

# TEST REPORT

**KCTL Inc.**

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 443-390, Korea  
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Report No.: KCTL15-FR0030

Page( 1 ) / ( 64 ) Pages

**KCTL**  
<http://www.kctl.co.kr>

## 1. Applicant

Name: Hyundai Mobis Co., Ltd.  
Address: 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, Korea

## 2. Sample Description:

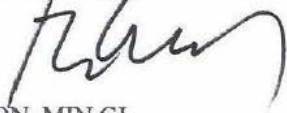
FCC ID: TQ8-AVB30F6AN  
IC ID: 5074A-AVBA0F6KN  
Type of equipment: Digital Car Audio System  
Basic Model: AVB30F6AN  
Variant Model: AVBA0F6KN

3. Date of Test: August 28 ~ September 10, 2015  
FCC Part 15 Subpart C, 15.247  
4. Test method used: RSS-247 Issue 1 May 2015  
RSS GEN Issue 4 November 2014

## 5. Test Results

Test Item: Refer to page 7  
Result: Refer to page 8 ~ page 63  
Measurement Uncertainty: Refer to page 7

This result shown in this report refer only to the sample(s) tested unless otherwise stated.

|             |                                                                                                              |                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Affirmation | Tested by                                                                                                    | Technical Manager                                                                                          |
|             | <br>Name: BAEK, DONG HEON | <br>Name: SON, MIN GI |

2015. 09. 11

**KCTL Inc.** Testing Laboratory

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## 1. Client information

**Applicant:** Hyundai Mobis Co., Ltd.  
**Address:** 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, Korea  
**Telephone number:** +81-31-260-2707  
**Facsimile number:** +81-31-899-1788  
**Contact person:** Choi Seung Hoon/ csh@mobis.co.kr

**Manufacturer:** Hyundai Mobis Co., Ltd.  
**Address:** 69-23, Hansam-Ro, Ducksan-Myeon, Jinchun-Gun,  
Chungcheongbuk-Do 365-843 Korea

## 2. Laboratory information

### Address

#### **KCTL Ltd.**

65 Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea

Telephone Number: 82-70-5008-1016 Facsimile Number: 82-505-299-8311

### Certificate

KOLAS No.: 231

FCC Site Designation No: KR0040

FCC Site Registration No: 687132

VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849

IC Site Registration No.:8035A-2

### SITE MAP



### 3. Description of E.U.T.

#### 3.1 Basic description

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| Applicant:              | Hyundai Mobis Co., Ltd.                                                          |
| Address of Applicant    | 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, Korea                               |
| Manufacturer            | Hyundai Mobis Co., Ltd.                                                          |
| Address of Manufacturer | 69-23, Hansam-Ro, Ducksan-Myeon, Jinchun-Gun,<br>Chungcheongbuk-Do 365-843 Korea |
| Type of equipment       | Digital Car Audio System                                                         |
| Basic Model             | AVB30F6AN                                                                        |
| Variant Model           | AVBA0F6KN *                                                                      |
| Serial number           | N/A                                                                              |

\* Variant model name is only for export toward Canada

### 3.2 General description

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Range    | 2 402 MHz ~ 2 480 MHz (Bluetooth)<br>2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20)<br>5 180 MHz ~ 5 240 MHz (802.11a/n/ac_HT20/VHT20)<br>5 190 MHz ~ 5 230 MHz (802.11n/ac_HT40/VHT40)<br>5 210 MHz (802.11ac_VHT80)<br>5 260 MHz ~ 5 320 MHz (802.11a/n/ac_HT20/VHT20)<br>5 270 MHz ~ 5 310 MHz (802.11n/ac_HT40/VHT40)<br>5 290 MHz (802.11ac_VHT80)<br>5 500 MHz ~ 5 700 MHz (802.11a/n/ac_HT20/VHT20)<br>5 510 MHz ~ 5 670 MHz (802.11n/ac_HT40/VHT40)<br>5 530 MHz (802.11ac_VHT80)<br>5 745 MHz ~ 5 825 MHz (802.11a/n/ac_HT20/VHT20)<br>5 755 MHz ~ 5 795 MHz (802.11n/ac_HT40/VHT40)<br>5 775 MHz (802.11ac_VHT80) |
| Type of Modulation | GFSK, $\pi/4$ DQPSK, 8DPSK : Bluetooth,<br>DSSS, OFDM : WIFI 2.4 G, OFDM : WIFI 5 G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Number of Channels | 2.0 GHz: 79 ch (Bluetooth)<br>11 ch (802.11b/g/n_HT20)<br>5.0 GHz: 5 150 MHz Band: 4 ch (802.11a/n/ac_HT20/VHT20)<br>2 ch (802.11n/ac_HT40/VHT40)<br>1 ch (802.11ac_VHT80)<br>5 250 MHz Band: 4 ch (802.11a/n/ac_HT20/VHT20)<br>2 ch (802.11n/ac_HT40/VHT40)<br>1 ch (802.11ac_VHT80)<br>5 470 MHz Band: 11 ch (11a/n/ac_HT20/VHT20)<br>5 ch (802.11n/ac_HT40/VHT40)<br>1 ch (802.11ac_VHT80)<br>5 725 MHz Band: 4 ch (802.11a/n/ac_HT20/VHT20)<br>2 ch (802.11n/ac_HT40/VHT40)<br>1 ch (802.11ac_VHT80)                                                                                                              |
| Type of Antenna    | Chip Antenna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Antenna Gain       | 2 GHz: 4.11 dBi (Bluetooth), 4.11 dBi (WiFi)<br>5 GHz: 5 150 MHz Band: 2.89 dBi, 5 250 MHz Band: 2.89 dBi<br>5 470 MHz Band: 2.51 dBi, 5 725 MHz Band: 5.78 dBi                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Transmit Power     | 4.45 dBm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Power supply       | DC 14.4 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H/W Version        | 1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| S/W Version        | 1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Test S/W version   | JFHEV.USA.0000.V060.150427                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| RF Power setting   | Using original setting value inside EUT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

Note : The above EUT information was declared by the manufacturer.

### 3.3 Test frequency

|                  | Frequency |
|------------------|-----------|
| Low frequency    | 2 402 MHz |
| Middle frequency | 2 441 MHz |
| High frequency   | 2 480 MHz |

### 3.4 Test Voltage

| Mode           | Voltage   |
|----------------|-----------|
| Normal voltage | DC 14.4 V |

#### ※ 15.247 Requirements for Bluetooth transmitter

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
  - 1) This system is hopping pseudo-randomly.
  - 2) Each frequency is used equally on the average by each transmitter.
  - 3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
  - 4) The receiver shifts frequencies in synchronization with the transmitted signals.
- 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
- 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

## 4. Summary of test results

### 4.1 Standards & results

| FCC Rule                        | IC Rule                          | Parameter                                    | Report Section | Test Result       |
|---------------------------------|----------------------------------|----------------------------------------------|----------------|-------------------|
| 15.203, 15.247(b)(4)            | -                                | Antenna Requirement                          | 5.1            | C                 |
| 15.247(b)(1), (4)               | RSS-247, 5.4 (2)                 | Maximum Peak Output Power                    | 5.2            | C                 |
| 15.247(a)(1)                    | RSS-247, 5.1 (2)                 | Carrier Frequency Separation                 | 5.3            | C                 |
| 15.247(a)(1)                    | RSS-247, 5.1 (1)                 | 20dB Channel Bandwidth                       | 5.4            | C                 |
| -                               | RSS-GEN, 6.6                     | Occupied Bandwidth                           | 5.4            | C                 |
| 15.247(a)(iii) 15.247(b)(1)     | RSS-247, 5.1                     | Number of Hopping Channel                    | 5.5            | C                 |
| 15.247(a) (iii)                 | RSS-247, 5.1 (4)                 | Time of Occupancy(Dwell Time)                | 5.6            | C                 |
| 15.247(d), 15.205(a), 15.209(a) | RSS-247, 5.5<br>RSS-GEN, 8.9, 10 | Spurious Emission, BandEdge, Restricted Band | 5.7            | C                 |
| 15.207(a)                       | RSS-GEN, 8.8                     | Conducted Emissions                          | -              | N/A <sub>1)</sub> |

Note: C=complies

NC= Not complies

NT=Not tested

NA=Not Applicable

N/A<sub>1)</sub> : This test is not applicable because the EUT falls into the automotive device and it's not to be connected to the public utility(AC) power line.

