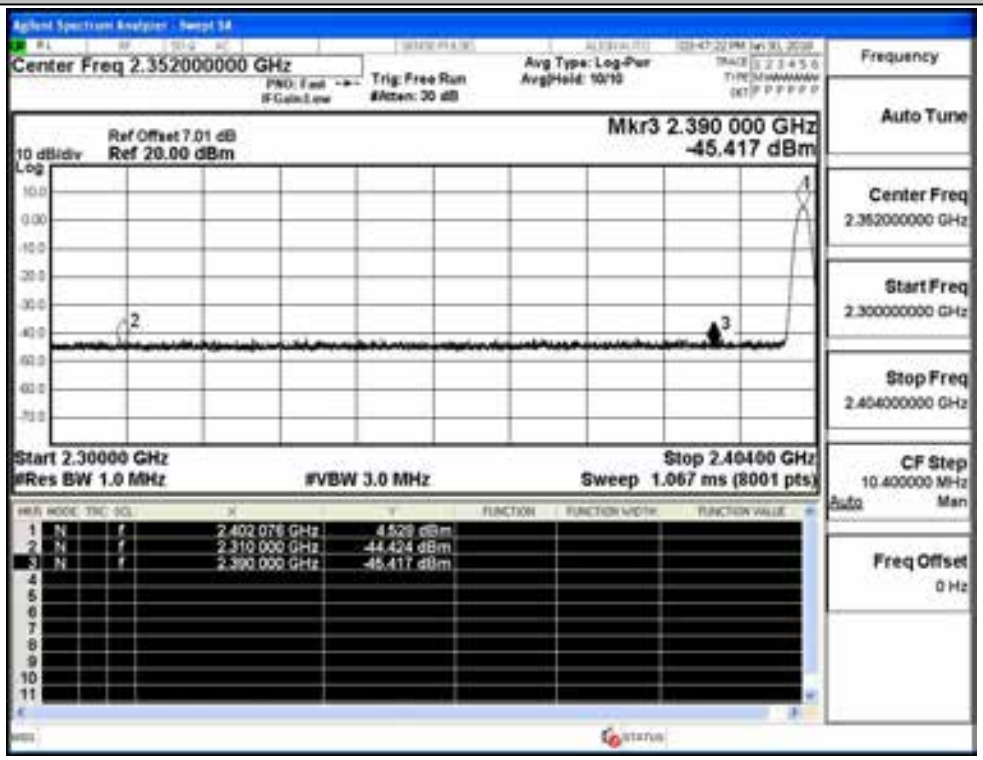
## . A.8 Restrict-band band-edge measurements

### Result Table

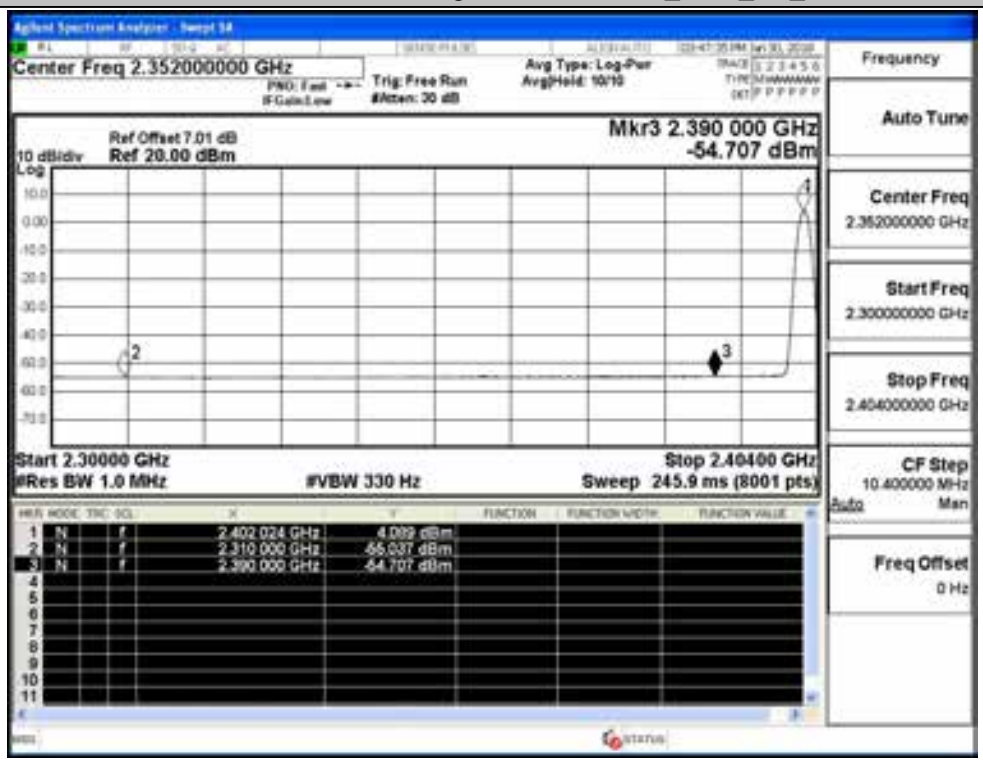
| Test Mode | Hopping | Freq. | Power [dBm] | Gain | Ground Factor | E [dBuV/m] | Detector | Limit [dBuV/m] | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| GFSK_DH5 | On | 2310.0 | -44.42 | 2 | 0 | 50.83 | PEAK | 74 | PASS |
| GFSK_DH5 | On | 2310.0 | -55.04 | 2 | 0 | 40.22 | AV | 54 | PASS |
| GFSK_DH5 | On | 2390.0 | -45.42 | 2 | 0 | 49.84 | PEAK | 74 | PASS |
| GFSK_DH5 | On | 2390.0 | -54.71 | 2 | 0 | 40.55 | AV | 54 | PASS |
| GFSK_DH5 | On | 2483.5 | -44.35 | 2 | 0 | 50.91 | PEAK | 74 | PASS |
| GFSK_DH5 | On | 2483.5 | -54.27 | 2 | 0 | 40.99 | AV | 54 | PASS |
| GFSK_DH5 | On | 2500.0 | -44.19 | 2 | 0 | 51.06 | PEAK | 74 | PASS |
| GFSK_DH5 | On | 2500.0 | -54.38 | 2 | 0 | 40.88 | AV | 54 | PASS |
| π/4DQPSK _2DH5 | On | 2310.0 | -45.32 | 2 | 0 | 49.94 | PEAK | 74 | PASS |
| π/4DQPSK_ 2DH5 | On | 2310.0 | -55.07 | 2 | 0 | 40.19 | AV | 54 | PASS |
| π/4DQPSK_ 2DH5 | On | 2390.0 | -44.86 | 2 | 0 | 50.40 | PEAK | 74 | PASS |
| π/4DQPSK _2DH5 | On | 2390.0 | -54.57 | 2 | 0 | 40.68 | AV | 54 | PASS |
| π/4DQPSK _2DH5 | On | 2483.5 | -44.85 | 2 | 0 | 50.41 | PEAK | 74 | PASS |
| π/4DQPSK _2DH5 | On | 2483.5 | -54.09 | 2 | 0 | 41.16 | AV | 54 | PASS |
| π/4DQPSK _2DH5 | On | 2500.0 | -43.85 | 2 | 0 | 51.41 | PEAK | 74 | PASS |
| π/4DQPSK_ 2DH5 | On | 2500.0 | -54.30 | 2 | 0 | 40.95 | AV | 54 | PASS |
| 8DPSK _3DH5 | On | 2310.0 | -45.40 | 2 | 0 | 49.85 | PEAK | 74 | PASS |
| 8DPSK _3DH5 | On | 2310.0 | -54.99 | 2 | 0 | 40.27 | AV | 54 | PASS |
| 8DPSK _3DH5 | On | 2390.0 | -45.29 | 2 | 0 | 49.97 | PEAK | 74 | PASS |
| 8DPSK _3DH5 | On | 2390.0 | -54.71 | 2 | 0 | 40.55 | AV | 54 | PASS |
| 8DPSK _3DH5 | On | 2483.5 | -44.64 | 2 | 0 | 50.62 | PEAK | 74 | PASS |
| 8DPSK _3DH5 | On | 2483.5 | -54.16 | 2 | 0 | 41.10 | AV | 54 | PASS |
| 8DPSK _3DH5 | On | 2500.0 | -44.72 | 2 | 0 | 50.54 | PEAK | 74 | PASS |
| 8DPSK _3DH5 | On | 2500.0 | -54.30 | 2 | 0 | 40.96 | AV | 54 | PASS |

