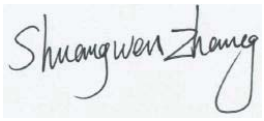
# RF TEST REPORT

| | |
|---|---|
| **Report No.:** | SET2013-06746 |
| **Product Name:** | IP Phone |
| **FCC ID:** | YZZGXP2140 |
| **Model No. :** | GXP2140 |
| **Applicant:** | Grandstream Networks, INC |
| **Address:** | 5F,Bldg #1,No.2 Kefa Rd.,Science & Technology Park, Shenzhen, China |
| **Issued by:** | CCIC-SET |
| **Lab Location:** | Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China |
| | **Tel:** 86 755 26627338 **Fax:** 86 755 26627238 |

This test report consists of 85 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CCIC-SET. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CCIC-SET within 20 days since the date when the report is received. It will not be taken into consideration beyond this limit.

# Test Report

| | |
|---|---|
| **Product Name.....:** | IP Phone |
| **Brand Name.....:** | Grandstream |
| **Trade Name.....:** | Grandstream |
| **Applicant.....:** | Grandstream Networks, INC |
| **Applicant Address.....:** | 5F, Bldg #1, No.2 Kefa Rd., Science & Technology Park, Shenzhen, China |
| **Manufacturer.....:** | Grandstream Networks, INC |
| **Manufacturer Address .....:** | 5F, Bldg #1, No.2 Kefa Rd., Science & Technology Park, Shenzhen, China |
| **Test Standards.....:** | 47 CFR Part 15 Subpart C：Radio Frequency Devices<br>ANSI C63.10:2009：American National Standard for Testing Unlicensed Wireless Devices<br>DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems |
| **Test date.....:** | Nov 20, 2013 - Nov 22, 2013 |
| **Test Result .....:** | PASS |
| **Tested by .....:** |  2013.11.22<br>Lu lei, Test Engineer |
| **Reviewed by .....:** |  2013.11.22<br>Shuangwen Zhang, Senior Egineer |
| **Approved by .....:** |  2013.11.22<br>Wu Li'an, Manager |

# TABLE OF CONTENTS



| Change History | | |
|---|---|---|
| Issue | Date | Reason for change |
| 1.0 | Nov 22, 2013 | First edition |
| | | |
| | | |

# 1. General Information

## 1.1. EUT Description

| | |
|---|---|
| EUT Type ..... : | IP Phone |
| Serial No. ..... : | (n.a, marked #1 by test site) |
| Hardware Version ..... : | N/A |
| Software Version ..... : | N/A |
| Applicant ..... : | Grandstream Networks, INC<br>5F, Bldg #1, No.2 Kefa Rd., Science & Technology Park, Shenzhen, China |
| Manufacturer ..... : | Grandstream Networks, INC<br>5F, Bldg #1, No.2 Kefa Rd., Science & Technology Park, Shenzhen, China |
| Frequency Range ..... : | The frequency range used is 2402MHz - 2480MHz (79 channels, at intervals of 1MHz); |
| Modulation Type ..... : | Bluetooth: FHSS (GFSK(1Mbps), ∏/4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps)) |
| Antenna Type..... : | PIFA |
| Antenna Gain..... : | 2.0dBi |

Note 1: The EUT is a IP Phone, it contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

Note 2: The EUT has two different mainboards , both of which have been tested, only the worse results are reported in this report.

For a more detailed description, please refer to the differences description.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 4: a. When power on, the EUT will scan the whole frequency until a Connection command from the other BT devices.

b. When receiving the signal from the other BT devices, The EUT transmit aresponse signal.

c. The other devices receive the response signal and recognize it, then send a connection command to establish the connection.

d. After the connection establish successfully, the data transmission is beginning. At the same time, the both devices will shift frequencies in synchronization per a same pseudo randomly ordered list of hopping frequencies, the hopping rate is1600 times per second. This device conforms to the criteria in FCC Public Notice DA 00-705.

e. The bandwidth of the receiver, which is set to a fixed width by the software.

Note 5: Bluetooth signal has 9 packages DH1, DH3, DH5, 3DH1, 3DH3, 3DH5, 5DH1, 5DH3, 5DH5, DH5 package is largest, we are testing DH5 in the document.

## 1.2. Support Equipment

| No. | Equipment | Brand Name | Model Name | Manufacturer | Serial No. |
|---|---|---|---|---|---|
| 1 | PC | DELL | PP11L | DELL | H5914A03 |
| 2 | Keyboard | lenovo | KU-0989 | (n.a.) | (n.a.) |
| 3 | Mouse | logitech | (n.a.) | (n.a.) | (n.a.) |

Remark: PC ,Keyboard and Mouse all have FCC DOC approval

## 1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 15 Subpart C 2012 | Radio Frequency Devices |
| 2 | ANSIC63.10-2009 | American National Standard for Testing Unlicensed Wireless Devices |
| 3 | ANSI C63.4-2009 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section in CFR 47 | Description | Result |
|---|---|---|---|
| 1 | 15.203 | Antenna Requirement | PASS |
| 2 | 15.247(a) | Number of Hopping Frequency | PASS |
| 3 | 15.247(b) | Peak Output Power | PASS |
| 4 | 15.247(a) | 20dB Bandwidth | PASS |
| 5 | 15.247(a) | Carrier Frequency Separation | PASS |
| 6 | 15.247(a) | Time of Occupancy (Dwell time) | PASS |
| 7 | 15.247(d) | Conducted Spurious Emission | PASS |
| 8 | 15.247(d) | Band Edge | PASS |
| 9 | 15.207 | Conducted Emission | PASS |
| 10 | 15.209<br>15.247(c) | Radiated Emission | PASS |

Note 1: The tests were performed according to the method of measurements prescribed in DA-00-705.

Note 2: The test of Radiated Emission and Conducted Spurious Emission were performed according to the method of measurements prescribed in ANSI C63.10 2009.

## 1.4. Facilities and Accreditations

### 1.4.1. Facilities

**CNAS-Lab Code: L1659**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

**FCC-Registration No.: 406086**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, Renewal date Nov. 19, 2011, valid time is until Nov. 18, 2014.

### 1.4.2. Test Environment Conditions

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

| | |
|---|---|
| Temperature (°C): | 15 - 35 |
| Relative Humidity (%): | 30 -60 |
| Atmospheric Pressure (kPa): | 86KPa-106KPa |

# 2. 47 CFR Part 15C Requirements

## 2.1. Antenna requirement

### 2.1.1. Applicable Standard

According to FCC 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.

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

### 2.1.2. Antenna Information

**Antenna Category:** External antenna
An External antenna was soldered to EUT via an adaptor cable, can't be removed away.

**Antenna General Information:**

| No. | EUT Model | Ant. Type | Ant. Model | Manufacturer | Gain(dBi) |
|---|---|---|---|---|---|
| 1 | GXP2140 | PIFA | V1195 | SHEN ZHEN VLG WIRELESS TECHNOLOGY CO.,LTD | 2.0 |

### 2.1.3. Result: comply

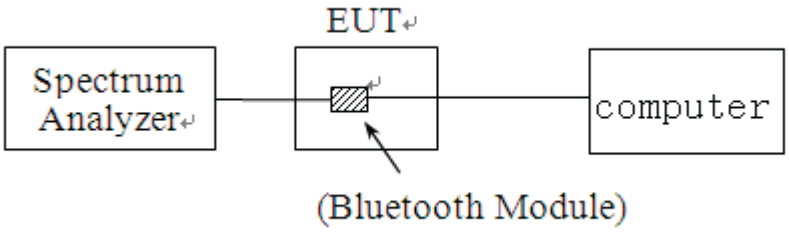
## 2.2. Number of Hopping Frequency

### 2.2.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

### 2.2.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

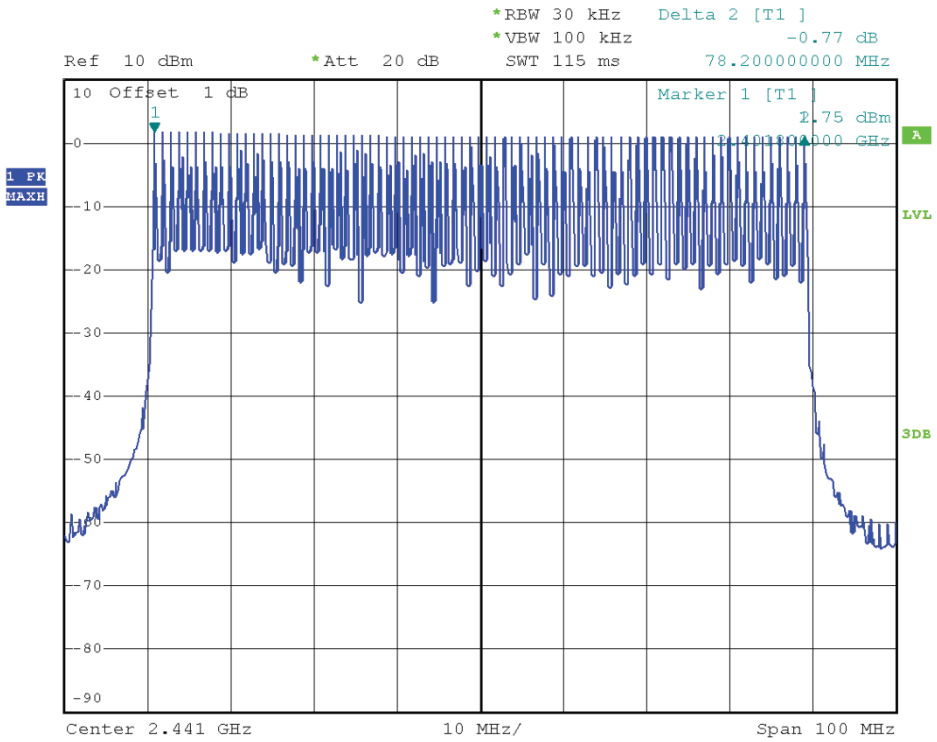
### 2.2.3. Test Result

The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

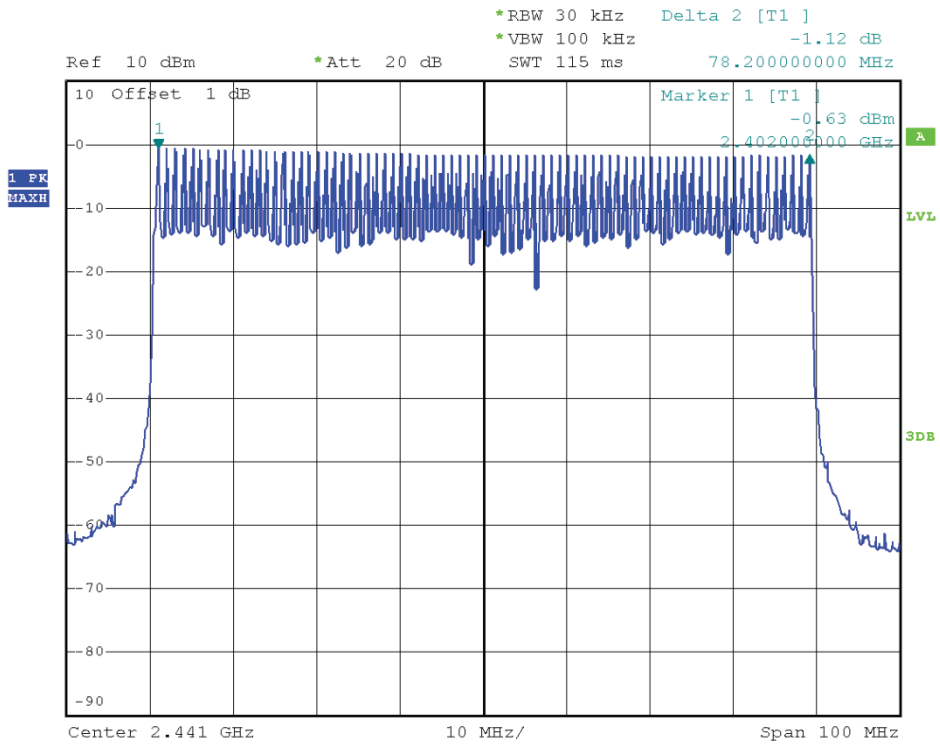
**A. Test Verdict:**

| Test Mode | Frequency Block (MHz) | Measured Channel Numbers | Min. Limit | Refer to Plot | Verdict |
|---|---|---|---|---|---|
| GFSK | 2400 - 2483.5 | 79 | 15 | Plot A | PASS |
| π/4-DQPSK | 2400 - 2483.5 | 79 | 15 | Plot B | PASS |
| 8-DPSK | 2400 - 2483.5 | 79 | 15 | Plot C | PASS |

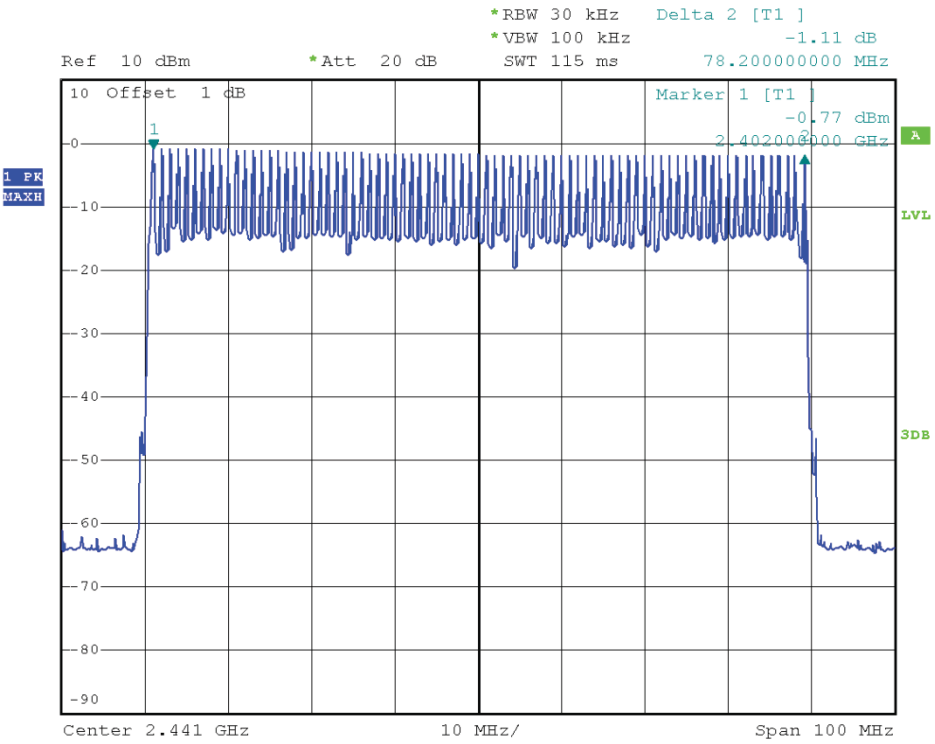
**B. Test Plots:**




(Plot A: GFSK)