\* The method of measurement used to test this DSS device is FCC Public Notice DA 00-705

\* The general test methods used to test on this device are ANSI C63.10:2013

### 4.2 Uncertainty

| Measurement Item             | Expanded Uncertainty<br>$U = KU_c$ ( $K = 2$ ) |                      |
|------------------------------|------------------------------------------------|----------------------|
| Conducted RF power           | $\pm 1.30$ dB                                  |                      |
| Conducted Spurious Emissions | $\pm 1.52$ dB                                  |                      |
| Radiated Spurious Emissions  | 30 MHz ~ 300 MHz:                              | + 4.94 dB, - 5.06 dB |
|                              |                                                | + 4.93 dB, - 5.05 dB |
|                              | 300 MHz ~ 1 000 MHz:                           | + 4.97 dB, - 5.08 dB |
|                              |                                                | + 4.84 dB, - 4.96 dB |
| Conducted Emissions          | 1 GHz ~ 25 GHz:                                | + 6.03 dB, - 6.05 dB |
|                              | 9 kHz ~ 150 kHz:                               | $\pm 3.75$ dB        |
|                              | 150 kHz ~ 30 MHz:                              | $\pm 3.36$ dB        |

## 5. Test results

### 5.1 Antenna Requirement

#### 5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 5.1.2 Result

##### -Complied

The transmitter has a Chip antenna. The directional gain of the antenna is 4.11 dBi.

## 5.2 Maximum Peak Output Power

### 5.2.1 Regulation

According to §15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 5.2.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold
5. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

### 5.2.3 Test Result

- Complied

\* GFSK

| Channel | Frequency (MHz) | Result (dBm) | Limit (dBm) | Margin (dB) | Avarage Power (dBm) |
|---------|-----------------|--------------|-------------|-------------|---------------------|
| Low     | 2 402           | 3.21         | 20.97       | 17.76       | 1.81                |
| Middle  | 2 441           | 3.52         | 20.97       | 17.45       | 2.24                |
| High    | 2 480           | 2.24         | 20.97       | 18.73       | 1.28                |

\*  $\pi/4$ DQPSK

| Channel | Frequency (MHz) | Result (dBm) | Limit (dBm) | Margin (dB) | Avarage Power (dBm) |
|---------|-----------------|--------------|-------------|-------------|---------------------|
| Low     | 2 402           | 4.06         | 20.97       | 16.91       | 0.15                |
| Middle  | 2 441           | 3.20         | 20.97       | 17.77       | -0.44               |
| High    | 2 480           | 2.82         | 20.97       | 18.15       | -0.93               |

\* 8DPSK

| Channel | Frequency (MHz) | Result (dBm) | Limit (dBm) | Margin (dB) | Avarage Power (dBm) |
|---------|-----------------|--------------|-------------|-------------|---------------------|
| Low     | 2 402           | 4.35         | 20.97       | 16.62       | 0.61                |
| Middle  | 2 441           | 4.45         | 20.97       | 16.52       | 0.88                |
| High    | 2 480           | 3.43         | 20.97       | 17.54       | 0.13                |

NOTE:

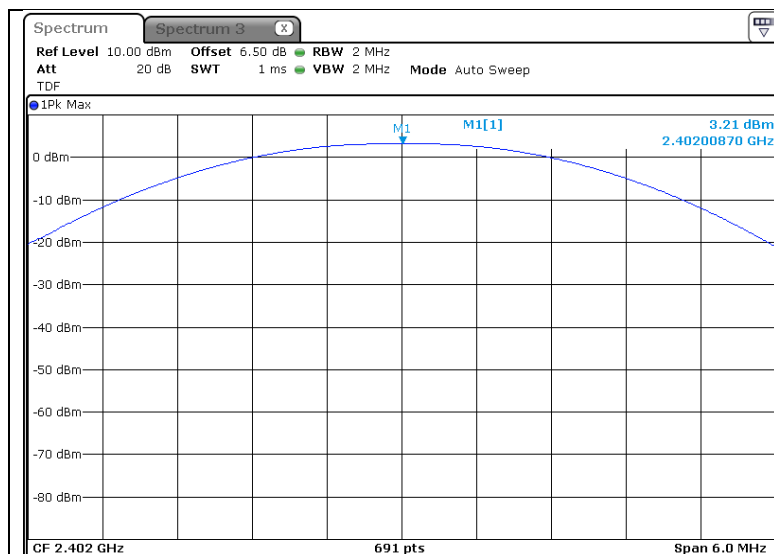
1. We took the insertion loss of the cable loss into consideration within the measuring instrument.

## 5.2.4 Test Plot

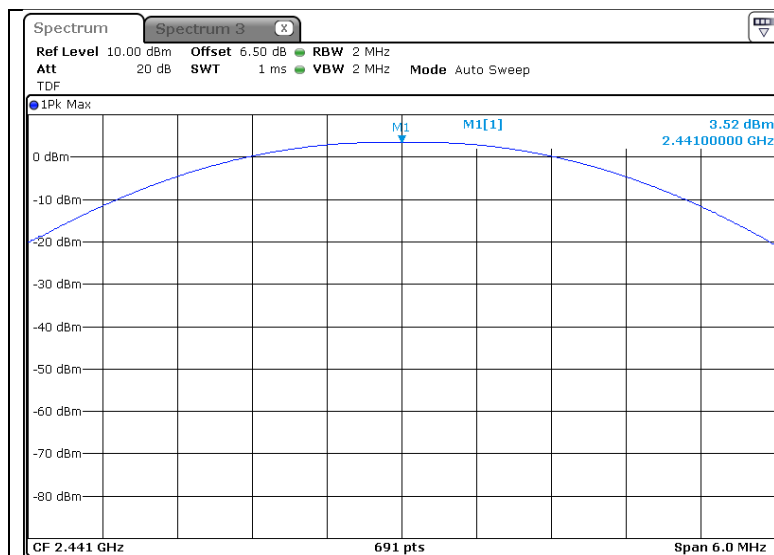
Figure 1. Plot of the Maximum Peak Output Power (Conducted)