**Test Graph**

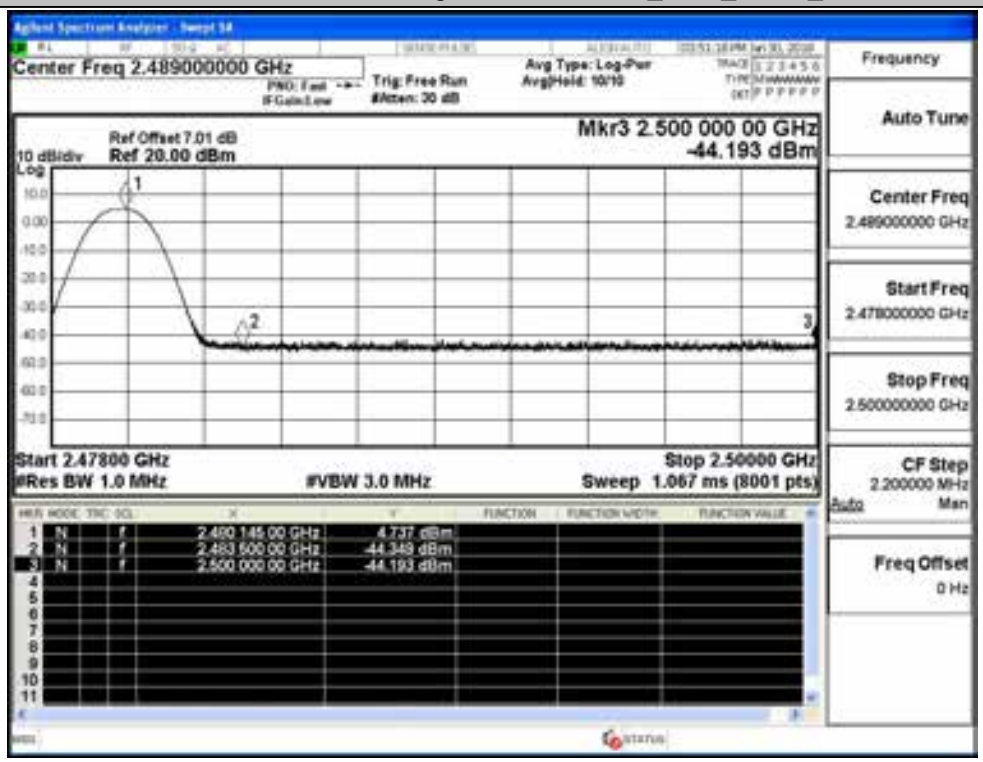
Restrict-band band-edge measurements_2402_PEAK_DH5



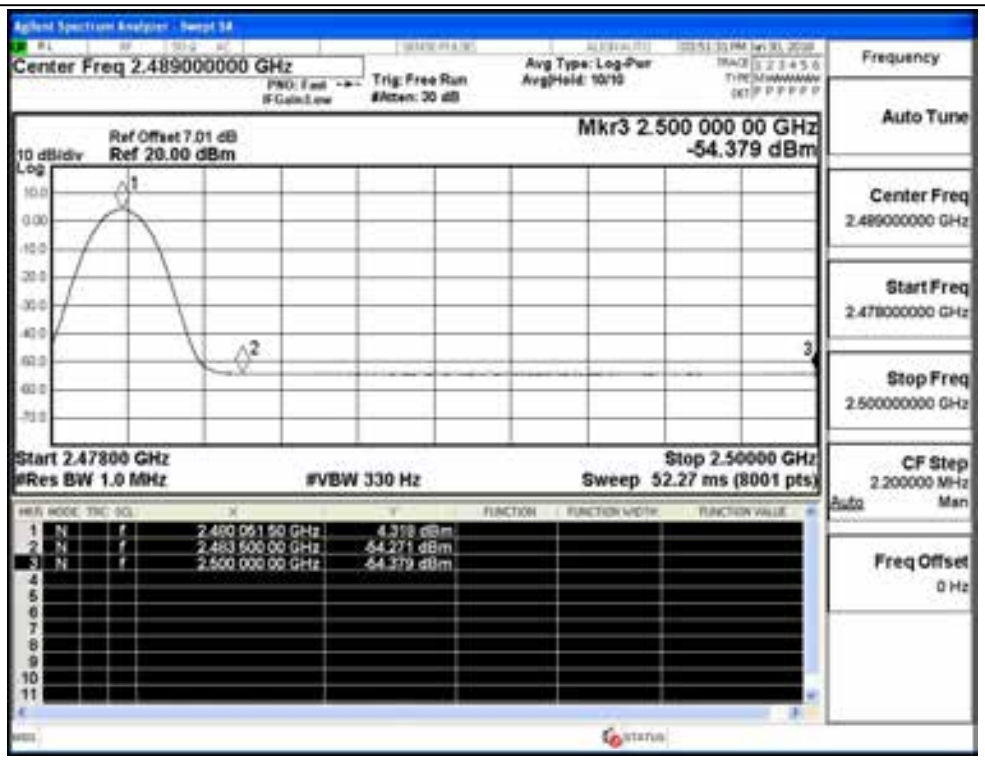

Restrict-band band-edge measurements_2402_AV_DH5



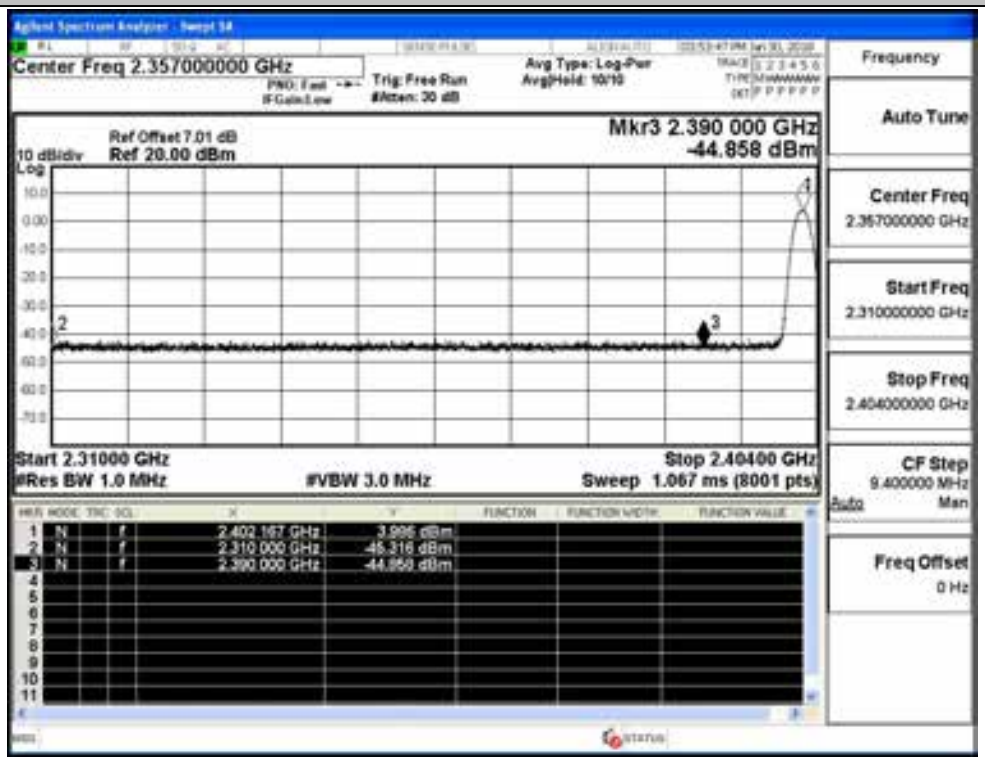
Restrict-band band-edge measurements_2480_PEAK_DH5




Restrict-band band-edge measurements_2480_AV_DH5




Restrict-band band-edge measurements_2402_PEAK_2DH5

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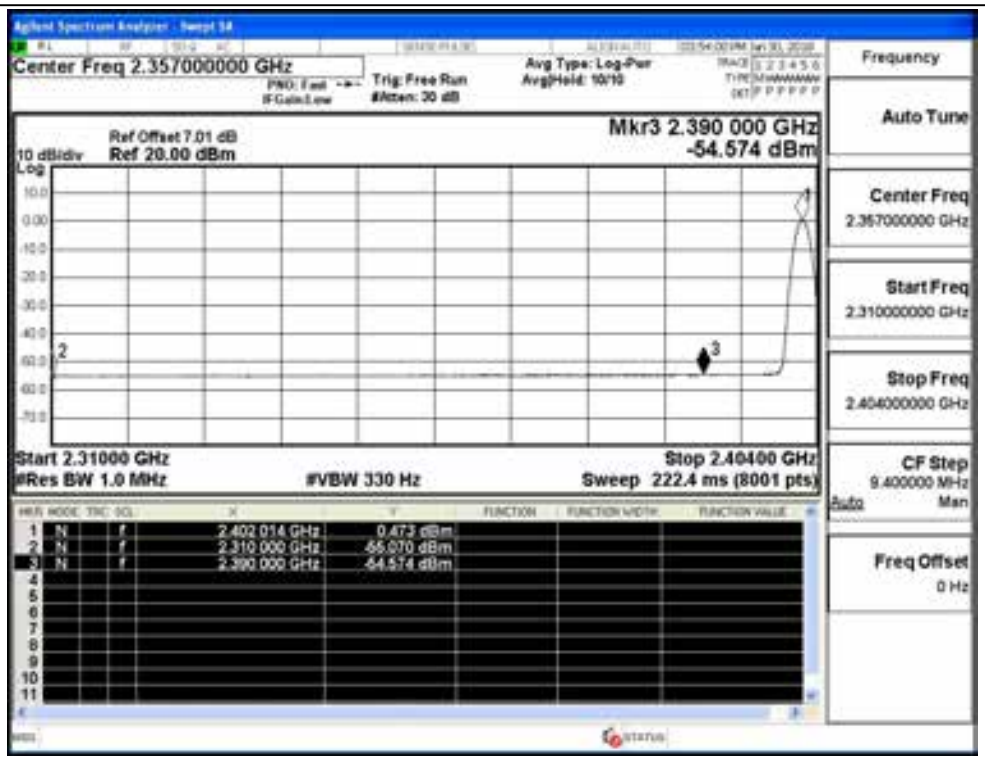