(Plot B: ∏/4-DQPSK)


*RBW 30 kHz
*VBW 100 kHz
Ref 10 dBm
*Att 20 dB
SWT 115 ms
Delta 2 [T1 ]
-1.11 dB
78.200000000 MHz
10 Offset 1 dB
Marker 1 [T1 ]
-0.77 dBm
2.402000000 GHz
1 PK
MAXH
A
LVL
3DB
Center 2.441 GHz
10 MHz/
Span 100 MHz

(Plot C: 8- DPSK)

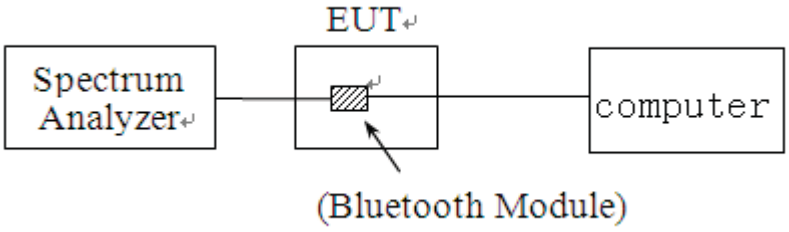
## 2.3. Peak Output Power

### 2.3.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

### 2.3.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

### 2.3.3. Test Result

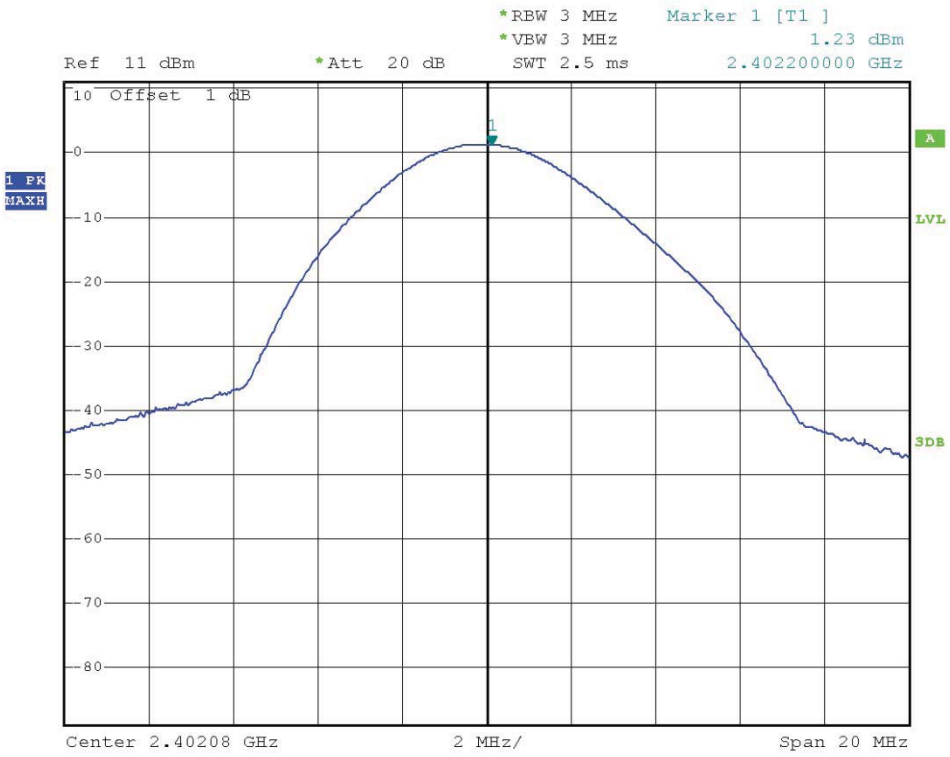
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. The lowest, middle and highest channel were tested by Power meter.

### 2.3.3.1. GFSK Mode

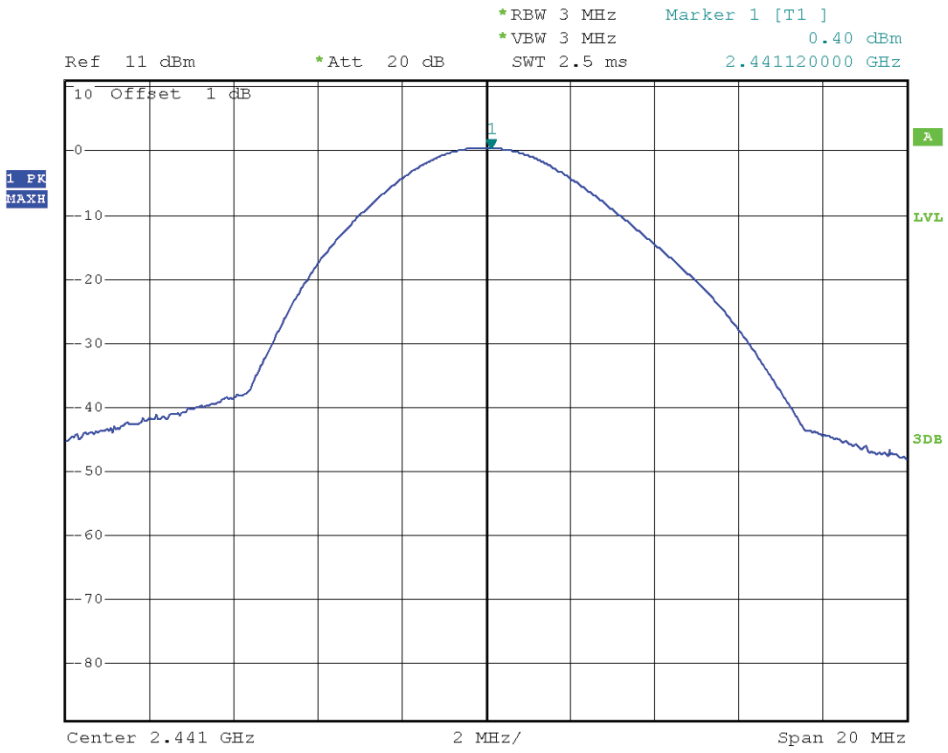
**A. Test Verdict:**

| Channel | Frequency (MHz) | Measured Output Peak Power | Limit | Verdict | Refer to Plot |
|---|---|---|---|---|---|
| | | dBm | dBm | | |
| 0 | 2402 | 1.23 | 30 | PASS | Plot A |
| 39 | 2441 | 0.40 | | PASS | Plot B |
| 78 | 2480 | 0.41 | | PASS | Plot C |

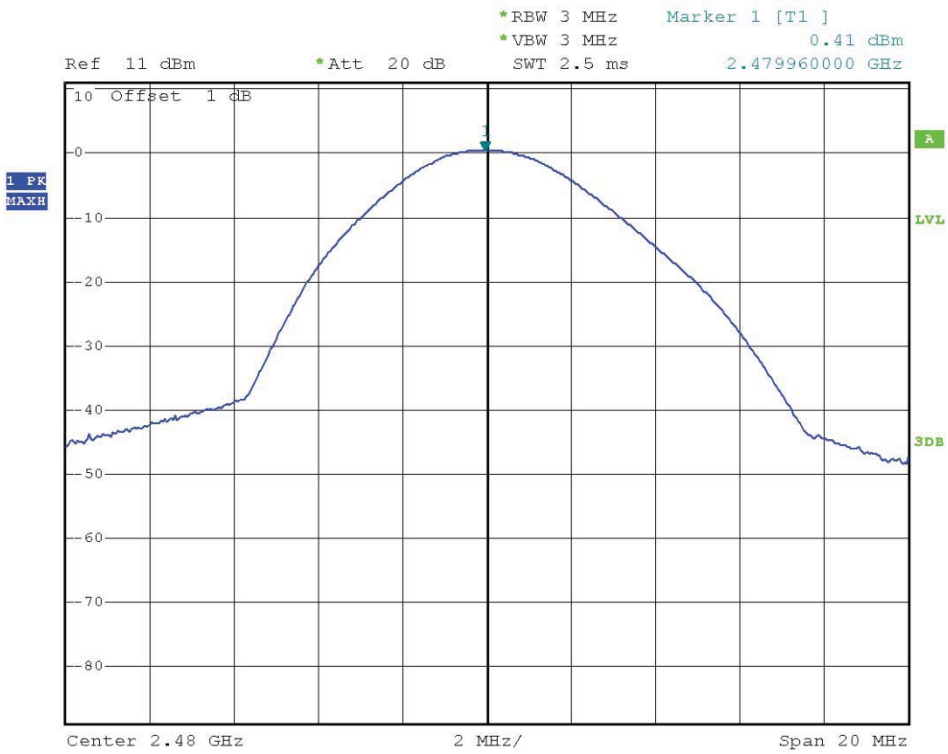
**B. Test Plots:**




(Plot A: Channel = 2402 @ GFSK)




(Plot B: Channel = 2441 @ GFSK)



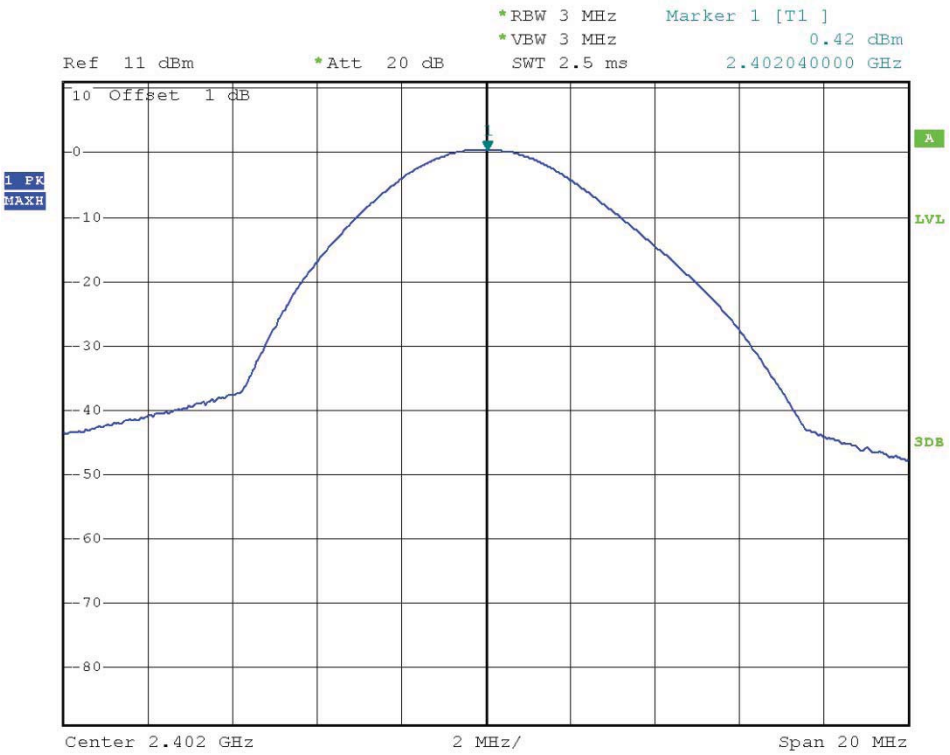

(Plot C: Channel = 2480 @ GFSK)

### 2.3.3.2. ∏/4-DQPSK Mode

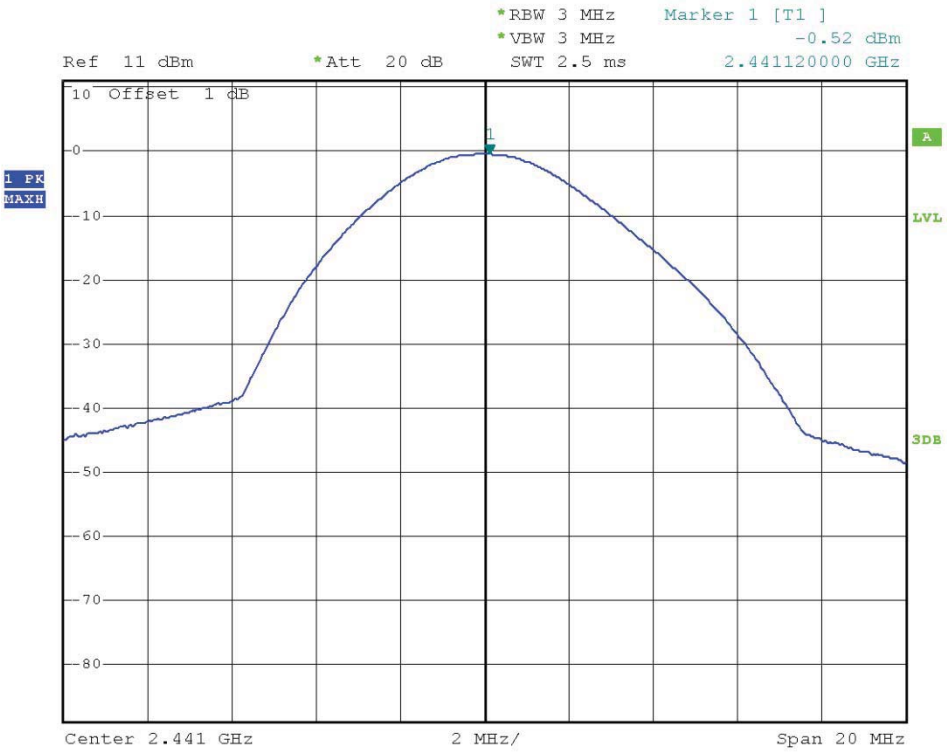
**A. Test Verdict:**

| Channel | Frequency (MHz) | Measured Output Peak Power | Limit | Verdict | Refer to Plot |
|---|---|---|---|---|---|
| | | dBm | dBm | | |
| 0 | 2402 | 0.42 | 30 | PASS | Plot A |
| 39 | 2441 | -0.52 | | PASS | Plot B |
| 78 | 2480 | -0.59 | | PASS | Plot C |