**\* GFSK**

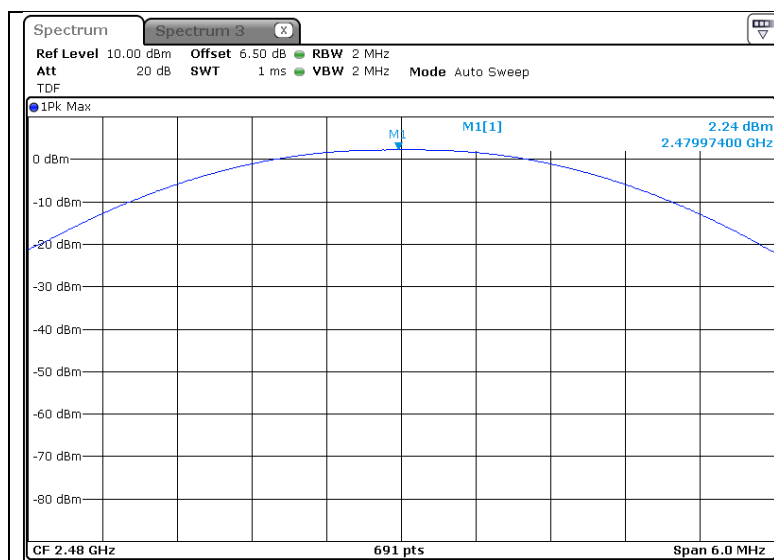
Lowest Channel( 2 402 MHz)



Middle Channel( 2 441 MHz)

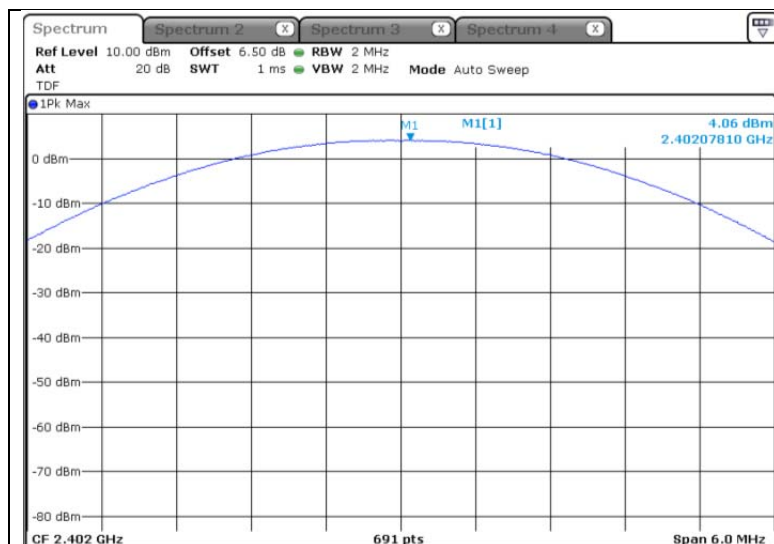


Highest Channel ( 2 480 MHz)

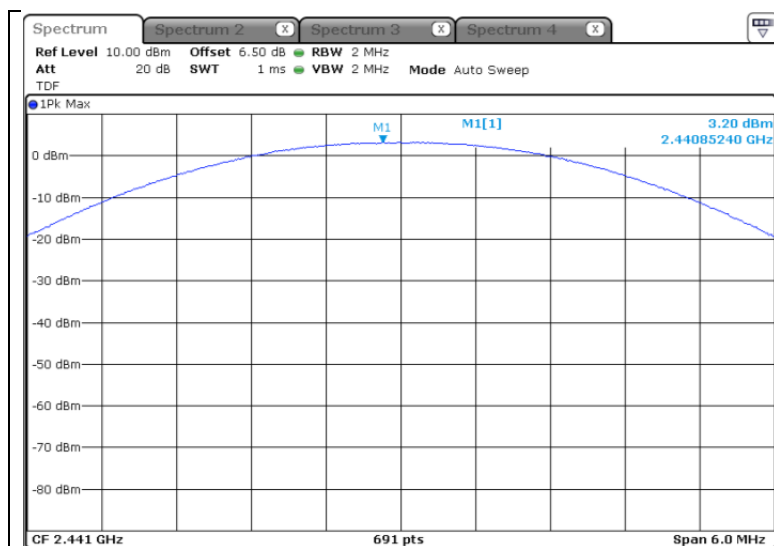


\*  $\pi/4$ QPSK

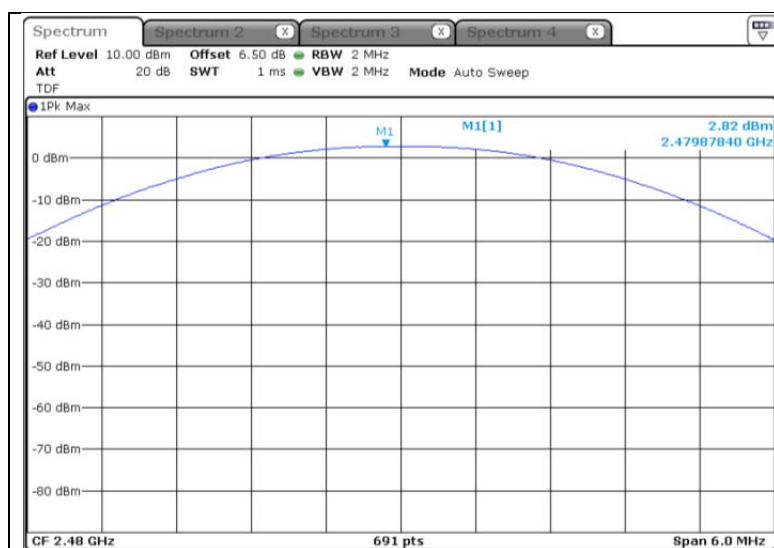
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

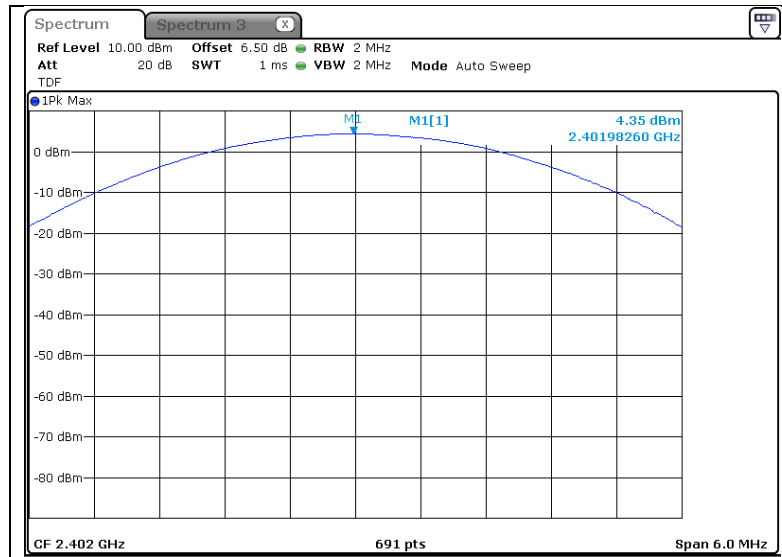


Highest Channel (2 480 MHz)