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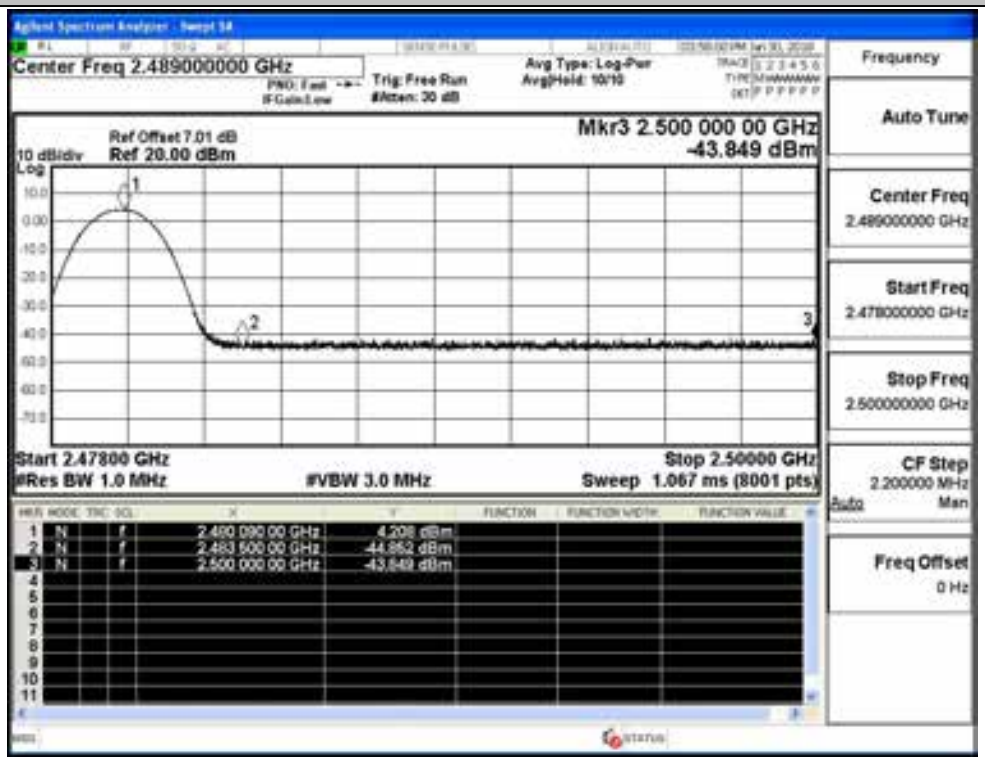
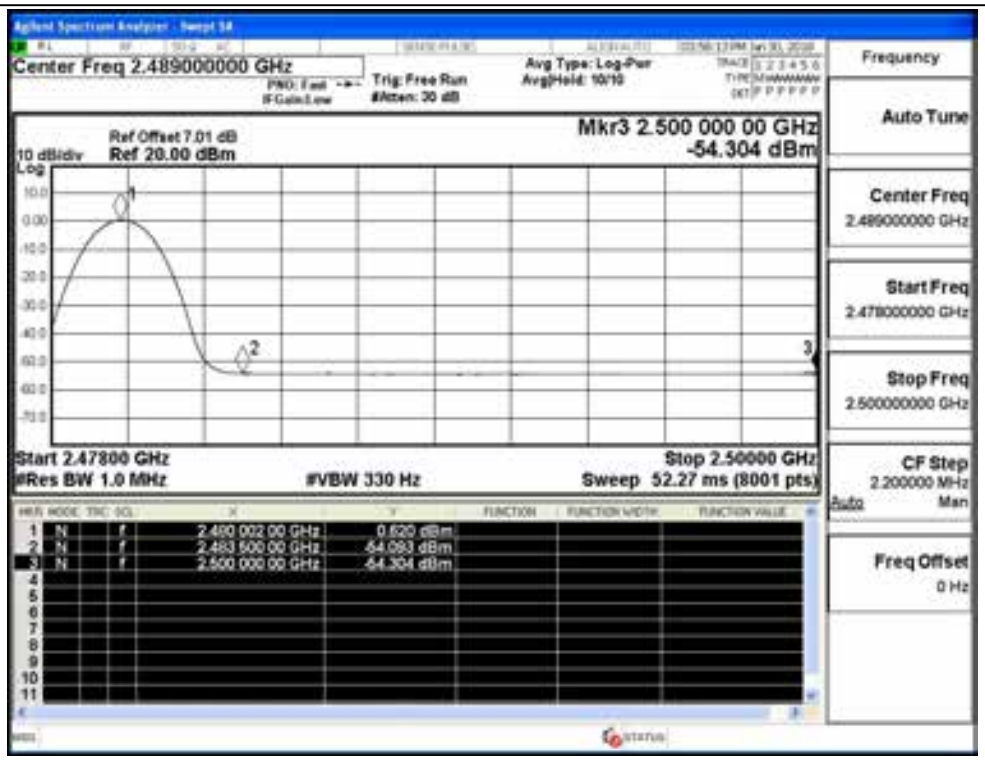
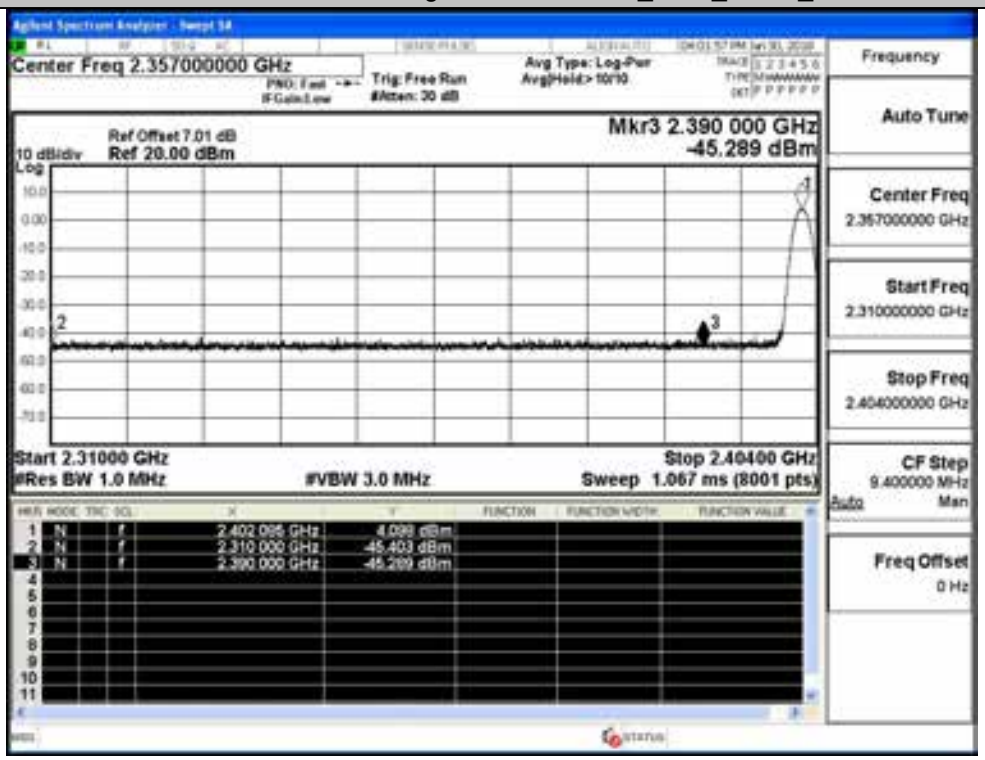