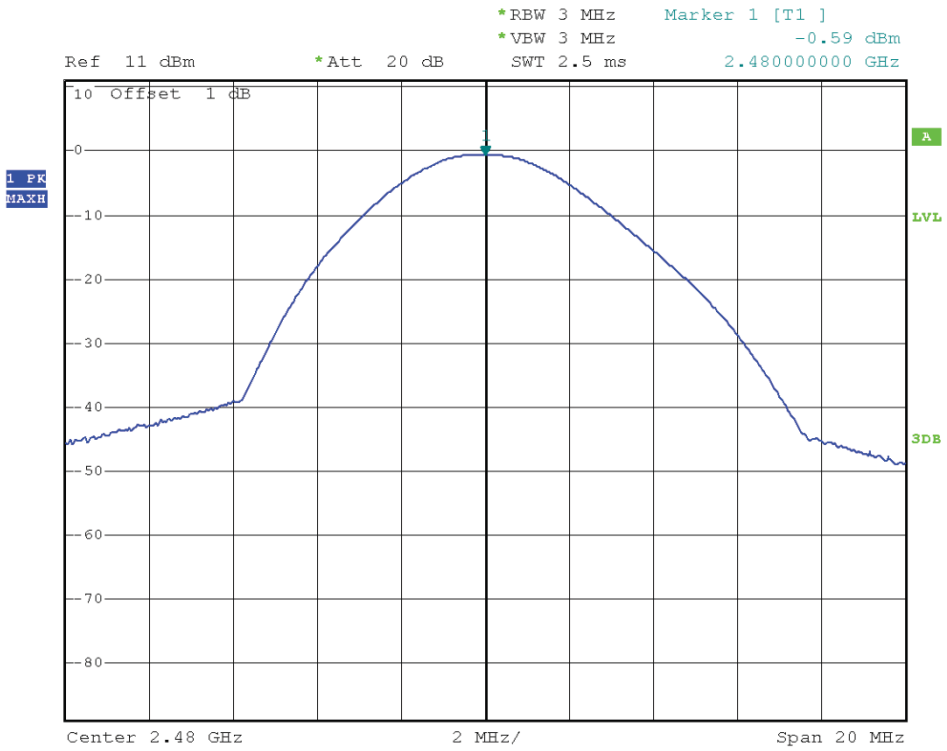
**B. Test Plots:**




(Plot A: Channel = 2402 @∏/4-DQPSK)




(Plot B: Channel = 2441 @ ∏/4-DQPSK)



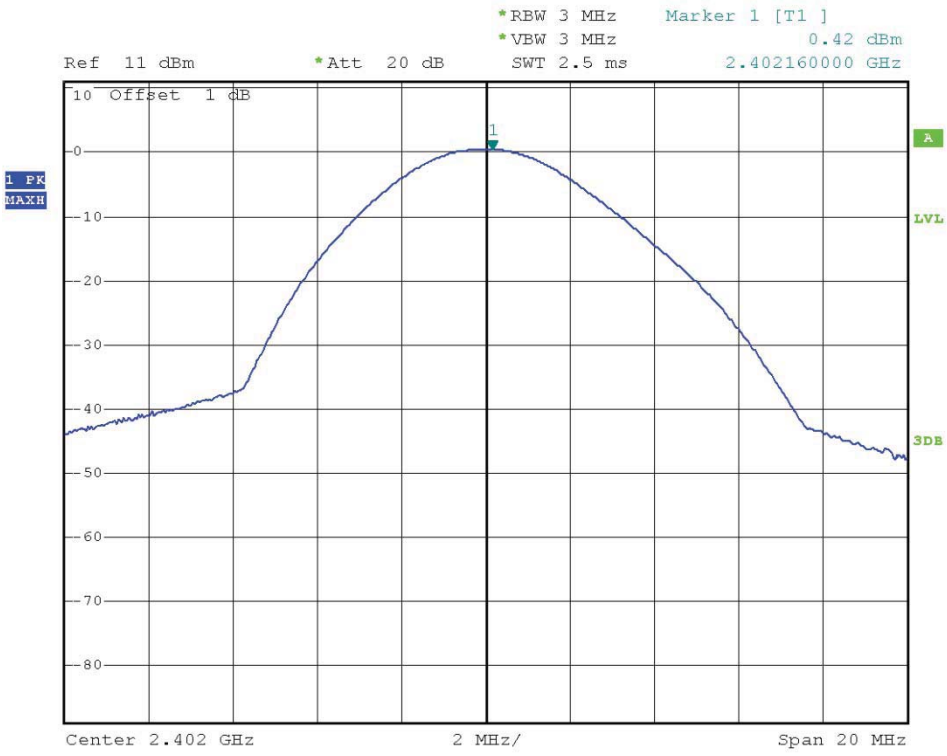

(Plot C: Channel = 2480 @ ∏/4-DQPSK)

### 2.3.3.3. 8-DPSK Mode

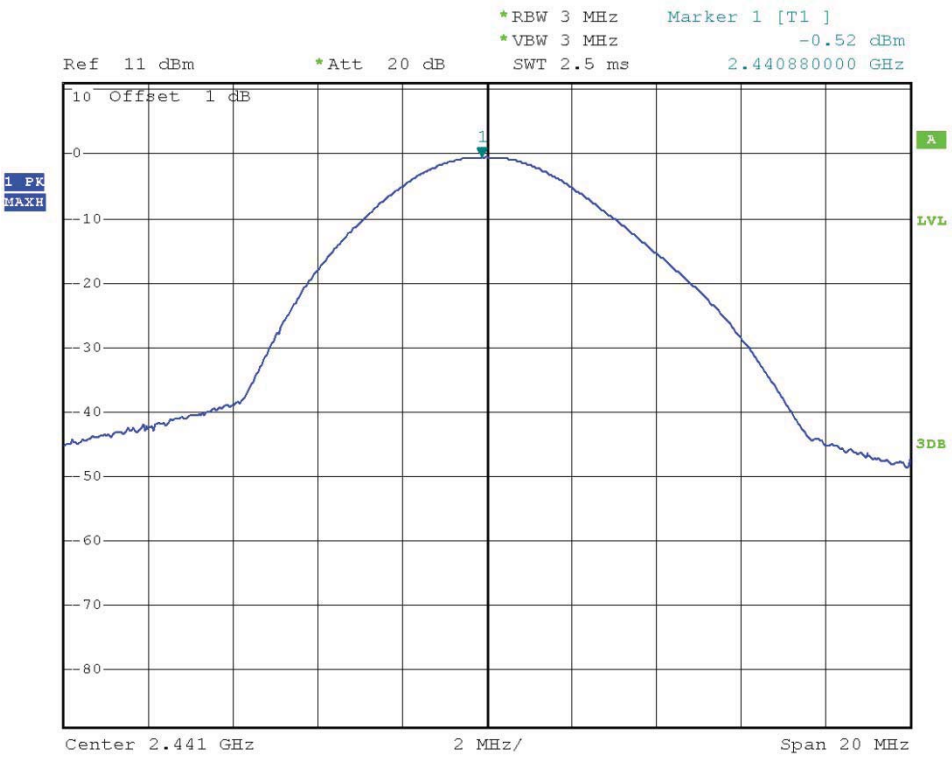
**A. Test Verdict:**

| Channel | Frequency (MHz) | Measured Output Peak Power | Limit | Verdict | Refer to Plot |
|---|---|---|---|---|---|
| | | dBm | dBm | | |
| 0 | 2402 | 0.42 | 30 | PASS | Plot A |
| 39 | 2441 | -0.52 | | PASS | Plot B |
| 78 | 2480 | -0.57 | | PASS | Plot C |

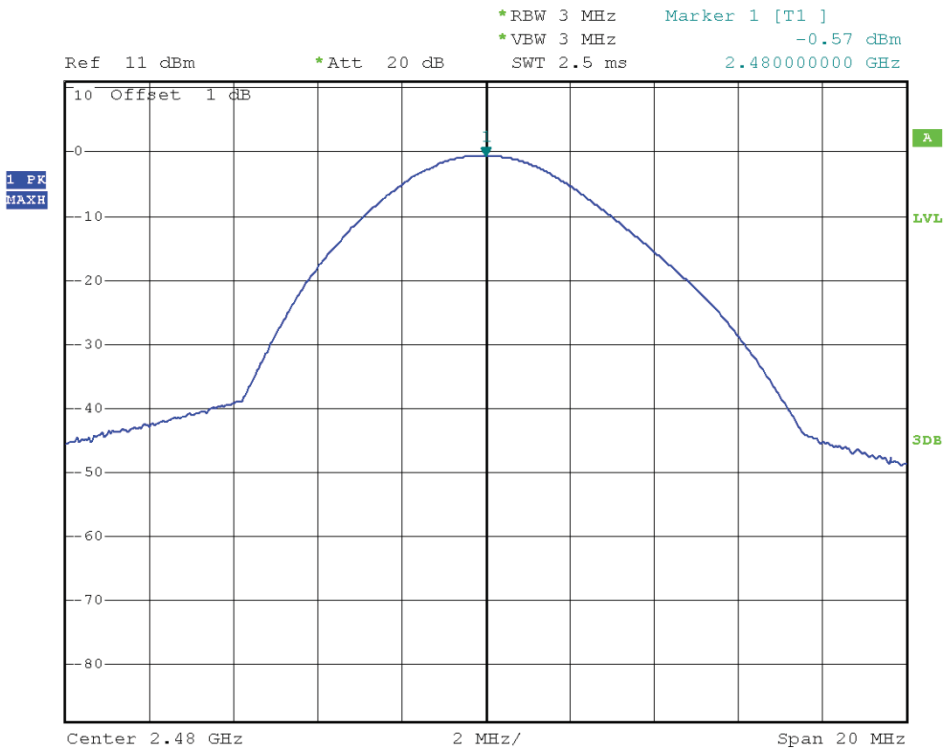
**B. Test Plots:**




(Plot A: Channel = 2402 @8-DPSK)




(Plot B: Channel = 2441 @ 8-DPSK)




(Plot C: Channel = 2480 @ 8-DPSK)

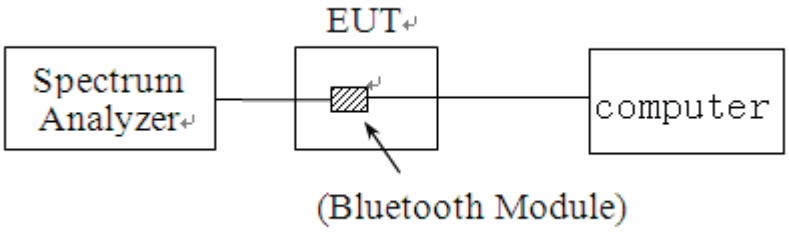
## 2.4. 20dB Bandwidth

### 2.4.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1% = 20dB) taking the total RF output power.

### 2.4.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

### 2.4.1. Test Procedure

Use the following spectrum analyzer settings:

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

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 2.4.2. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