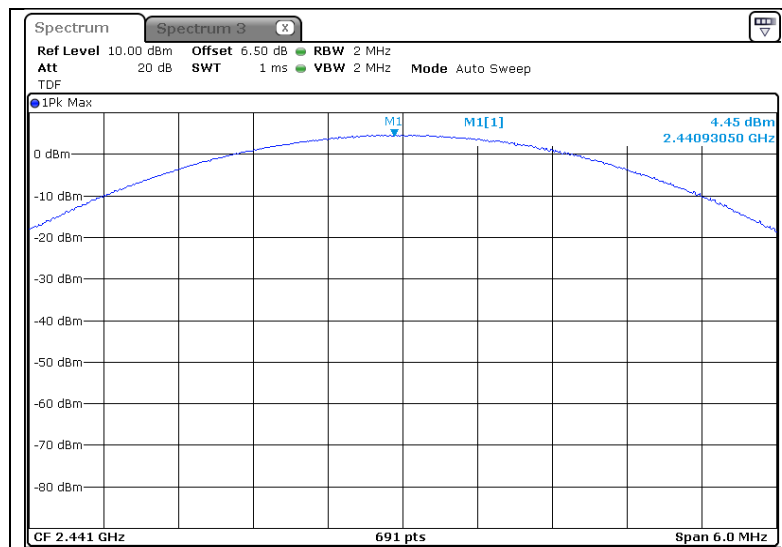


**\* 8DPSK**

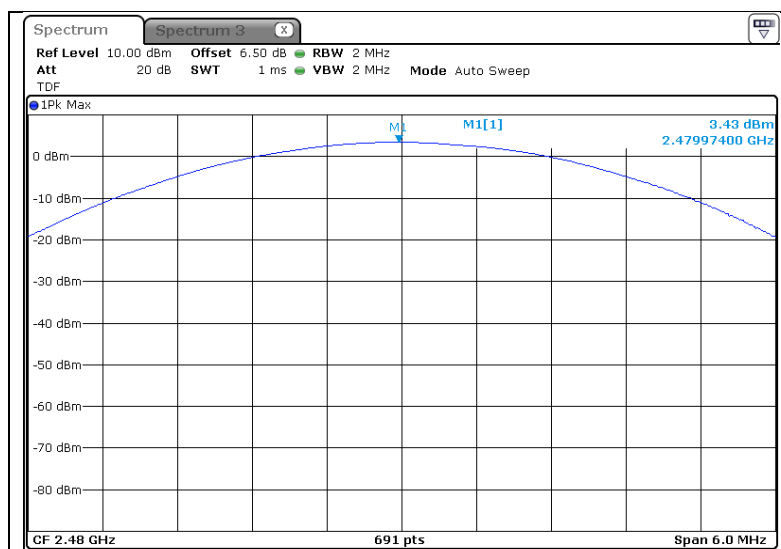
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)



Highest Channel ( 2 480 MHz)



## 5.3 Carrier Frequency Separation

### 5.3.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 5.3.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span Video (or Average) Bandwidth (VBW)  $\geq$  RBW Sweep = auto Detector function = peak Trace = max hold
5. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.

### 5.3.3 Test Result

- Complied

**\* GFSK**

| Frequency<br>(MHz) | Carrier frequency separation<br>(MHz) | Limit                           |
|--------------------|---------------------------------------|---------------------------------|
| 2 402              | 0.999                                 | $\geq 25$ kHz or 20 dBbandwidth |
| 2 441              | 0.999                                 | $\geq 25$ kHz or 20 dBbandwidth |
| 2 480              | 1.003                                 | $\geq 25$ kHz or 20 dBbandwidth |

**\*  $\pi/4$ DQPSK**

| Operating Mode | Carrier frequency separation<br>(MHz) | Limit                                              |
|----------------|---------------------------------------|----------------------------------------------------|
| 2 402          | 0.999                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| 2 441          | 1.003                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| 2 480          | 1.003                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |

**\* 8DPSK**

| Operating Mode | Carrier frequency separation<br>(MHz) | Limit                                              |
|----------------|---------------------------------------|----------------------------------------------------|
| 2 402          | 1.164                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| 2 441          | 0.999                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |
| 2 480          | 0.999                                 | $\geq 25$ kHz or two-thirds of the 20 dB bandwidth |

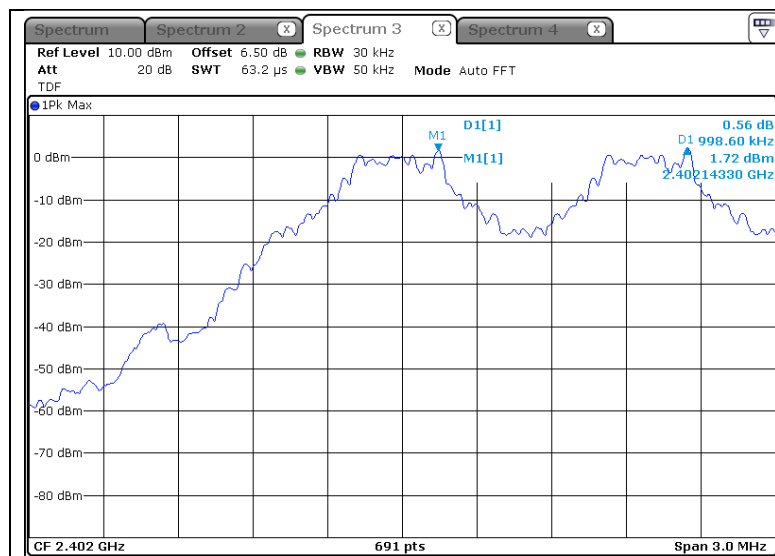
NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

### 5.3.4 Test Plot

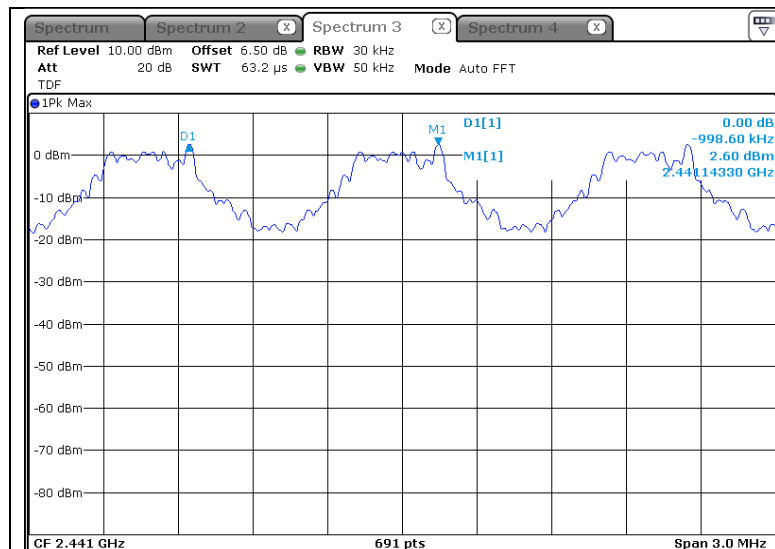
Figure 2. Plot of the Carrier Frequency Separation (Conducted)

**\* GFSK**

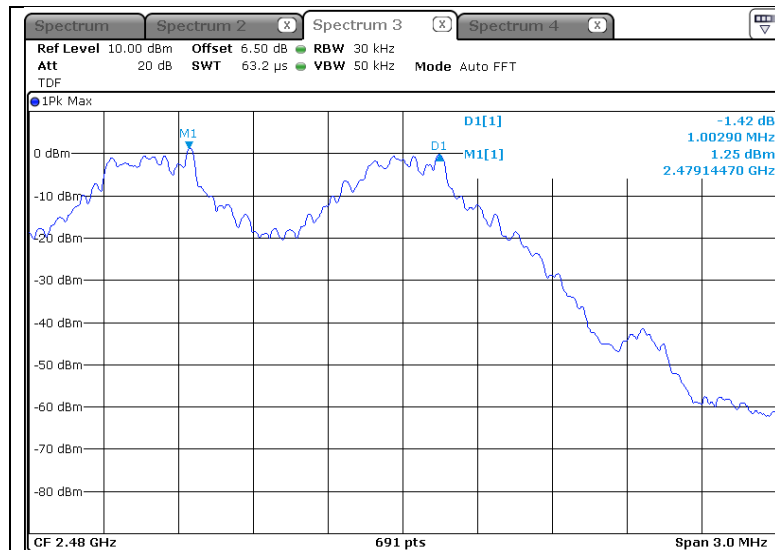
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