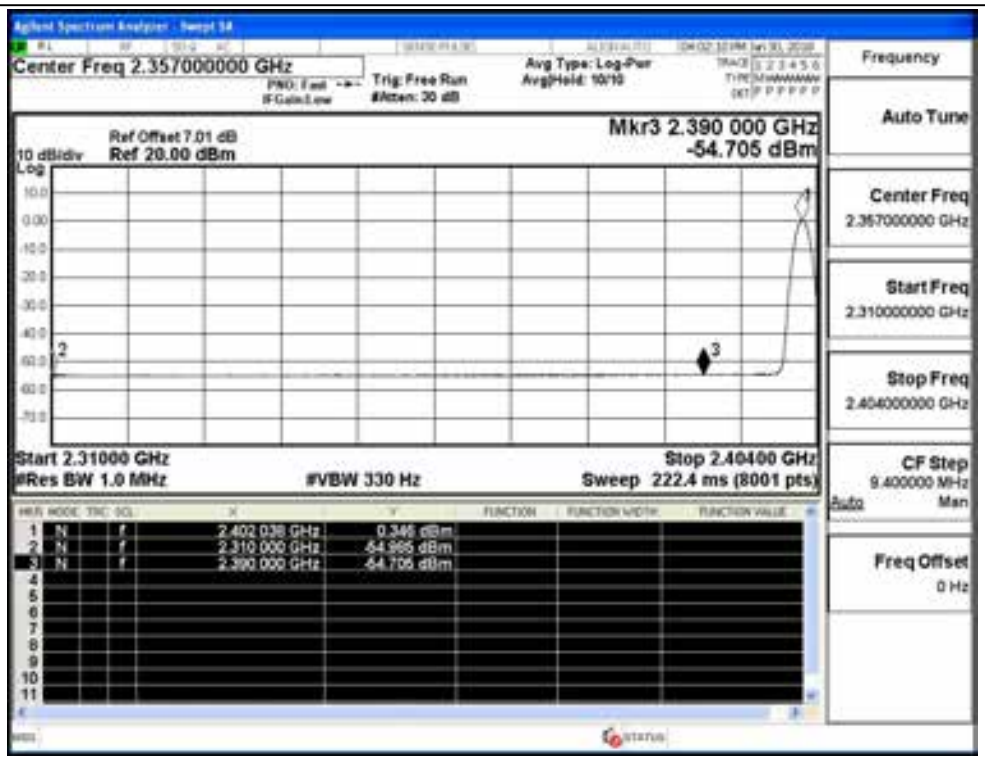

Restrict-band band-edge measurements_2480_AV_2DH5



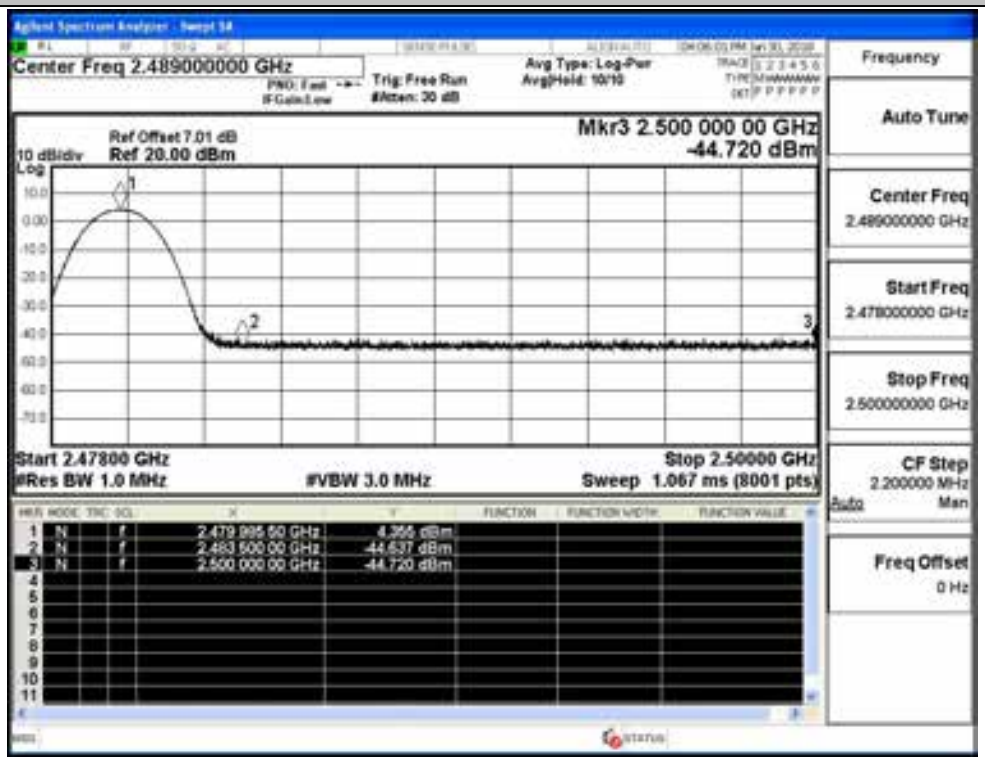

Restrict-band band-edge measurements_2402_PEAK_3DH5



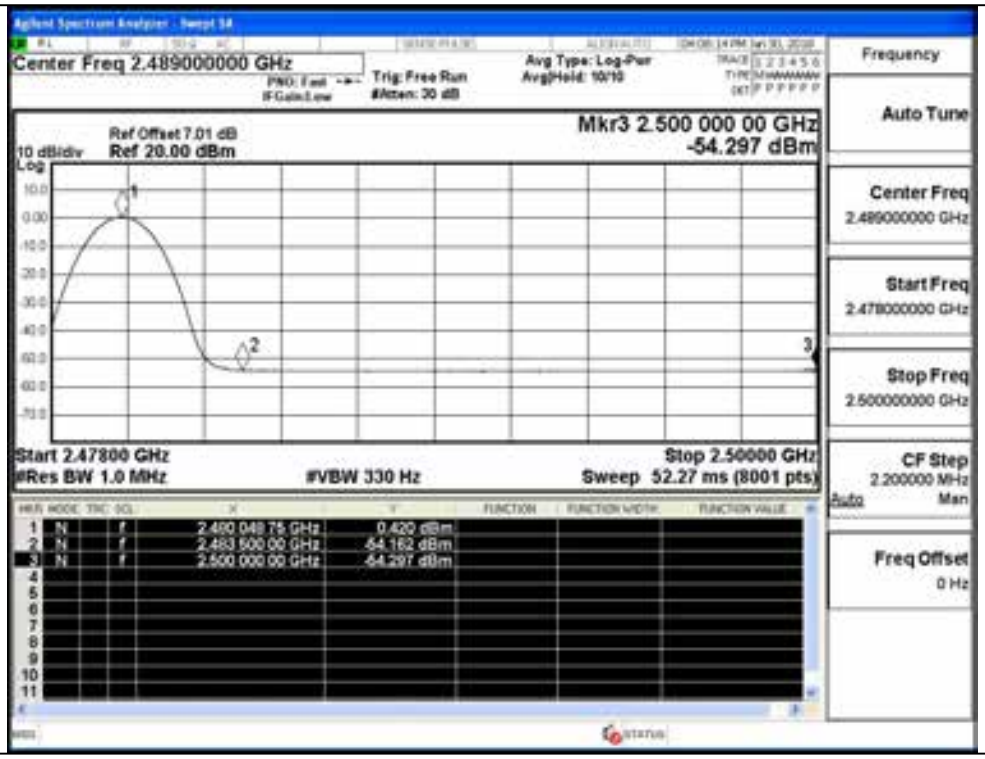

Restrict-band band-edge measurements_2402_AV_3DH5




Restrict-band band-edge measurements_2480_PEAK_3DH5




Restrict-band band-edge measurements_2480_AV_3DH5


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.489000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
Frequency
Auto Tune
Ref Offset 7.01 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr3 2.500 000 00 GHz
-54.297 dBm
Center Freq
2.489000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.500000000 GHz
Start 2.47800 GHz
#Res BW 1.0 MHz
#VBW 330 Hz
Stop 2.50000 GHz
Sweep 52.27 ms (8001 pts)
CF Step
2.200000 MHz
Auto
Man
Freq Offset
0 Hz
1 N 1 f 2.480 048 75 GHz 0.420 dBm
2 N 1 f 2.483 500 00 GHz -54.162 dBm
3 N 1 f 2.500 000 00 GHz -54.297 dBm

# Test Setup Photos of the EUT

Test Setup Photo(s) of Radiated Emissions Measurement

Fig. 1

Fig. 2

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Test Setup Photo of Line Conducted Emissions Measurement