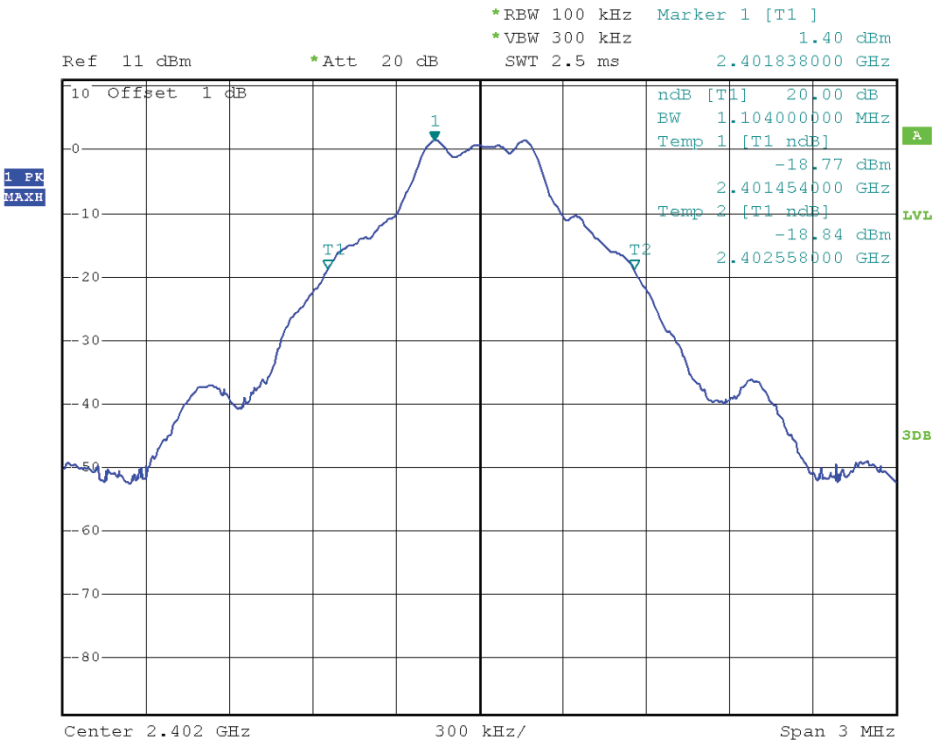
### 2.4.2.1. GFSK Mode

**A. Test Verdict:**

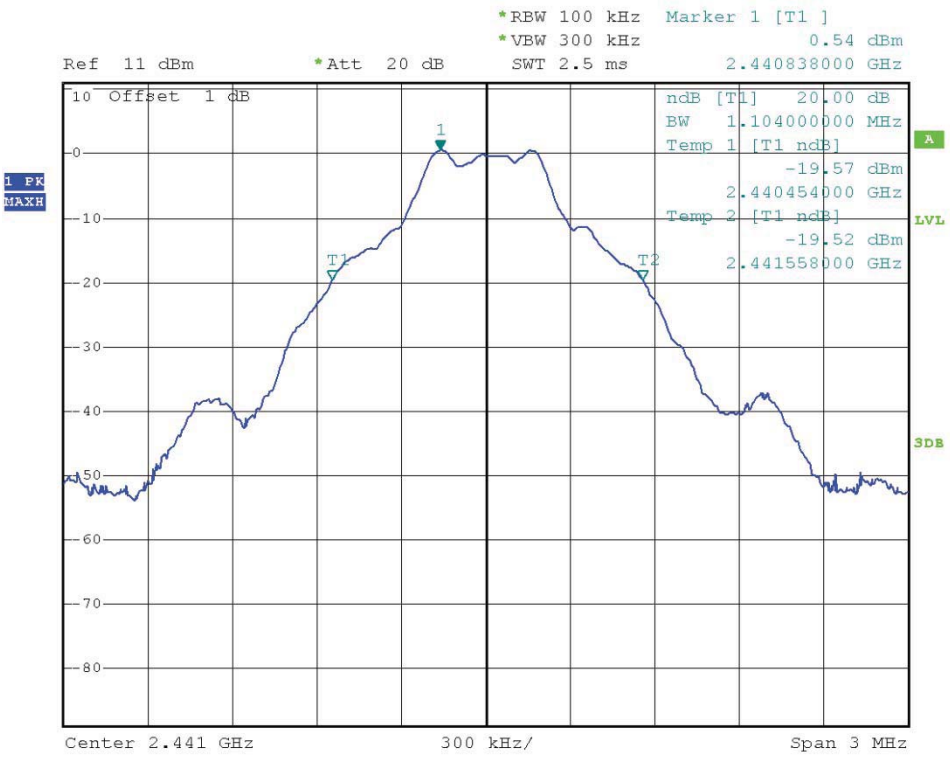
The maximum 20dB bandwidth measured is 1.104MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---|---|---|---|
| 0 | 2402 | 1.104 | Plot A |
| 39 | 2441 | 1.104 | Plot B |
| 78 | 2480 | 1.104 | Plot C |

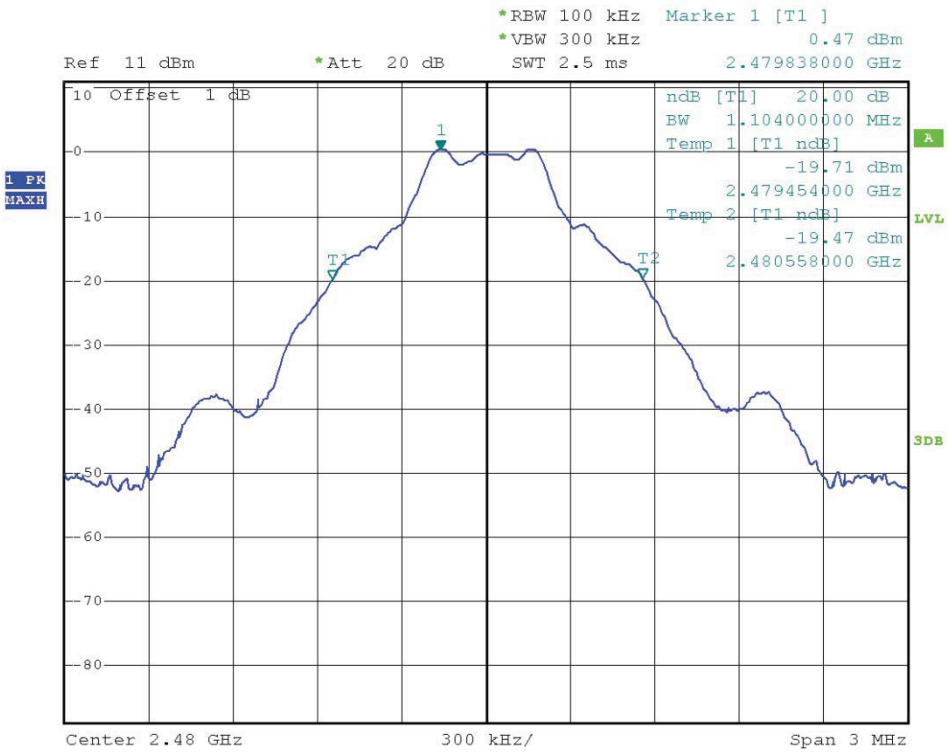
**C. Test Plots:**




(Plot A: Channel = 2402 @ GFSK)




(Plot B: Channel = 2441 @ GFSK)




(Plot C: Channel = 2480 @ GFSK)

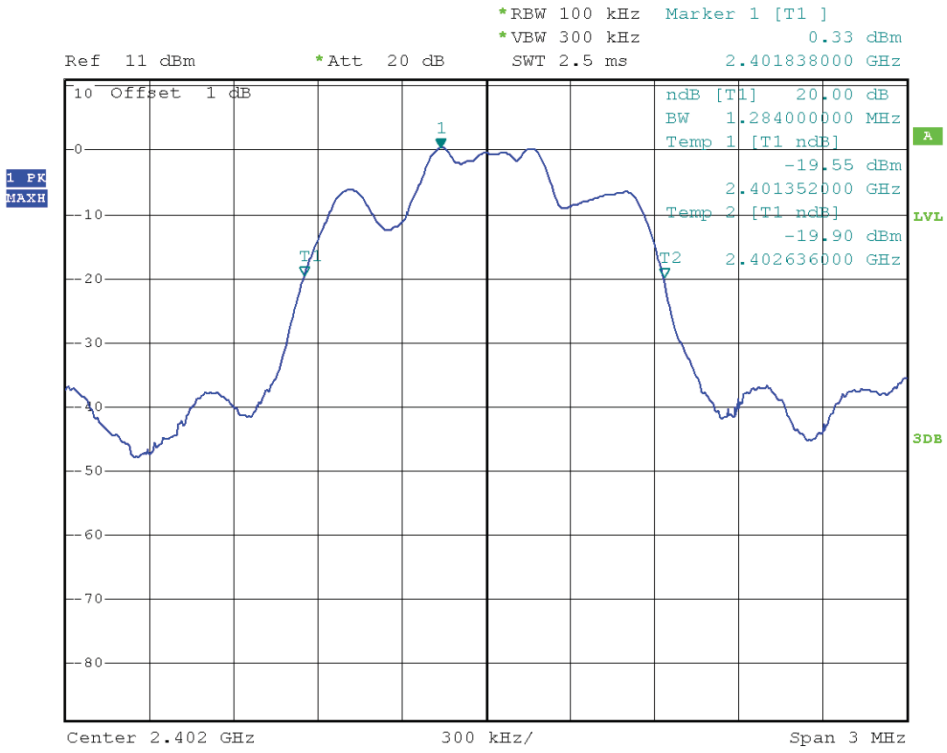
### 2.4.2.2. π/4-DQPSK Mode

**A. Test Verdict:**

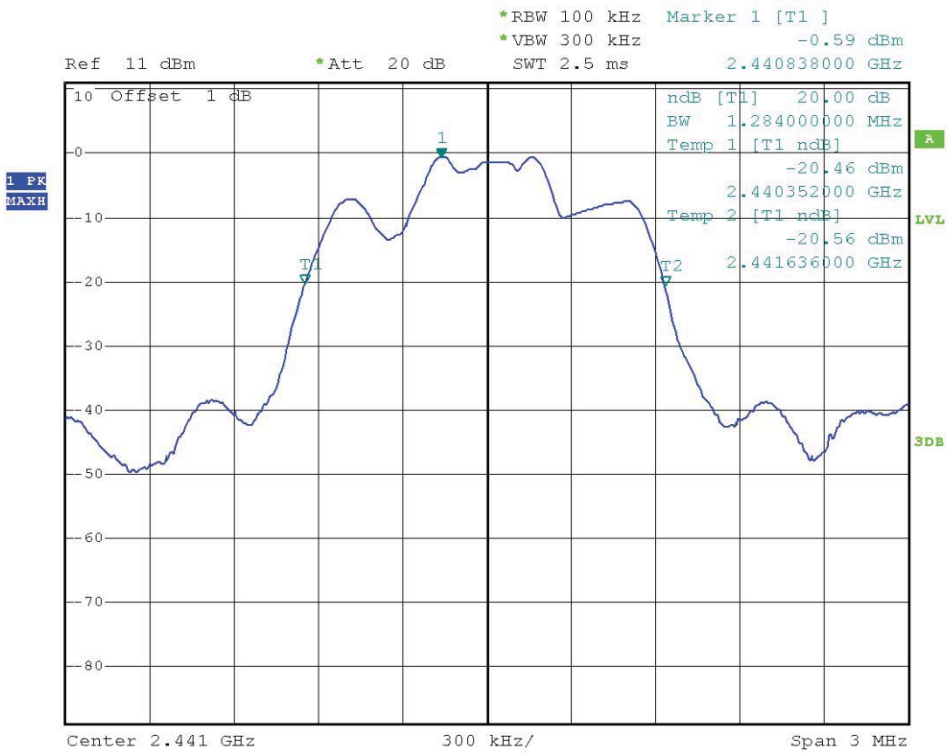
The maximum 20dB bandwidth measured is 1.284MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---|---|---|---|
| 0 | 2402 | 1.284 | Plot A |
| 39 | 2441 | 1.284 | Plot B |
| 78 | 2480 | 1.284 | Plot C |

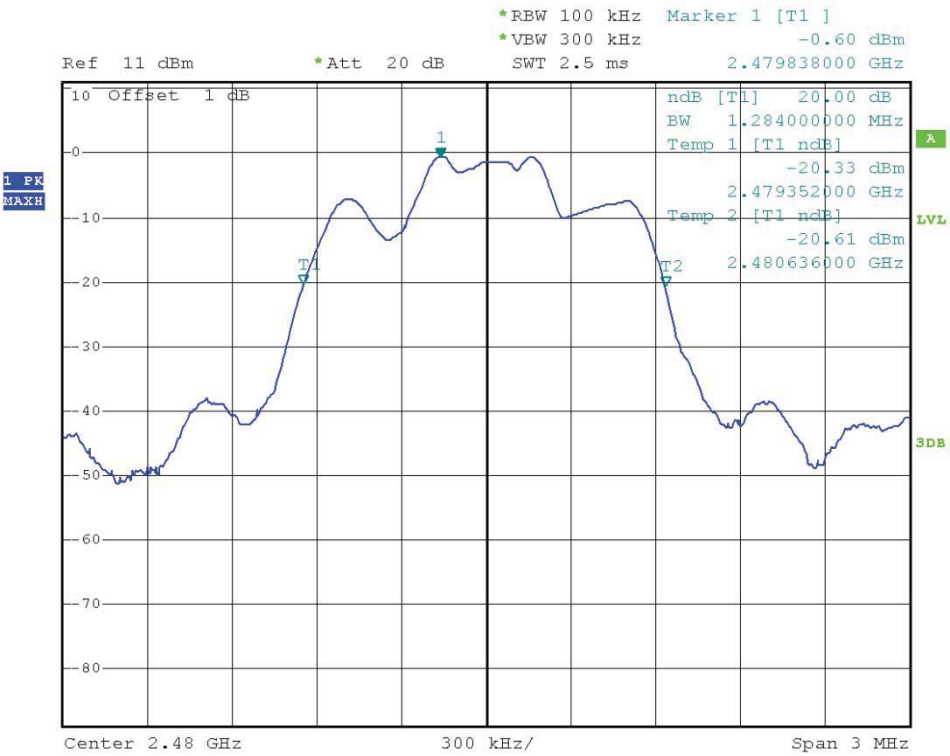
**Test Plots:**




(Plot A: Channel = 2402 @ π/4-DQPSK)




(Plot B: Channel = 2441 @ ∏/4-DQPSK)




(Plot C: Channel = 2480 @ ∏/4-DQPSK)