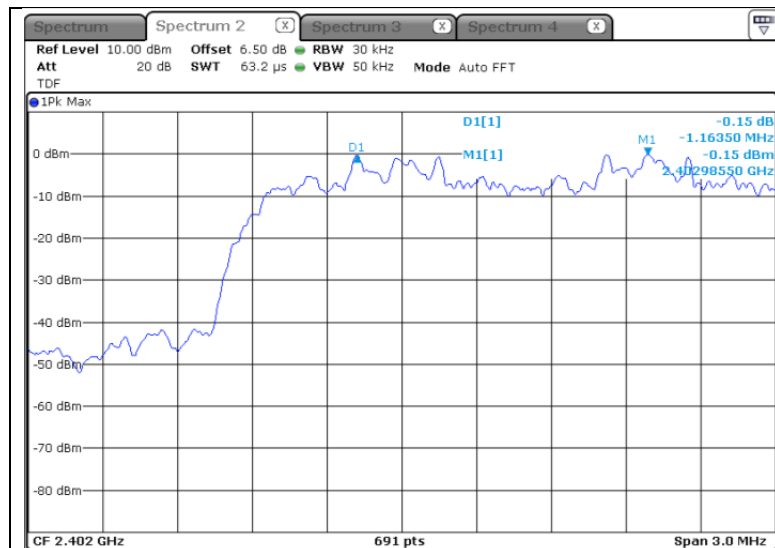


Highest Channel ( 2 480 MHz)

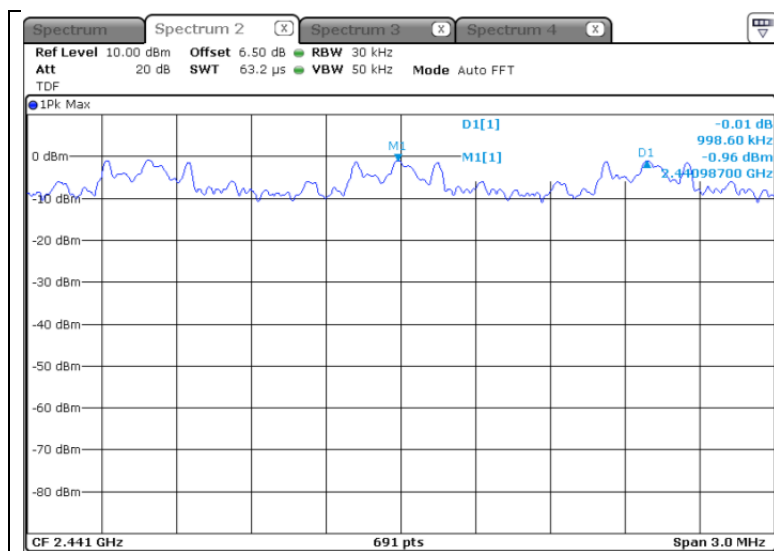


\*  $\pi/4$ DQPSK

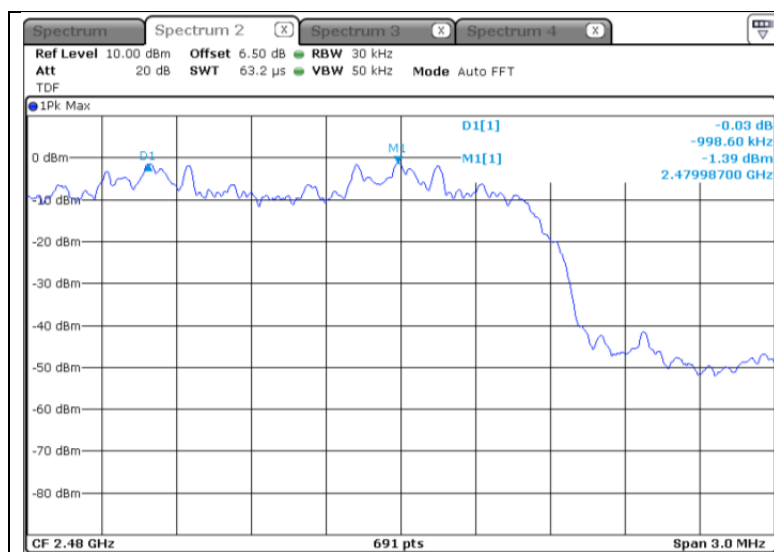
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

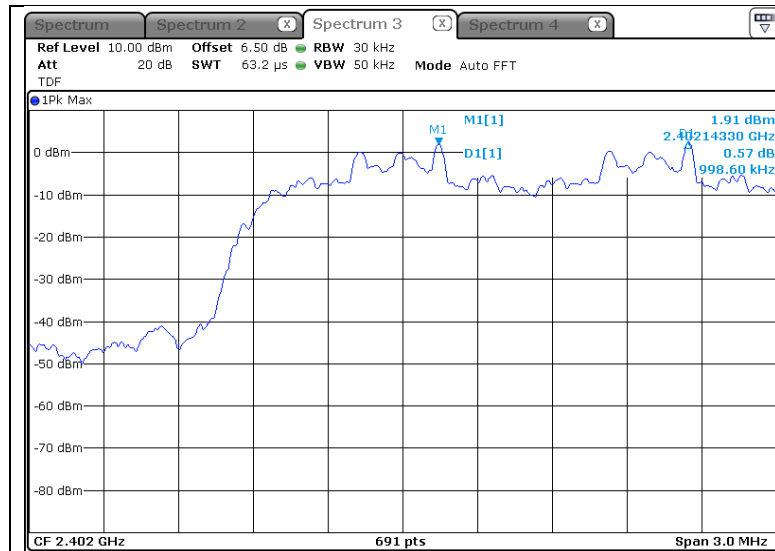


Highest Channel ( 2 480 MHz)

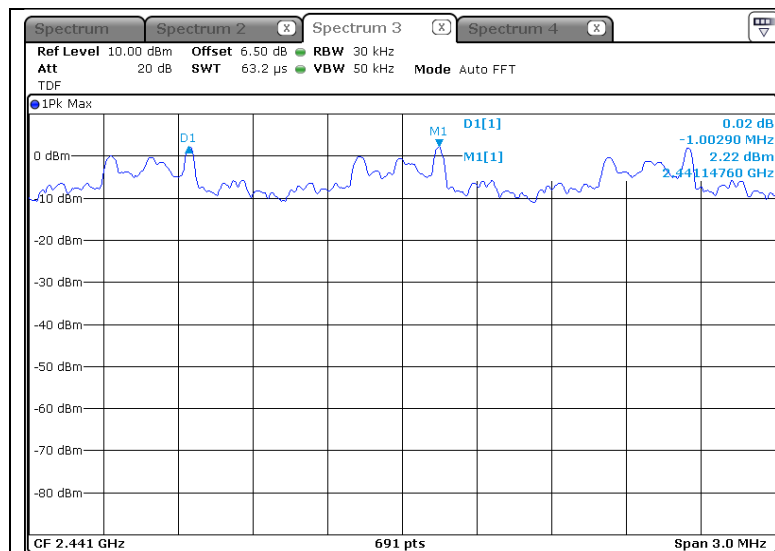


**\* 8DPSK**

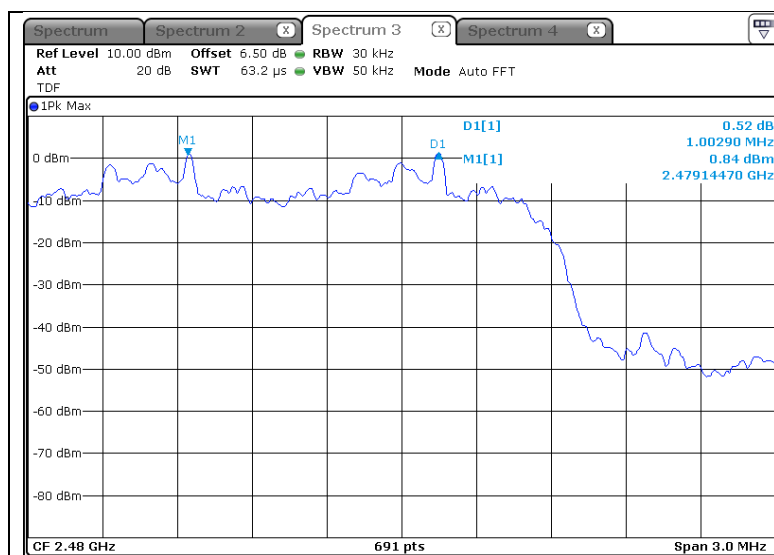
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)