Fig. 3

# External Photos of the EUT

Fig. 1

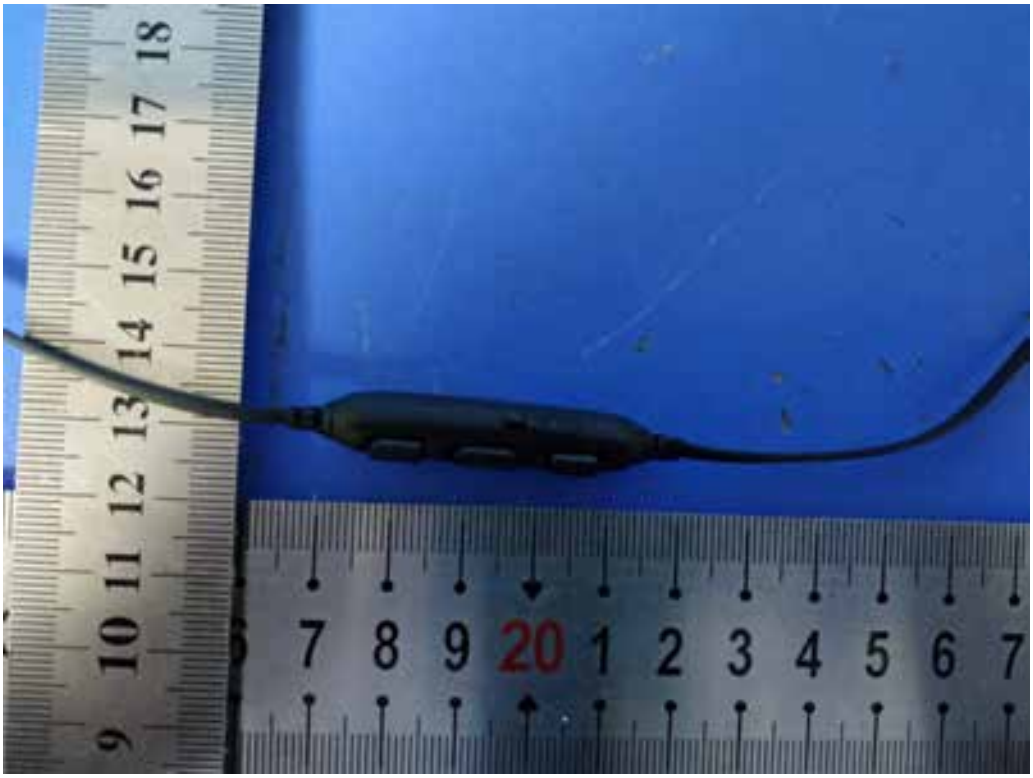


Fig. 2

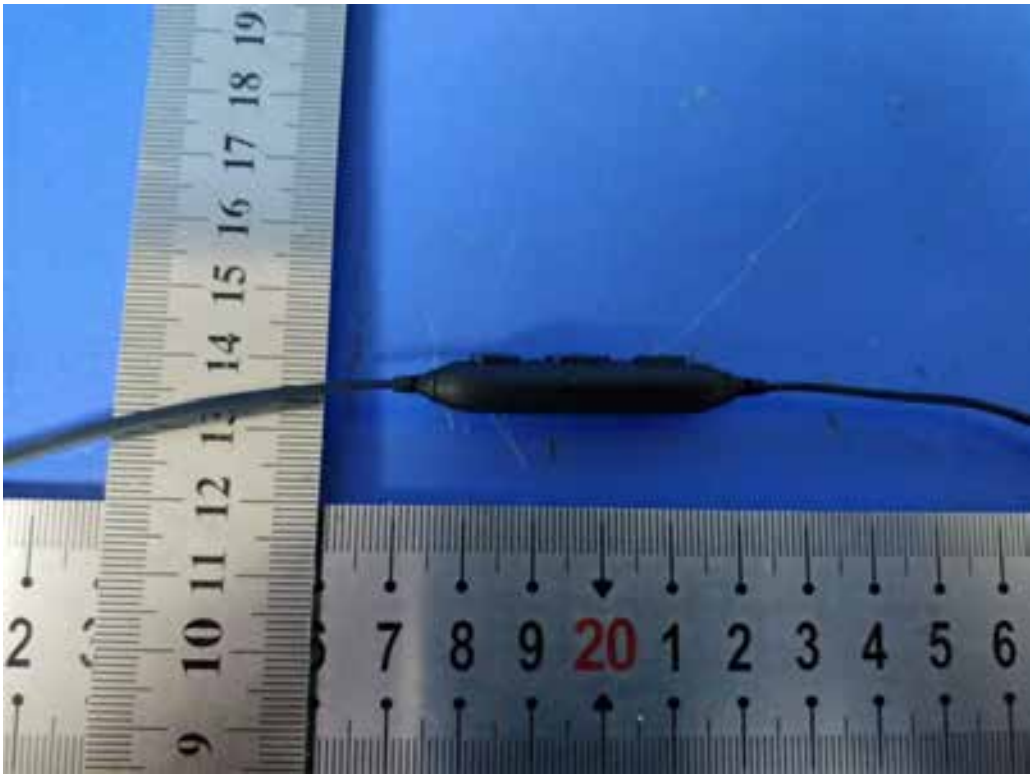


Fig. 3

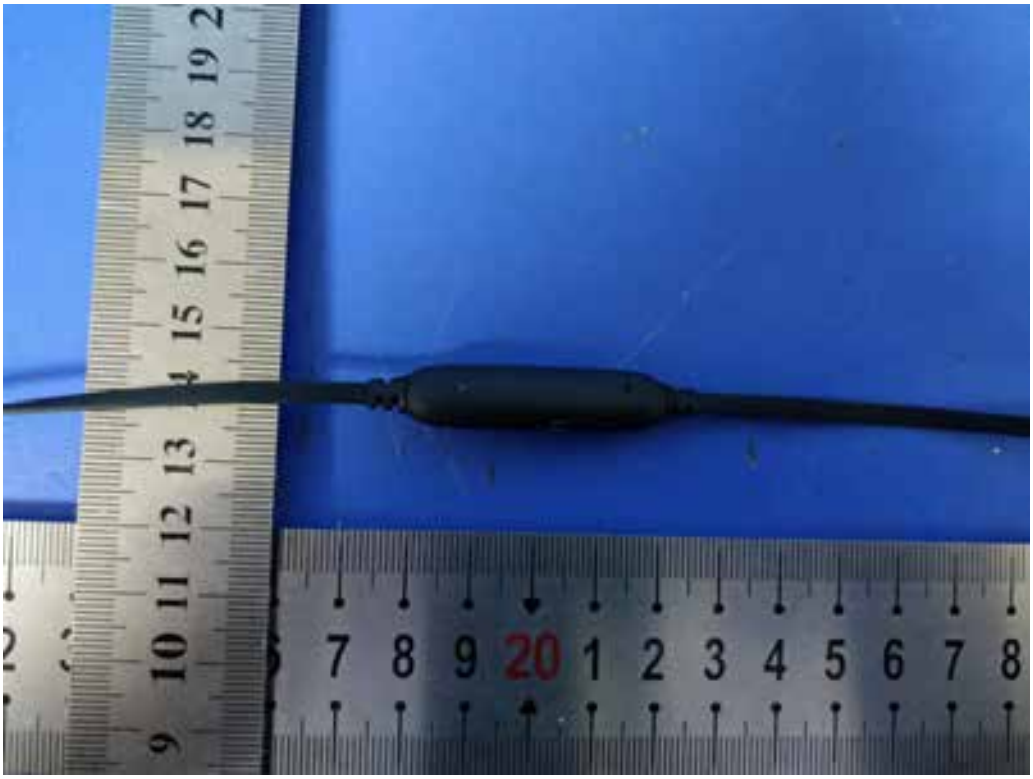
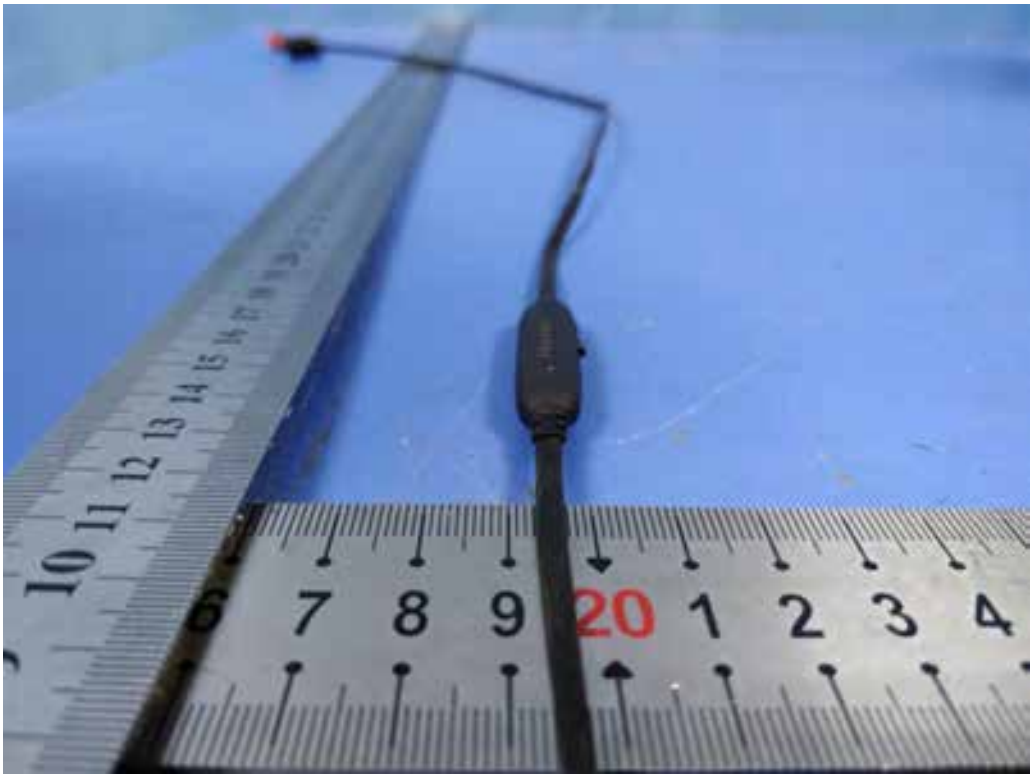