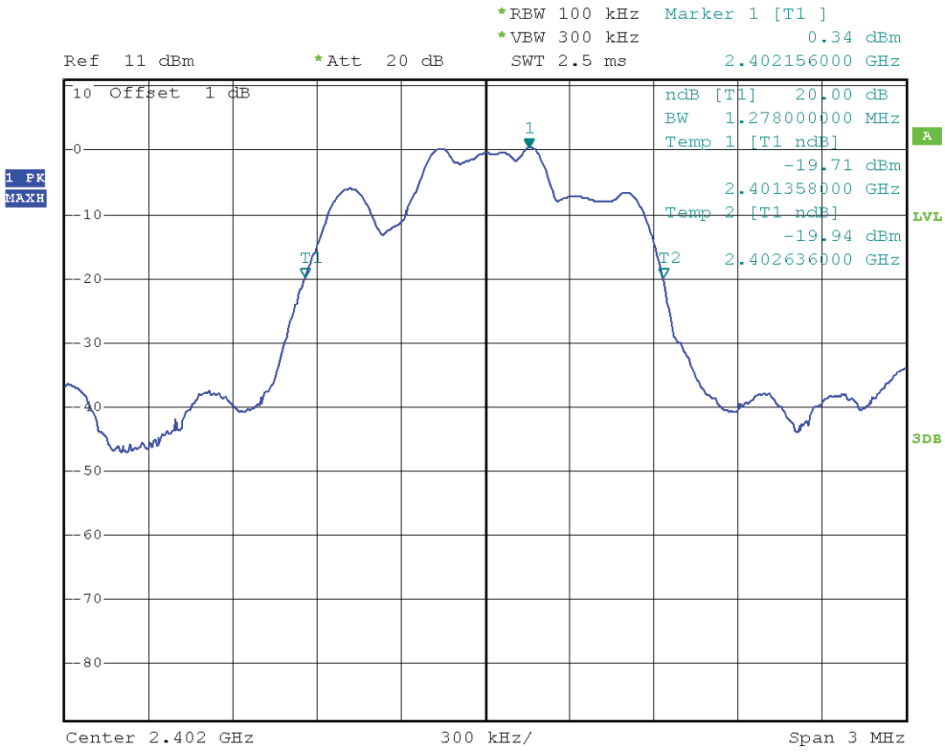
### 2.4.2.3. 8-DPSK Mode

**A. Test Verdict:**

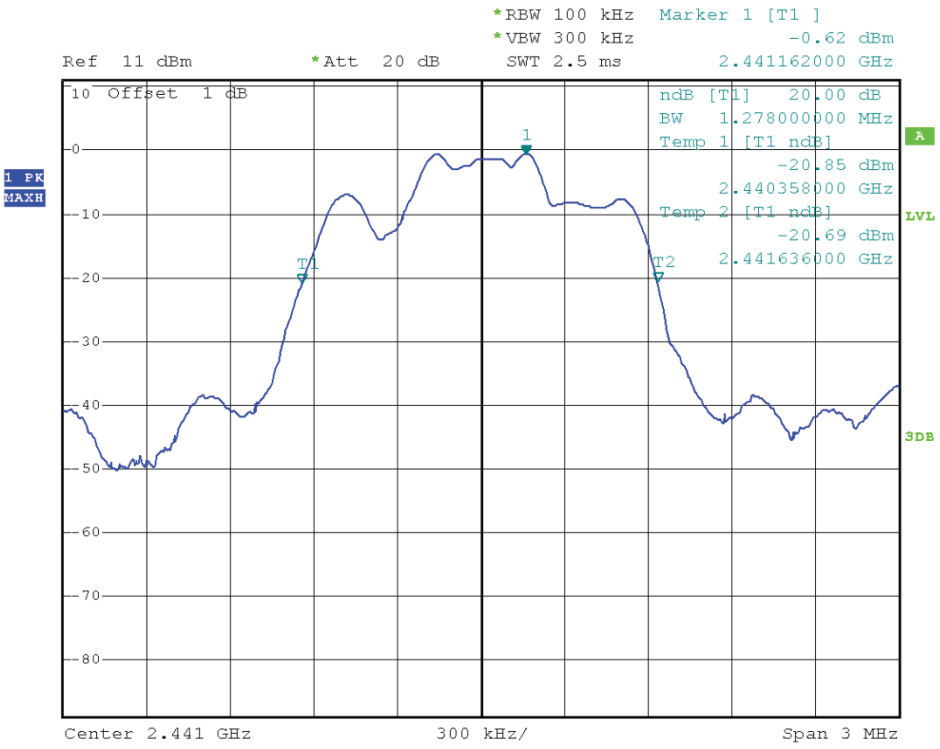
The maximum 20dB bandwidth measured is 1.278MHz according to the table below.

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---|---|---|---|
| 0 | 2402 | 1.278 | Plot A |
| 39 | 2441 | 1.278 | Plot B |
| 78 | 2480 | 1.278 | Plot C |

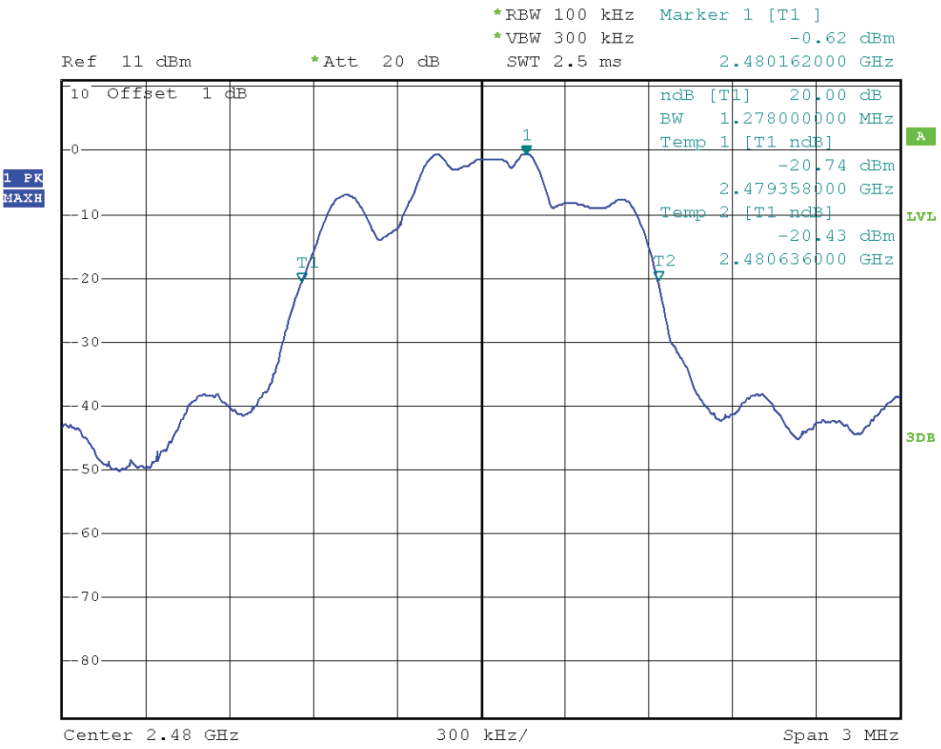
**B. Test Plots:**




(Plot A: Channel = 2402 @ 8-DPSK)




(Plot B: Channel = 2441 @ 8-DPSK)




(Plot C: Channel = 2480 @ 8-DPSK)

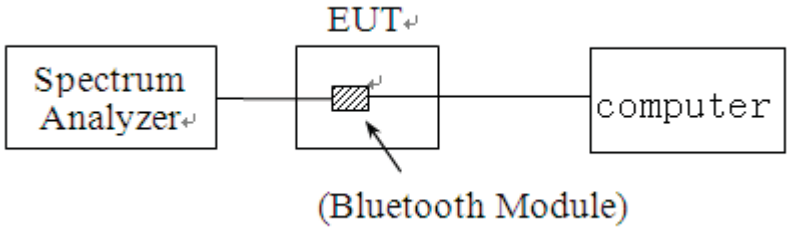
## 2.5. Carried Frequency Separation

### 2.5.1. Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

### 2.5.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

### 2.5.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = auto

Detector function = peak

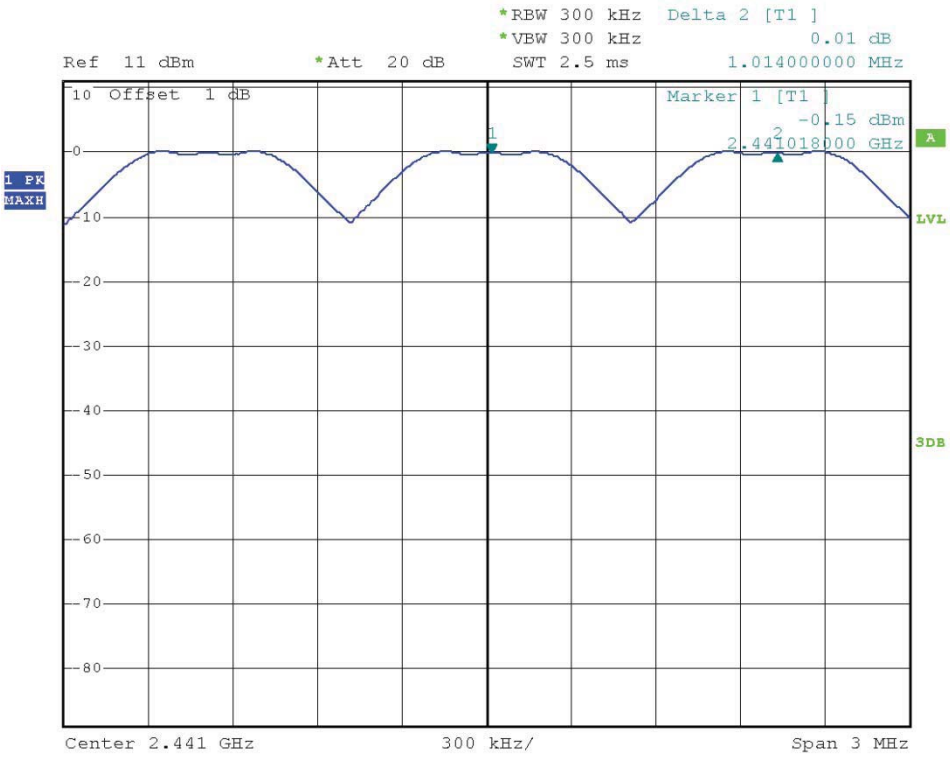
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

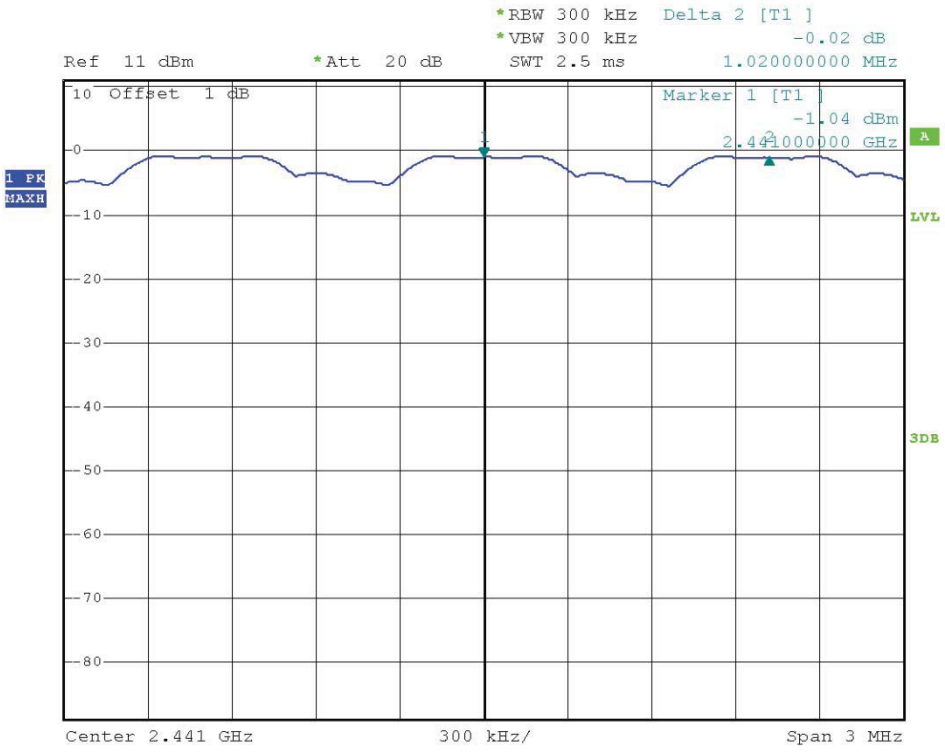
### 2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

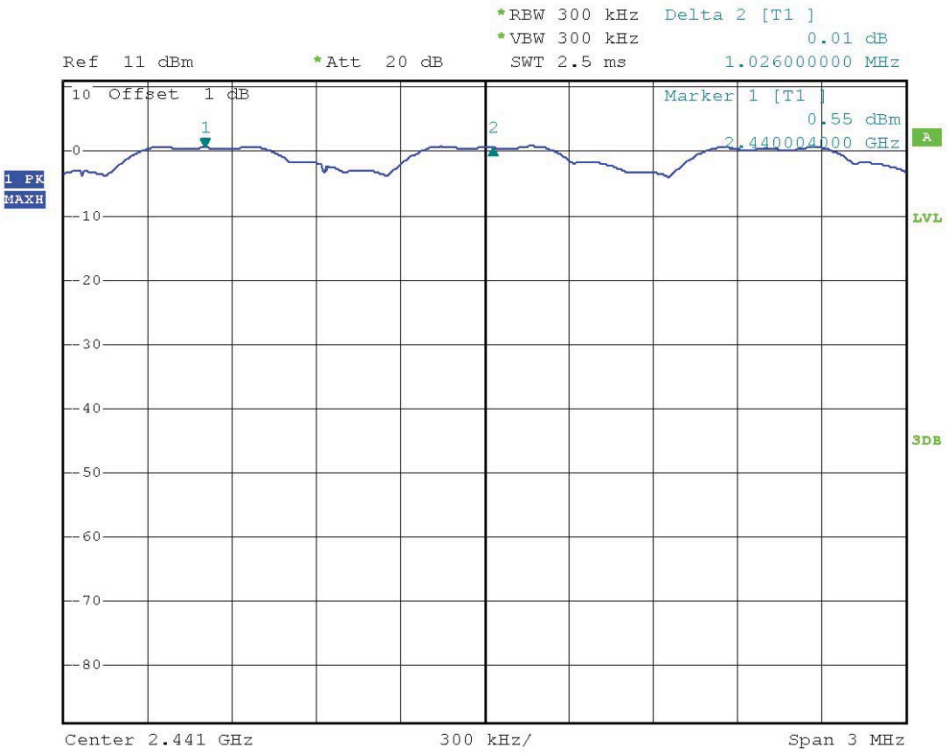
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.104MHz for GFSK mode, 1.284MHz for ∏/4-DQPSK mode and 1.278MHz for 8-DPSK mode, refer to section 2.4.1), whichever is greater. So, the verdict is PASSING




(Plot A: GFSK)




(Plot B: ∏/4-DQPSK)




(Plot C: 8-DPSK)

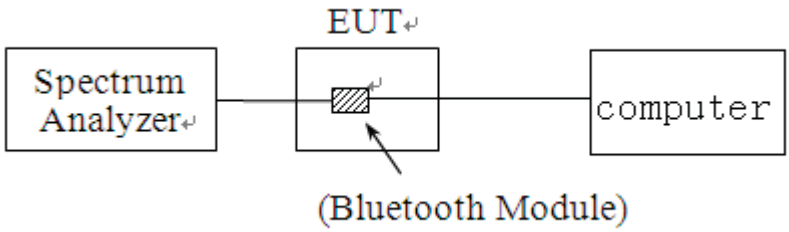
## 2.6. Time of Occupancy (Dwell time)

### 2.6.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 2.6.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the PC is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

### 2.6.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW ≥ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

### 2.6.4. Test Result

The average time of occupancy on any channel within the Period can be calculated with formulas (for DH5 package type):