Highest Channel ( 2 480 MHz)



## 5.4 20 dB Channel Bandwidth

### 5.4.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

### 5.4.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer as follows: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  $RBW \geq 1\%$  of the 20 dB bandwidth  $VBW \geq RBW$  Sweep = auto Detector function = peak Trace = max hold
5. Set a reference level on it equal to the highest peak value.
6. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
7. Repeat above procedures until all frequencies measured were complete..

### 5.4.3 Test Result

- Complied

| Mode          | Channel | 20 dB Channel Bandwidth(MHz) | Occupied Bandwidth (99 % BW)(MHz) |
|---------------|---------|------------------------------|-----------------------------------|
| GFSK          | Low     | 1.046                        | 0.912                             |
|               | Middle  | 1.046                        | 0.912                             |
|               | High    | 1.042                        | 0.196                             |
| $\pi/4$ DQPSK | Low     | 1.285                        | 1.15                              |
|               | Middle  | 1.285                        | 1.15                              |
|               | High    | 1.289                        | 1.15                              |
| 8DPSK         | Low     | 1.285                        | 1.155                             |
|               | Middle  | 1.289                        | 1.155                             |
|               | High    | 1.216                        | 1.142                             |

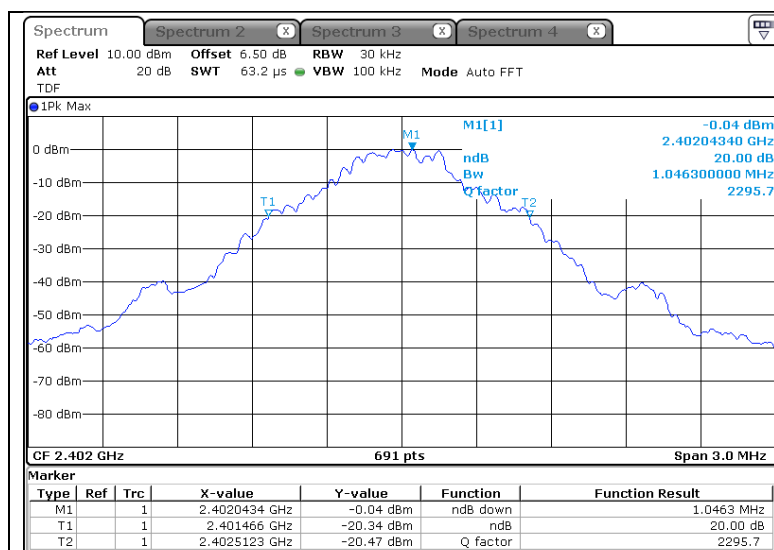
NOTE: We took the insertion loss of the cable loss into consideration within the measuring instrument.

## 5.4.4 Test Plot

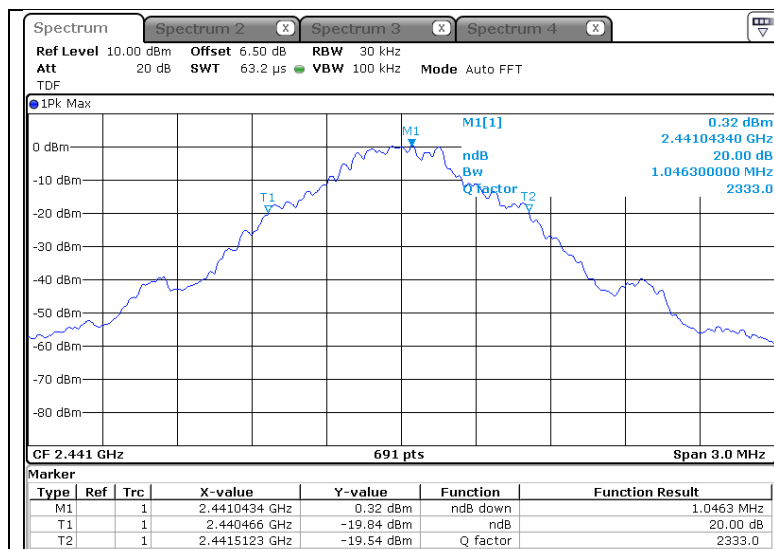
Figure 3. Plot of the 20 dB Channel Bandwidth / Occupied Bandwidth (Conducted)

### \* GFSK (20 dB Channel Bandwidth)

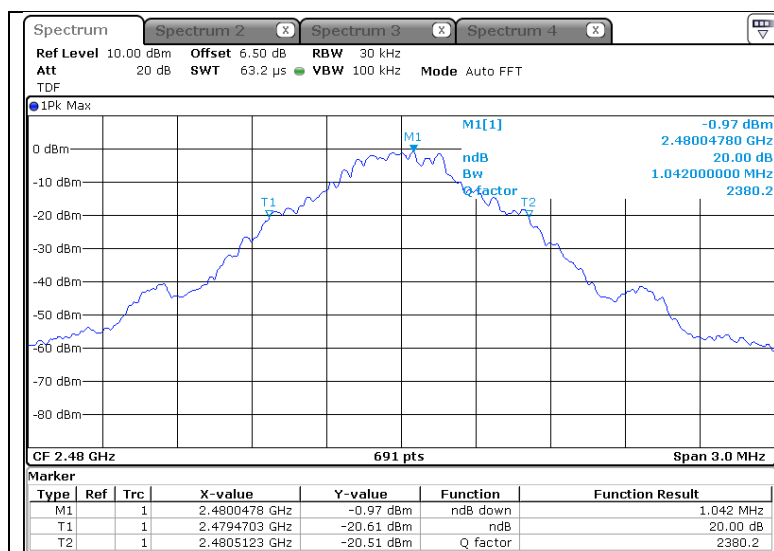
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