Fig. 4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6 7 8 9 20 1 2 3 4

Fig. 5

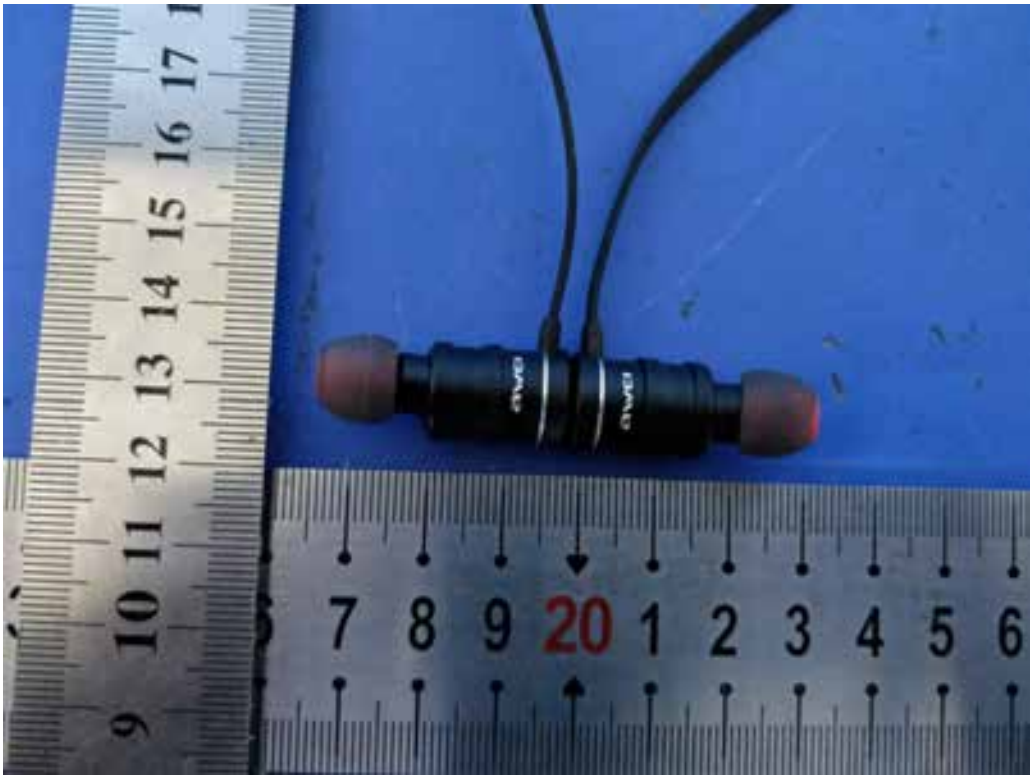
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Fig. 6

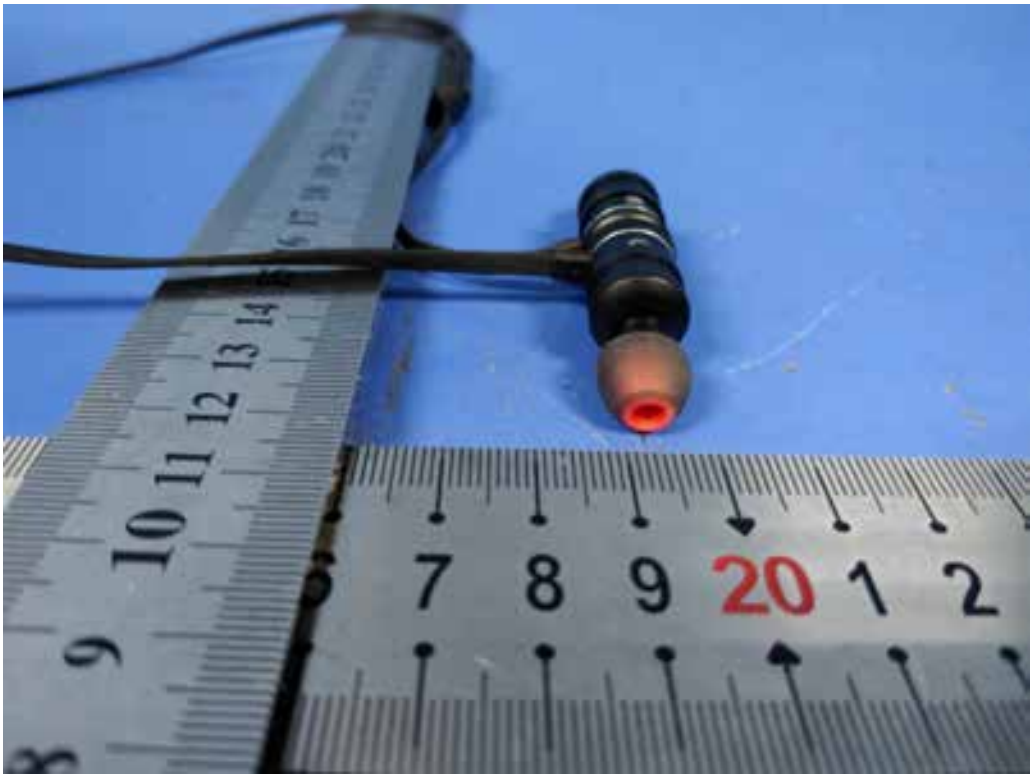


Fig. 7

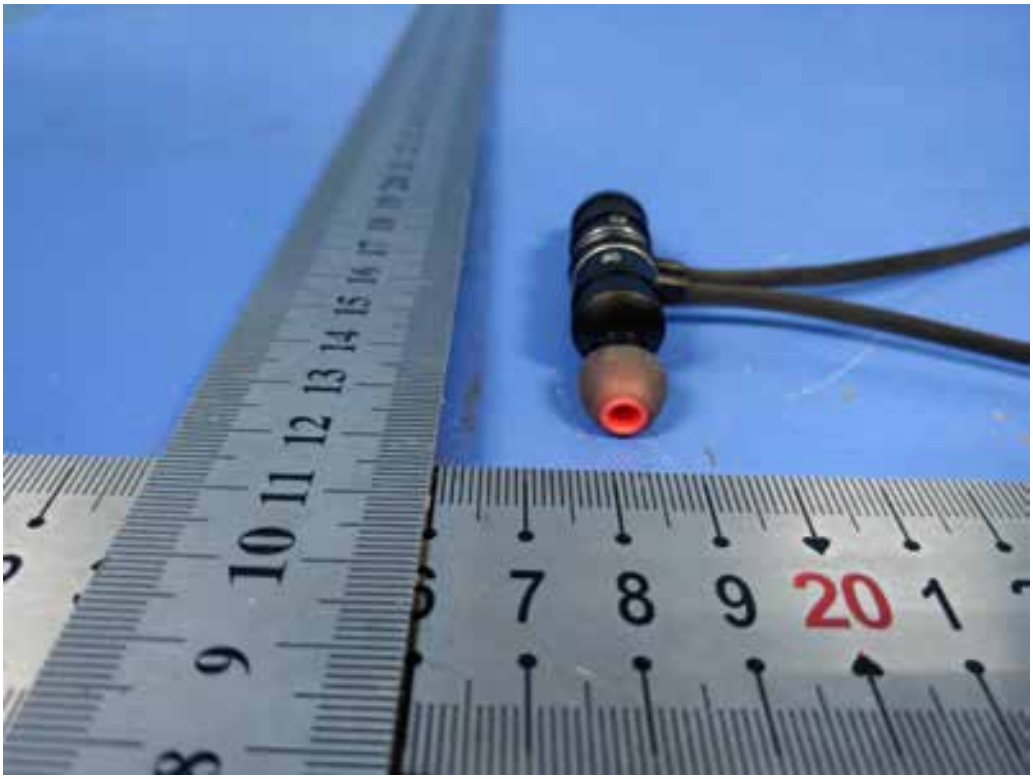


Fig. 8

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# Internal Photos of the EUT