{Total of Dwell} = {Pulse Time} * (1600 / 6) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4s * {Number of Hopping Frequency}

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

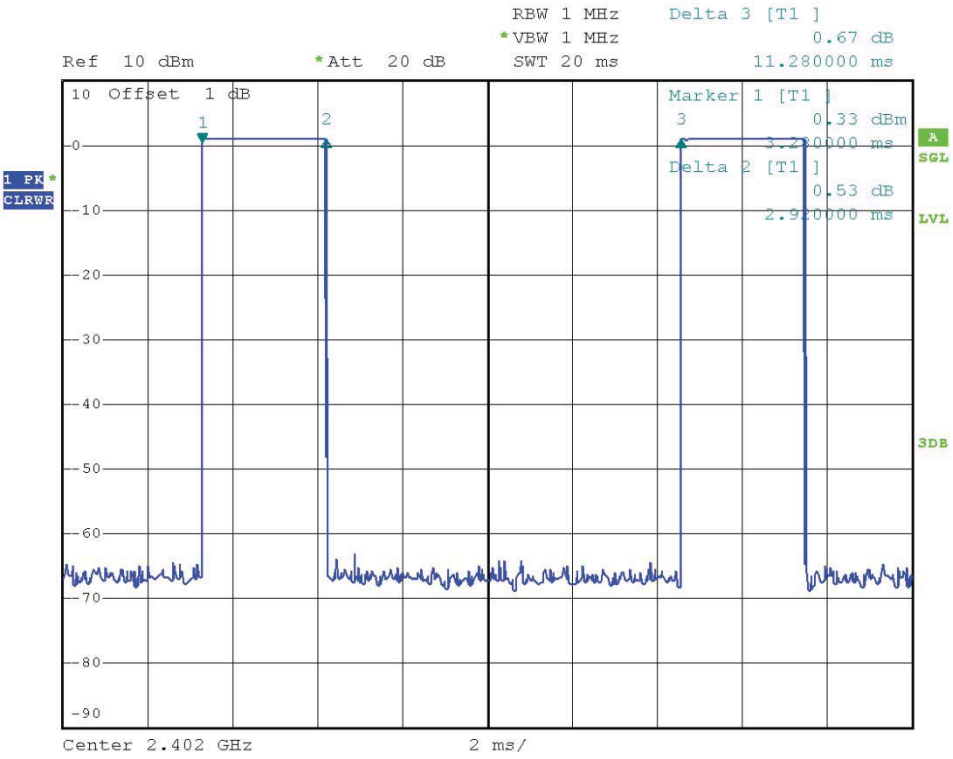
### 2.6.4.1. GFSK Mode

**A. Test Verdict:**

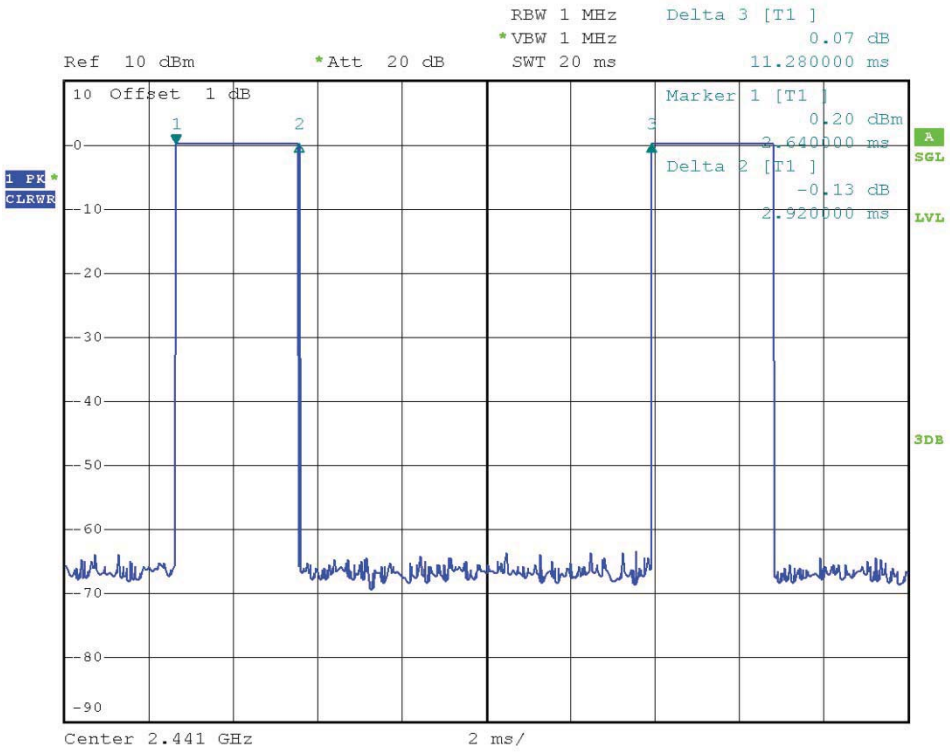
| Channel | Frequency (MHz) | Pulse Time | | Total of Dwell (ms) | Limit (ms) | Verdict |
|---|---|---|---|---|---|---|
| | | ms | Refer to Plot | | | |
| 0 | 2402 | 2.92 | Plot A | 311.467 | 400 | PASS |
| 39 | 2441 | 2.92 | Plot B | 311.467 | | PASS |
| 78 | 2480 | 2.92 | Plot C | 311.467 | | PASS |

**B. Test Plots:**

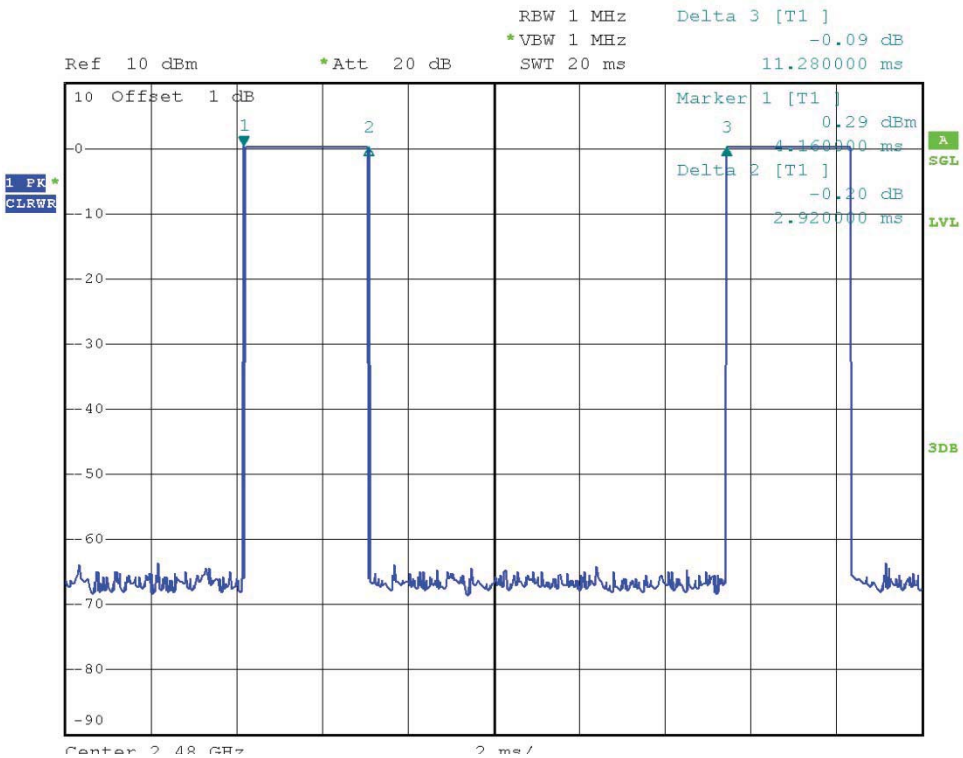
Note: the following plots record the Pulse Time of the Module carrier.




(Plot A: Channel = 2402 @ GFSK)




(Plot B: Channel = 2441 @ GFSK)




(Plot C: Channel = 2480 @ GFSK)

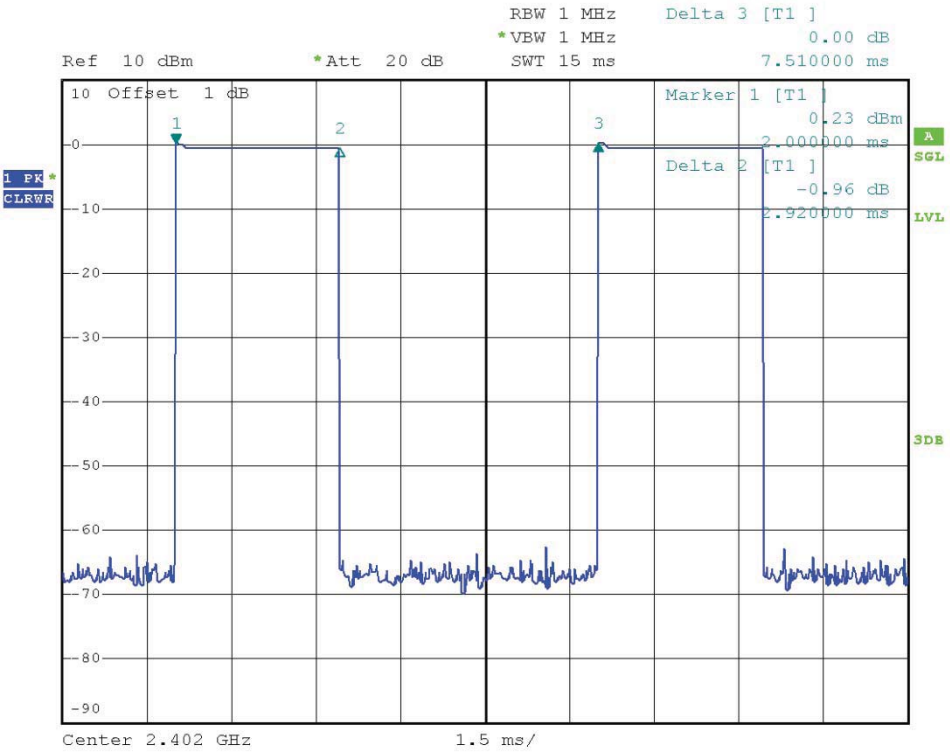
### 2.6.4.2. Π/4-DQPSK Mode

**A. Test Verdict:**

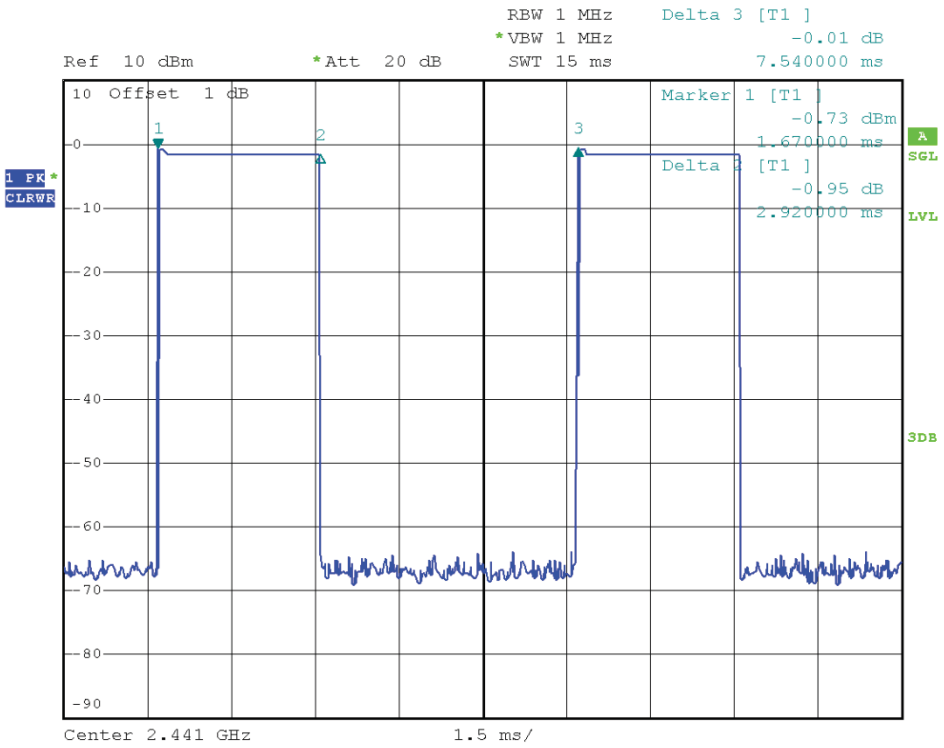
| Channel | Frequency (MHz) | Pulse Time | | Total of Dwell (ms) | Limit (ms) | Verdict |
|---|---|---|---|---|---|---|
| | | ms | Refer to Plot | | | |
| 0 | 2402 | 2.92 | Plot A | 311.467 | 400 | PASS |
| 39 | 2441 | 2.92 | Plot B | 311.467 | | PASS |
| 78 | 2480 | 2.92 | Plot C | 311.467 | | PASS |

**B. Test Plots:**

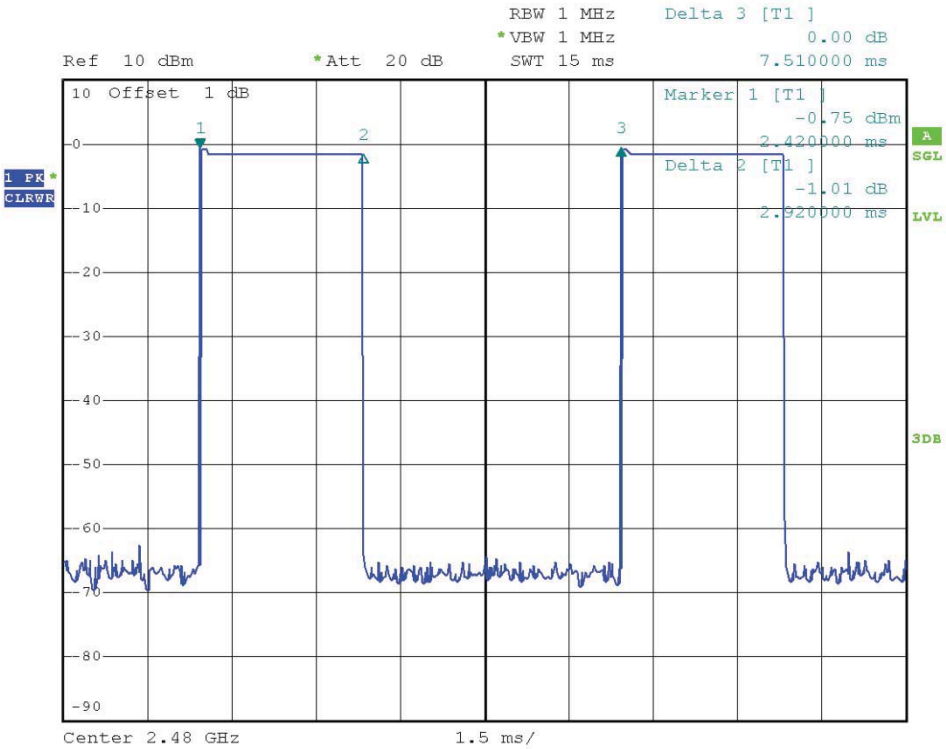
Note: the following plots record the Pulse Time of the Module carrier.