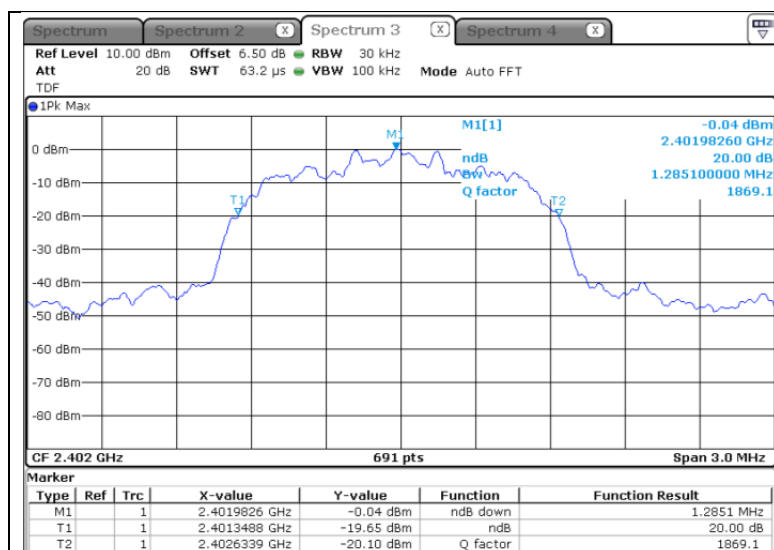


## Highest Channel ( 2 480 MHz)

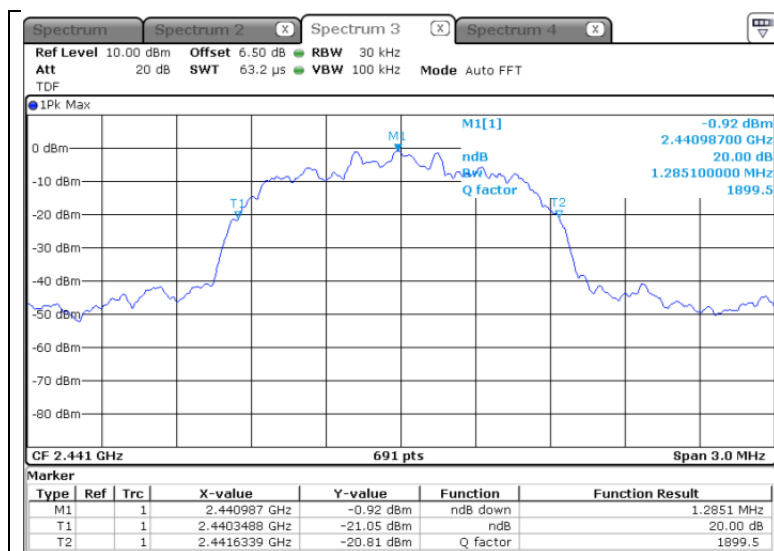


## \* $\pi/4$ DQPSK (20 dB Channel Bandwidth)

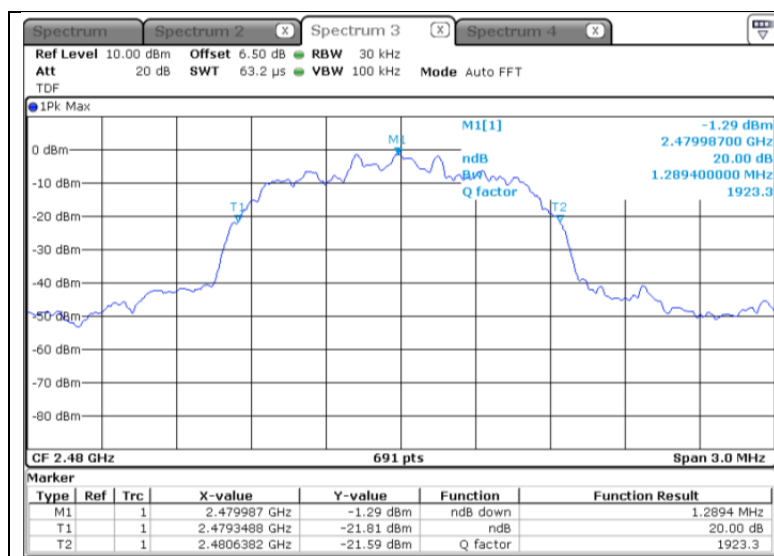
## Lowest Channel( 2 402 MHz)



## Middle Channel (2 441 MHz)

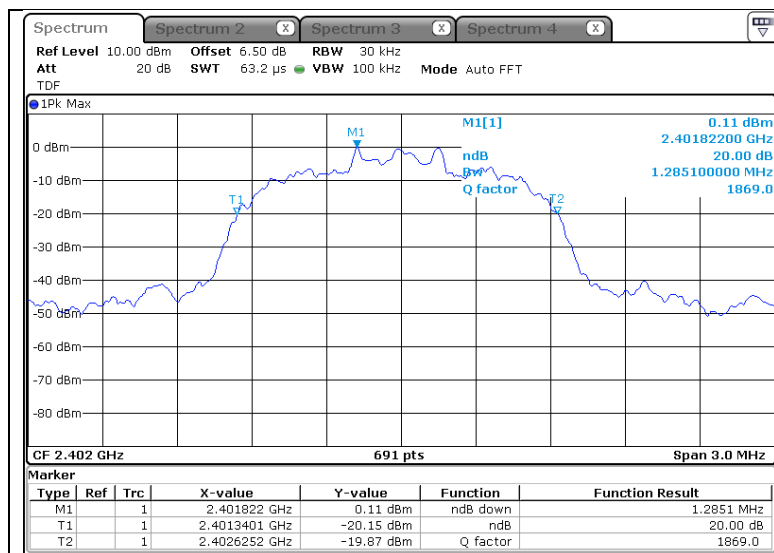


## Highest Channel (2 480 MHz)

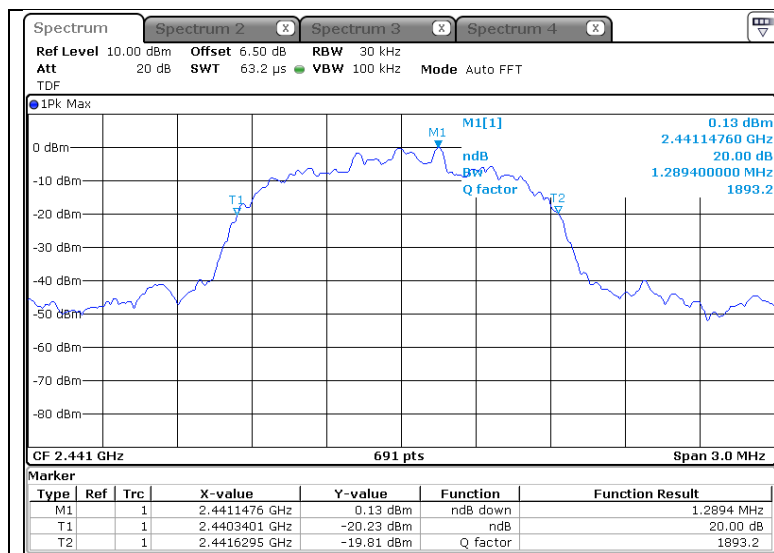


**\* 8DPSK (20 dB Channel Bandwidth)**

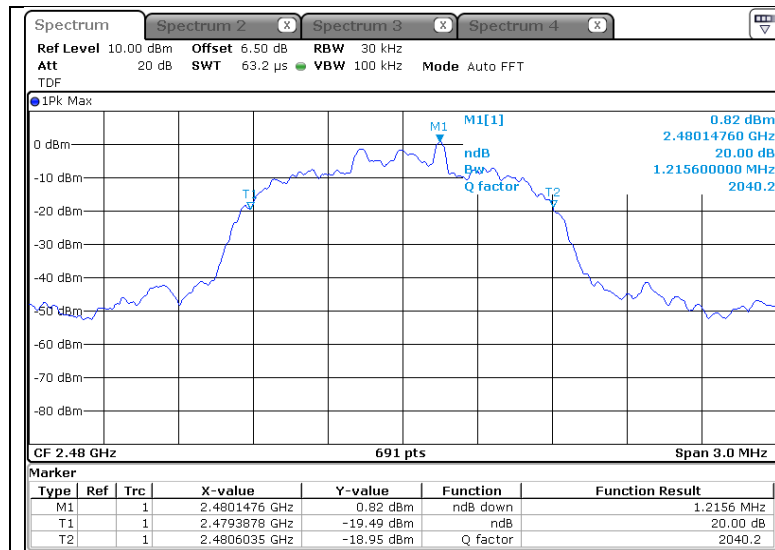
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