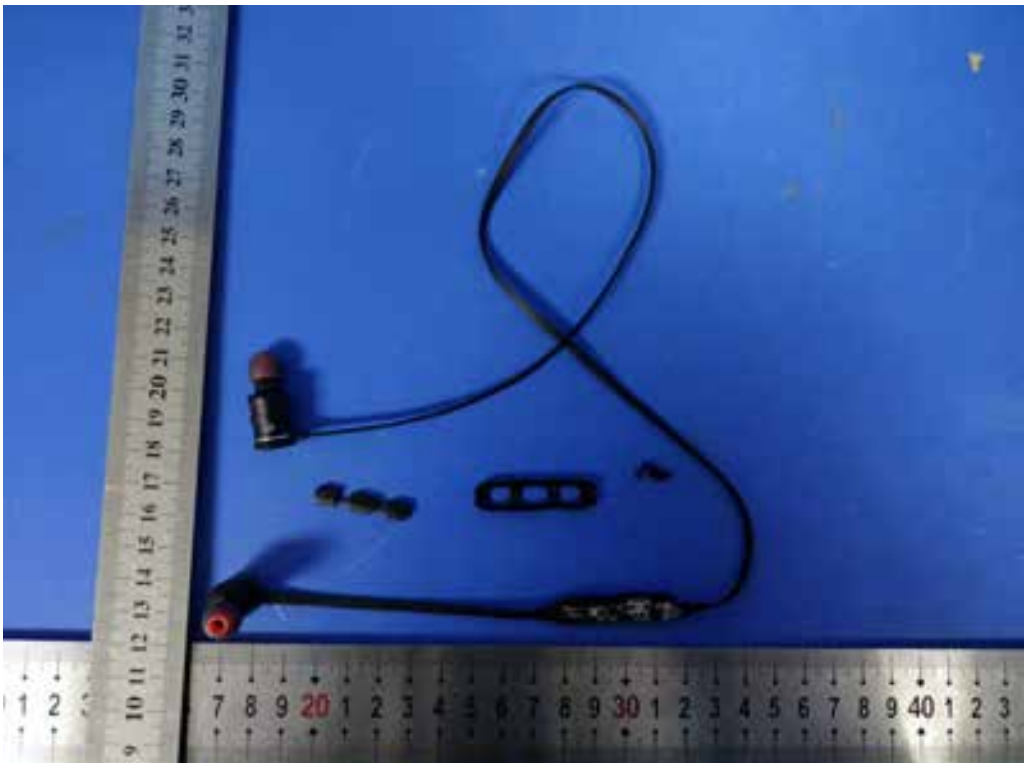


Fig. 1

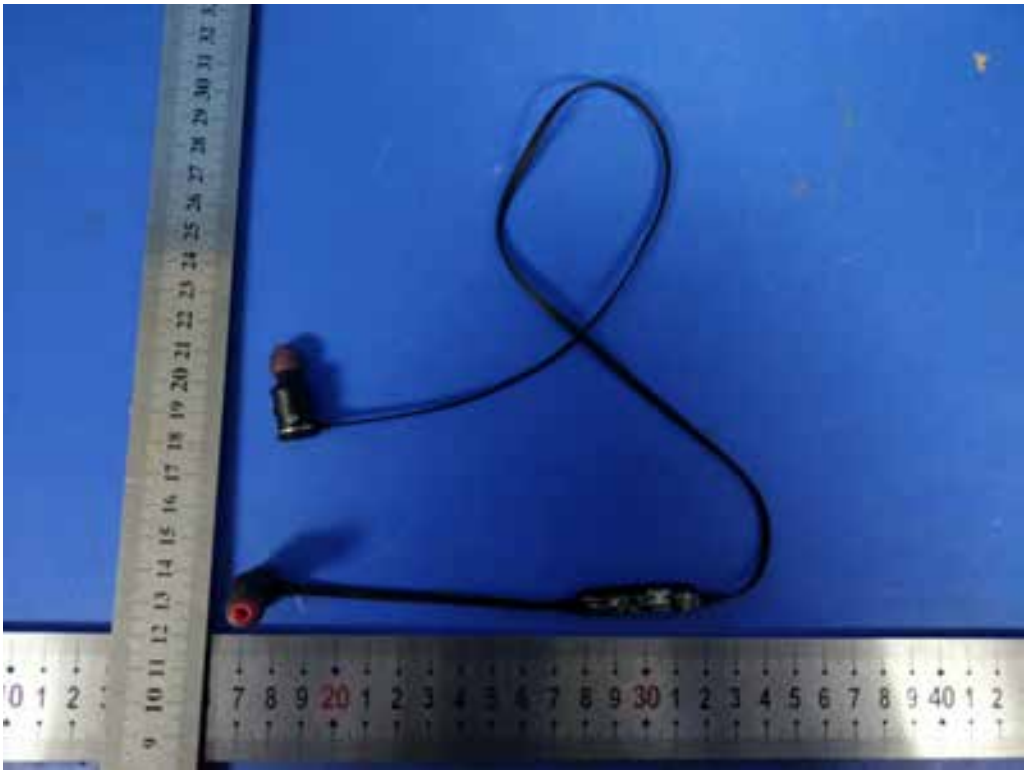


Fig. 2

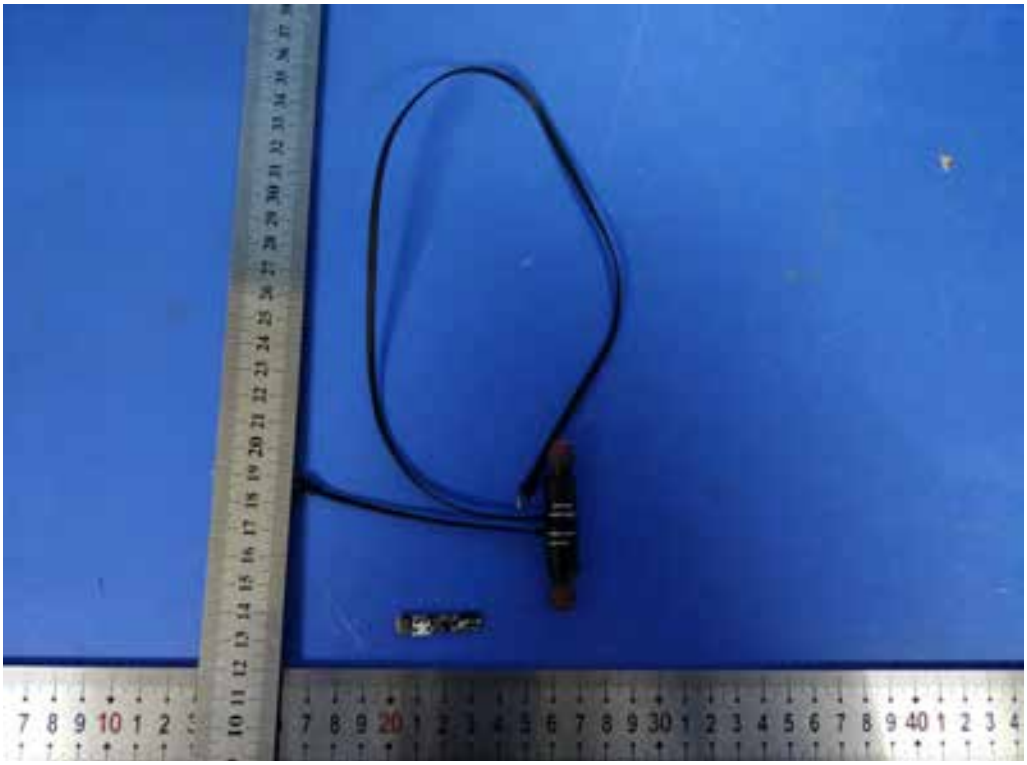


Fig. 3

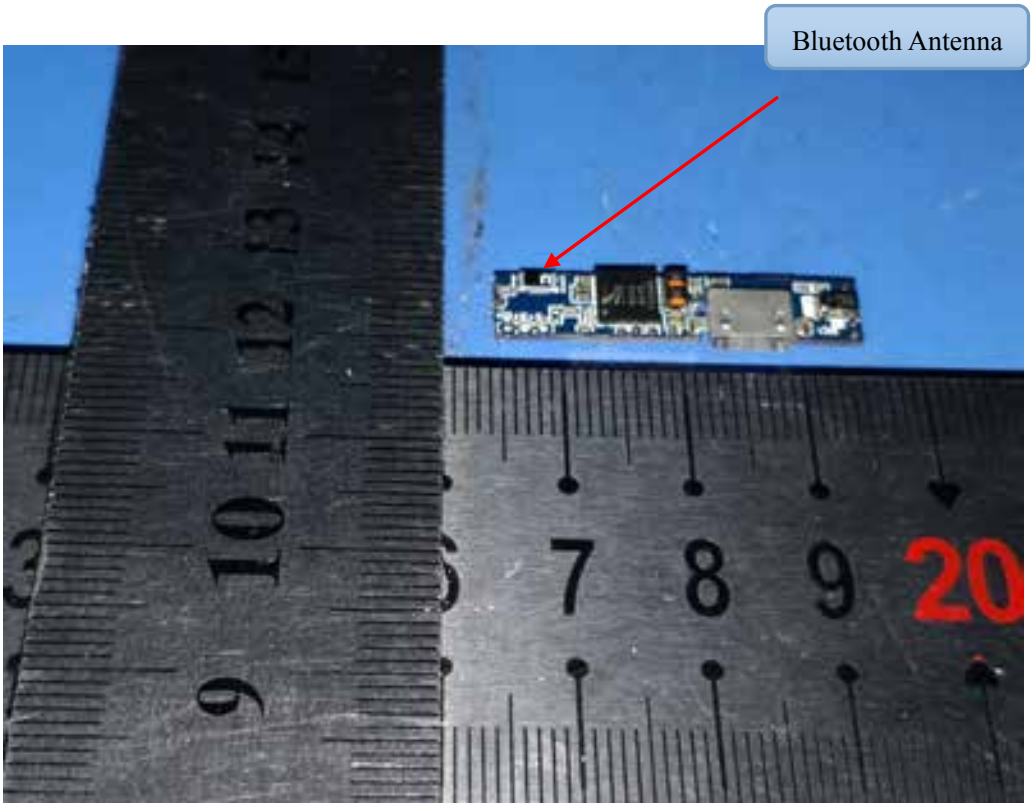



Fig. 4

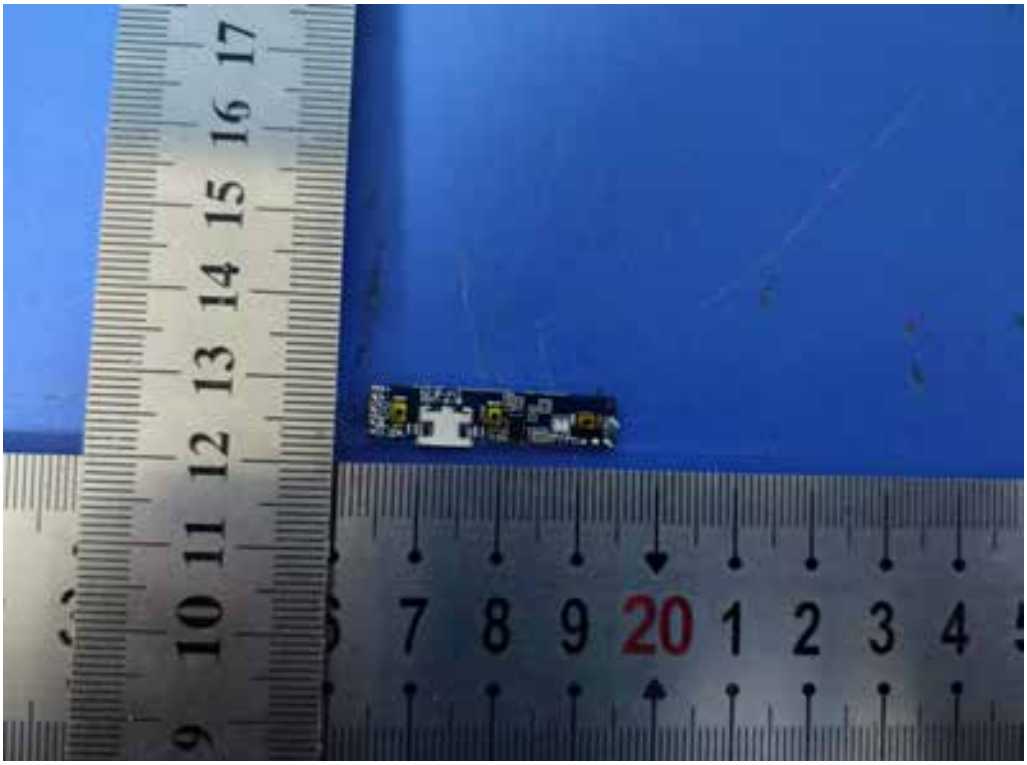