(Plot A: Channel = 2402 @ Π/4-DQPSK)




(Plot B: Channel = 2441 @ ∏/4-DQPSK)




(Plot C: Channel = 2480 @ ∏/4-DQPSK)

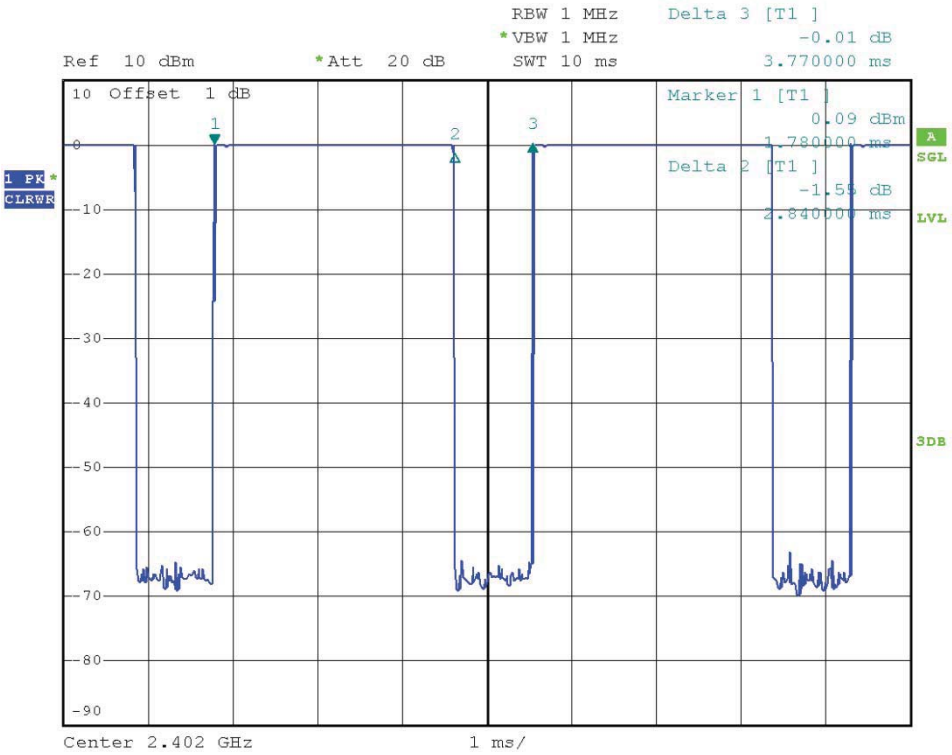
### 2.6.4.3. 8-DPSK mode

**A. Test Verdict:**

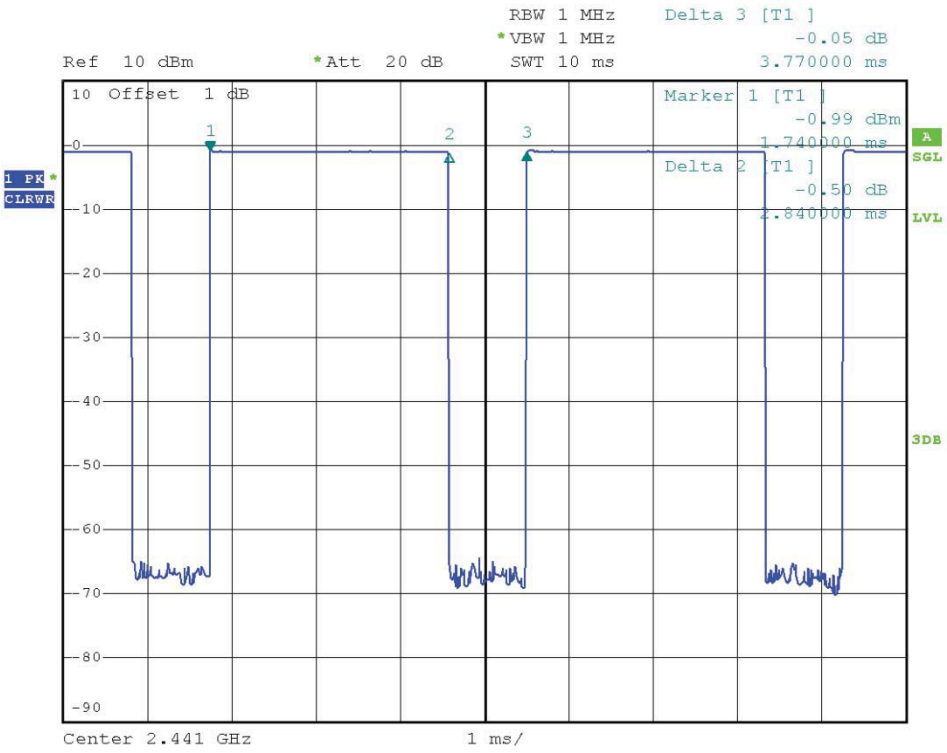
| Channel | Frequency (MHz) | Pulse Time | | Total of Dwell (ms) | Limit (ms) | Verdict |
|---|---|---|---|---|---|---|
| | | ms | Refer to Plot | | | |
| 0 | 2402 | 2.84 | Plot A | 302.933 | 400 | PASS |
| 39 | 2441 | 2.84 | Plot B | 302.933 | | PASS |
| 78 | 2480 | 2.82 | Plot C | 300.800 | | PASS |

**B. Test Plots:**

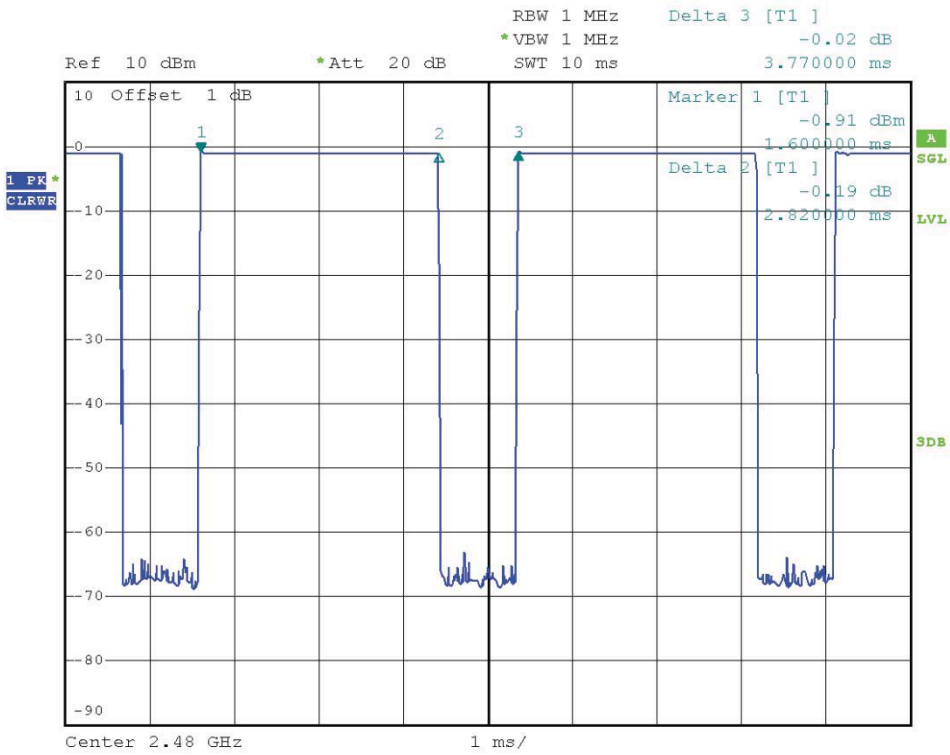
Note: the following plots record the Pulse Time of the Module carrier.




(Plot A: Channel = 2402 @ 8-DPSK)




(Plot B: Channel = 2441 @ 8-DPSK)




(Plot C: Channel = 2480 @ 8-DPSK)

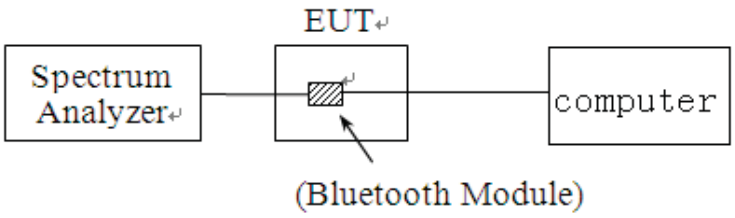
## 2.7. Conducted Spurious Emissions

### 2.7.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 2.7.2. Test Description

**A. Test Setup:**




The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

**B. Equipments List:**

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 1164.4391.40 | 2014.06.10 |

### 2.7.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

### 2.7.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

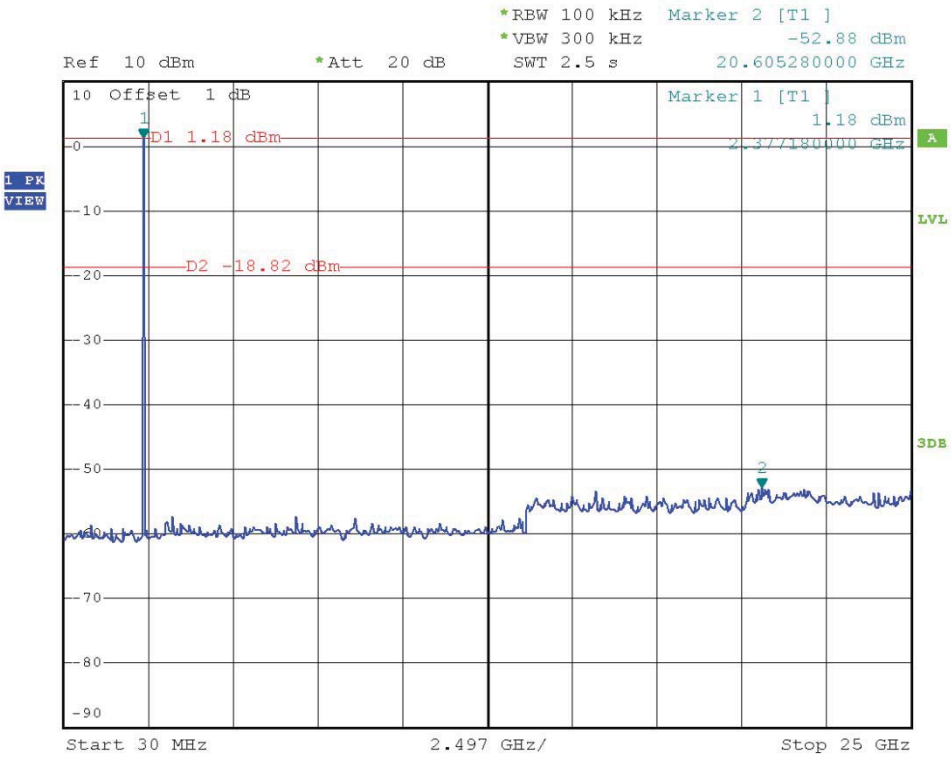
### 2.7.4.1. GFSK Mode

**A. Test Verdict:**

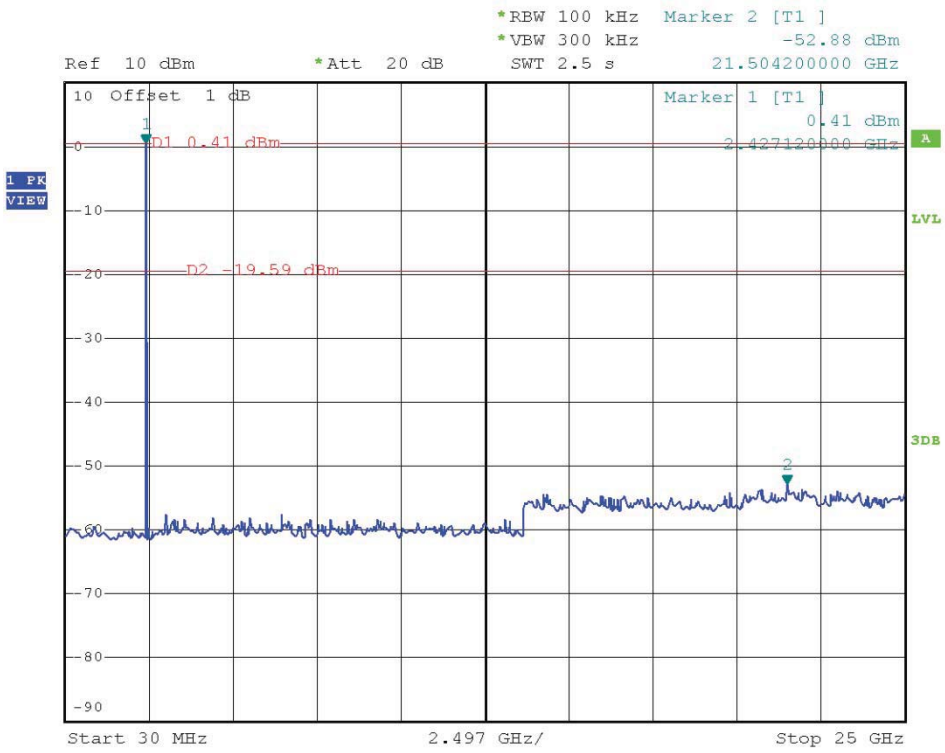
| Channel | Frequency (MHz) | Measured Max. Out of Band EmissiondBm) | Refer to Plot | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|
| | | | | Carrier Level | Calculated -20dBc Limit | |
| 0 | 2402 | -52.88 | Plot A | 1.18 | -18.82 | PASS |
| 39 | 2441 | -52.88 | Plot B | 0.41 | -19.59 | PASS |
| 78 | 2480 | -53.79 | Plot C | 0.35 | -19.65 | PASS |