Fig. 5

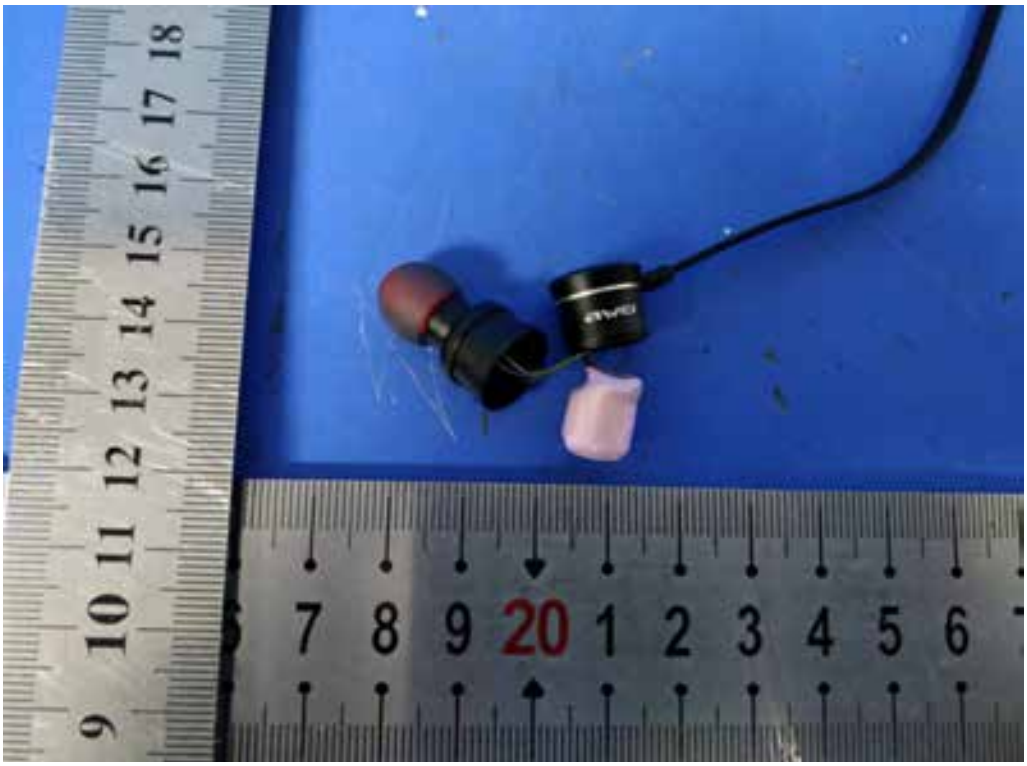
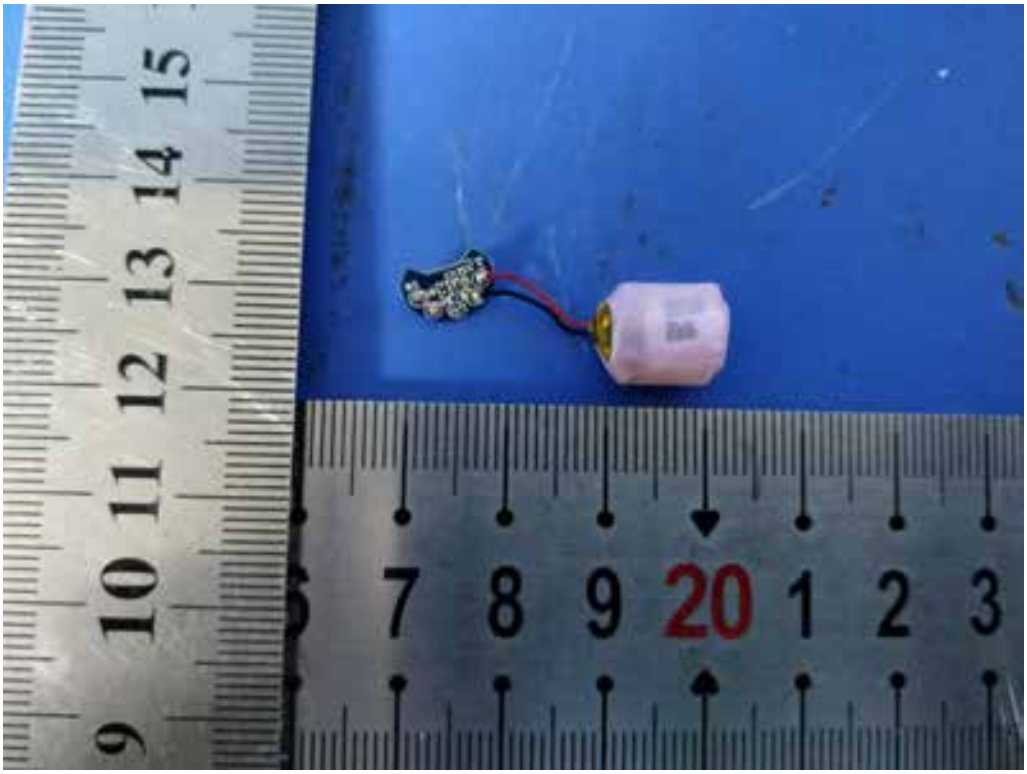


Fig. 6

9 10 11 12 13 14 15 16 17 18 19
7 8 9 20 1 2 3 4 5 6 7

Fig. 7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7 8 9 20 1 2 3

Fig. 8