**B. Test Plots:**

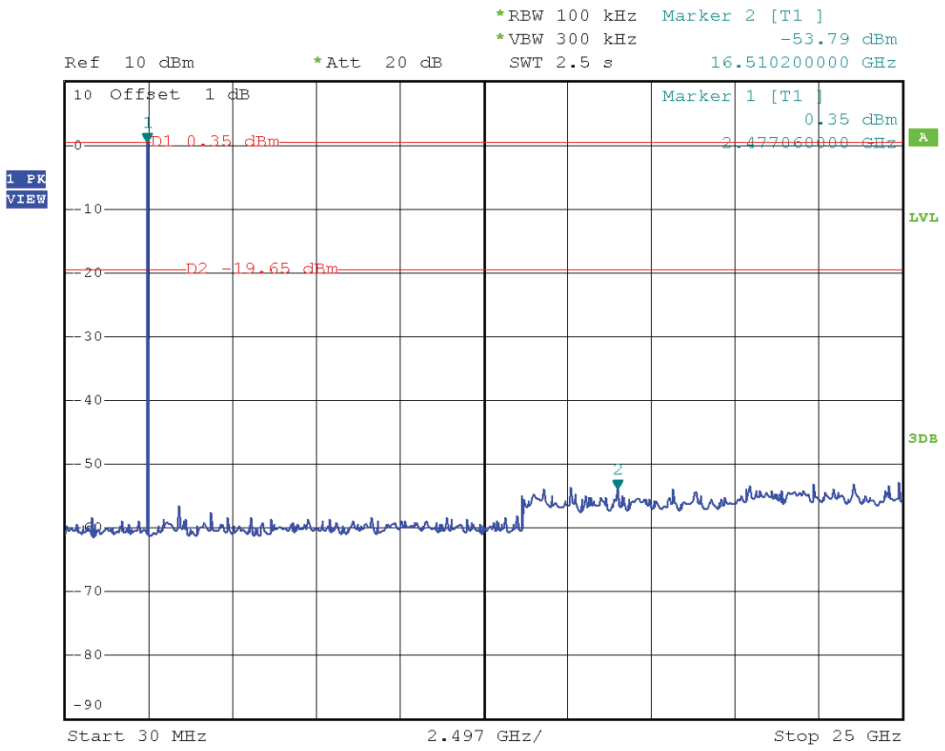
Note: the power of the Module transmitting frequency should be ignored.




(Plot A: Channel = 0, 30MHz to 25GHz @ GFSK Mode)




(Plot B: Channel = 39, 30MHz to 25GHz @ GFSK Mode)




(Plot C: Channel = 78, 30MHz to 25GHz @ GFSK Mode)

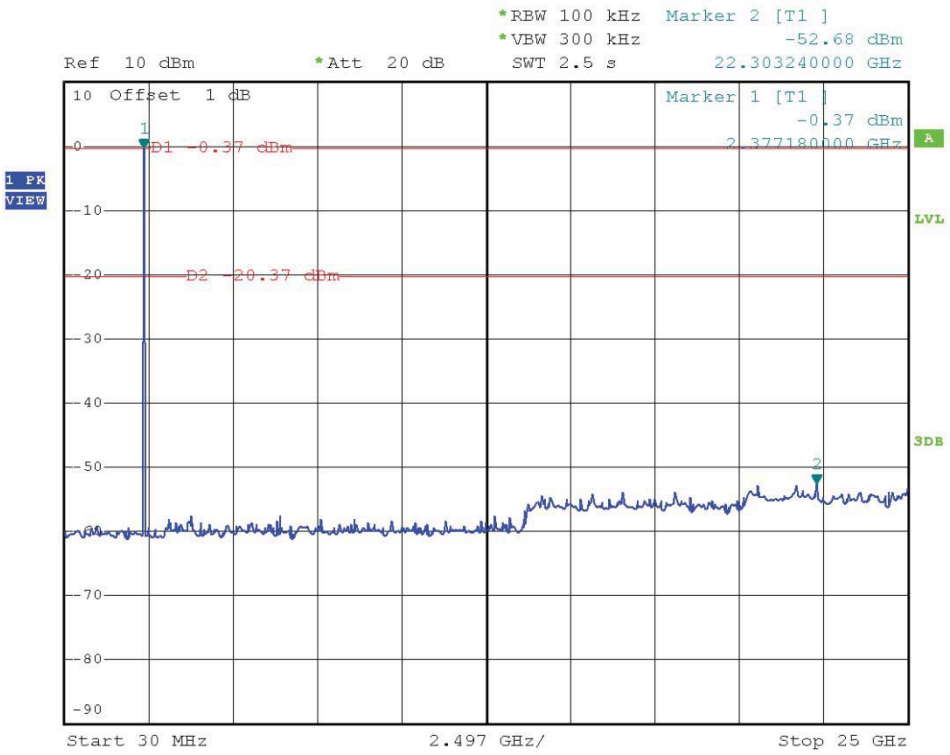
### 2.7.4.2. ∏/4-DQPSK Mode

**A. Test Verdict:**

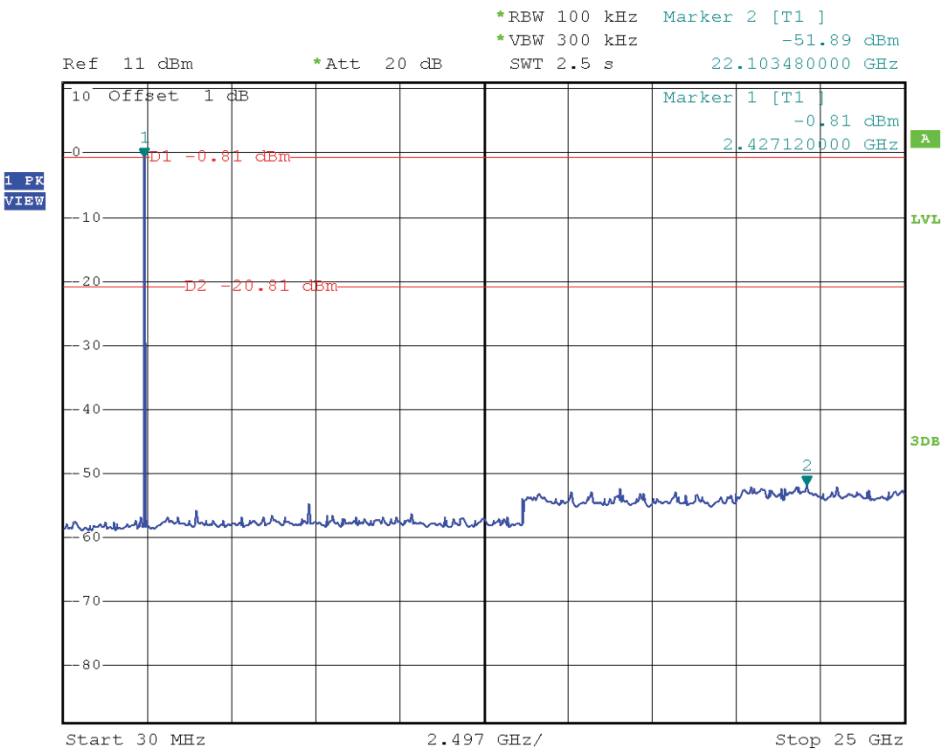
| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|
| | | | | Carrier Level | Calculated -20dBc Limit | |
| 0 | 2402 | -52.68 | Plot A | -0.37 | -20.37 | PASS |
| 39 | 2441 | -51.89 | Plot B | -0.81 | -20.81 | PASS |
| 78 | 2480 | -52.27 | Plot C | -2.19 | -22.19 | PASS |

**B. Test Plots:**

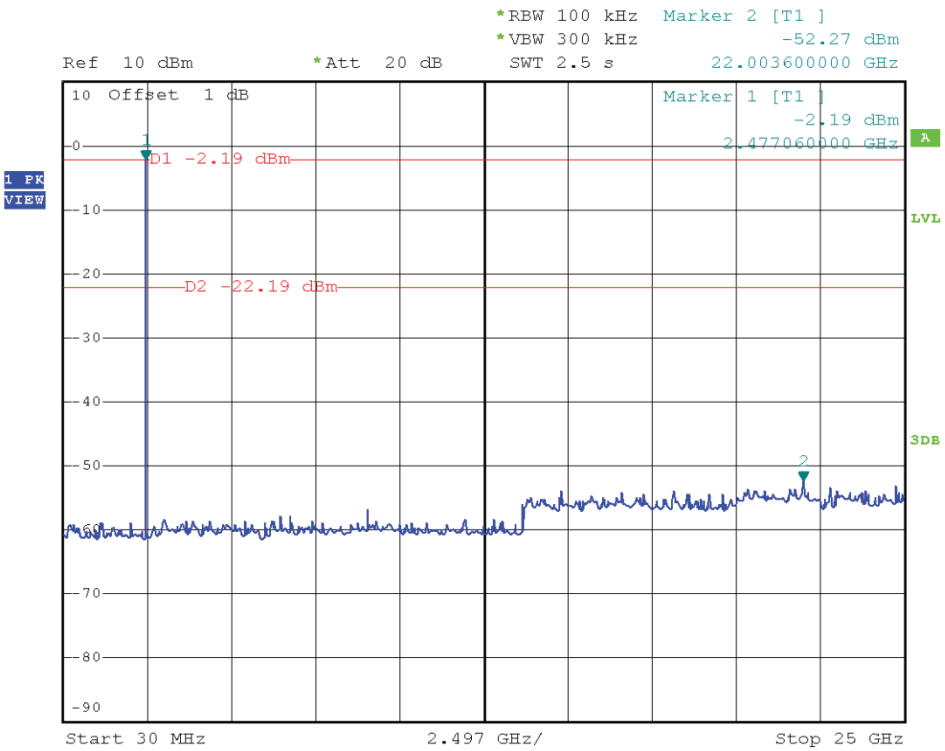
Note: the power of the Module transmitting frequency should be ignored.




(Plot A: Channel = 0, 30MHz to 25GHz @ ∏/4-DQPSK)




(Plot B: Channel = 39, 30MHz to 25GHz @ ∏/4-DQPSK)




(PlotC: Channel = 78, 30MHz to 25GHz @ ∏/3-DQPSK)

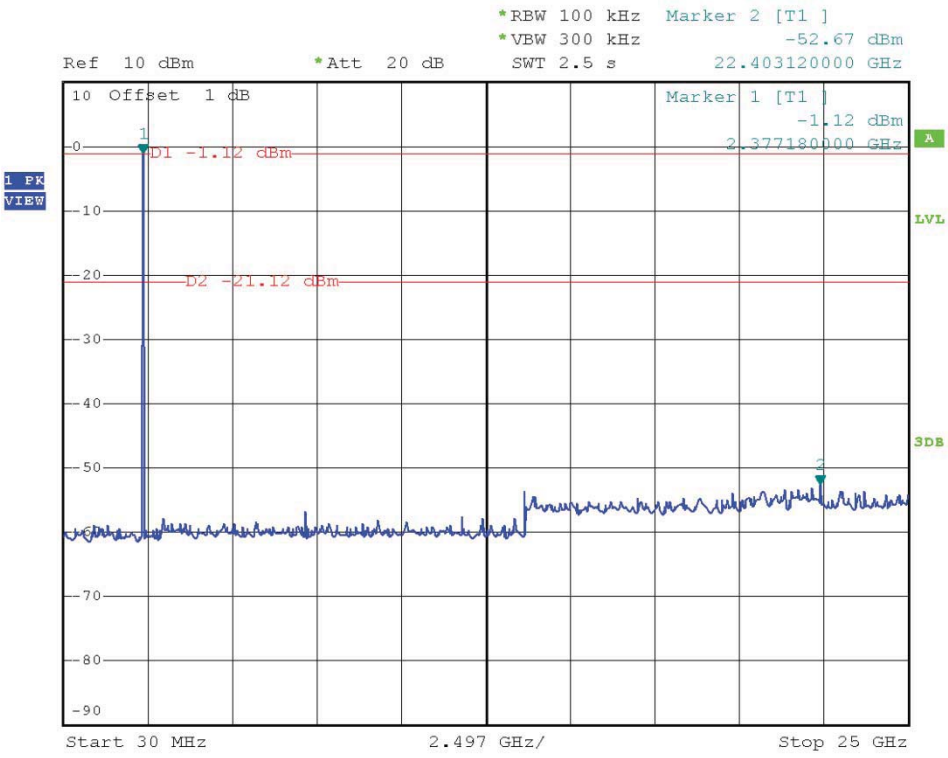
### 2.7.4.3. 8-DPSK Mode

**A. Test Verdict:**

| Channel | Frequency (MHz) | Measured Max. Out of Band Emission (dBm) | Refer to Plot | Limit (dBm) | | Verdict |
|---|---|---|---|---|---|---|
| | | | | Carrier Level | Calculated -20dBc Limit | |
| 0 | 2402 | -52.67 | Plot G.1 | -1.12 | -21.12 | PASS |
| 39 | 2441 | -53.09 | Plot H.1 | -2.11 | -22.11 | PASS |
| 78 | 2480 | -52.91 | Plot I.1 | -2.22 | -22.22 | PASS |

**B. Test Plots:**

Note: the power of the Module transmitting frequency should be ignored.




(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)