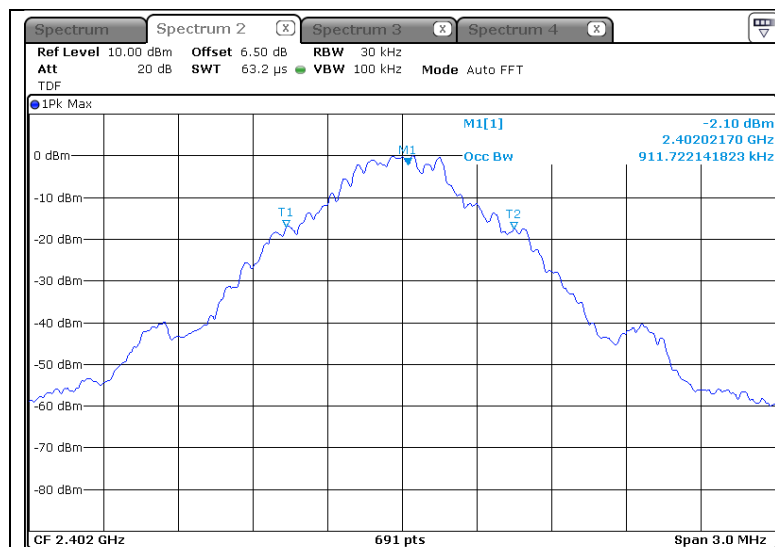


Highest Channel ( 2 480 MHz)

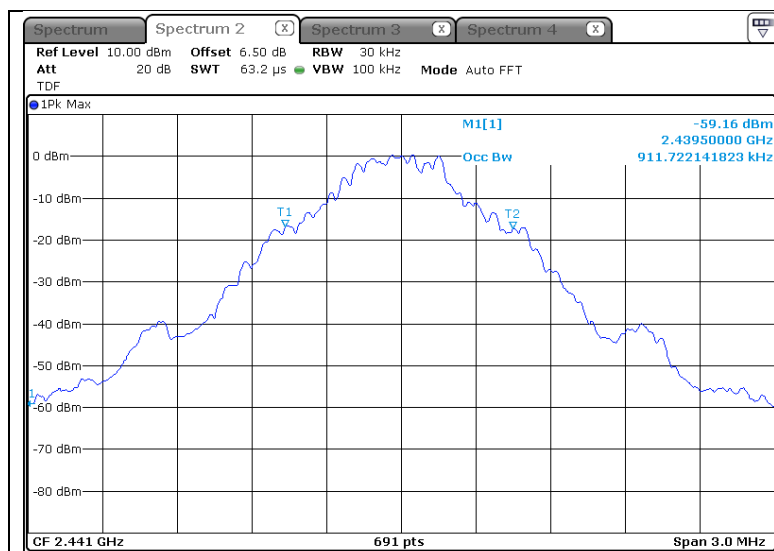


**\* GFSK (Occupied Bandwidth)**

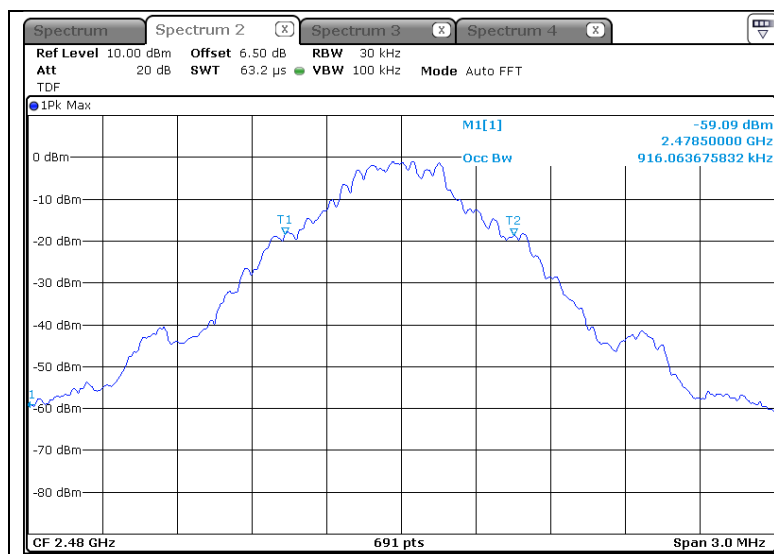
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

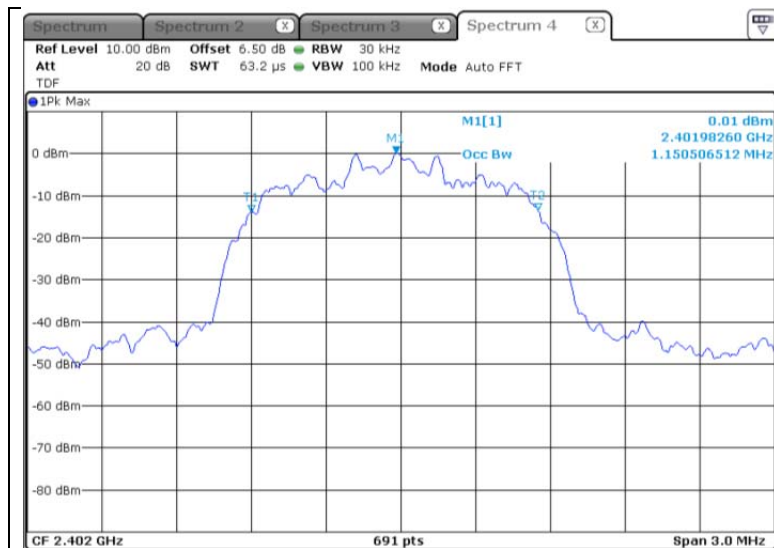


Highest Channel (2 480 MHz)

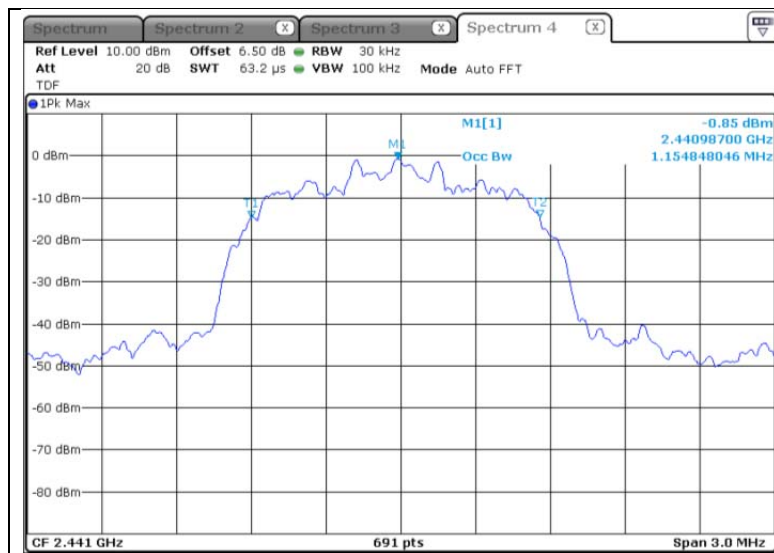


**\*  $\pi/4$ DQPSK (Occupied Bandwidth)**

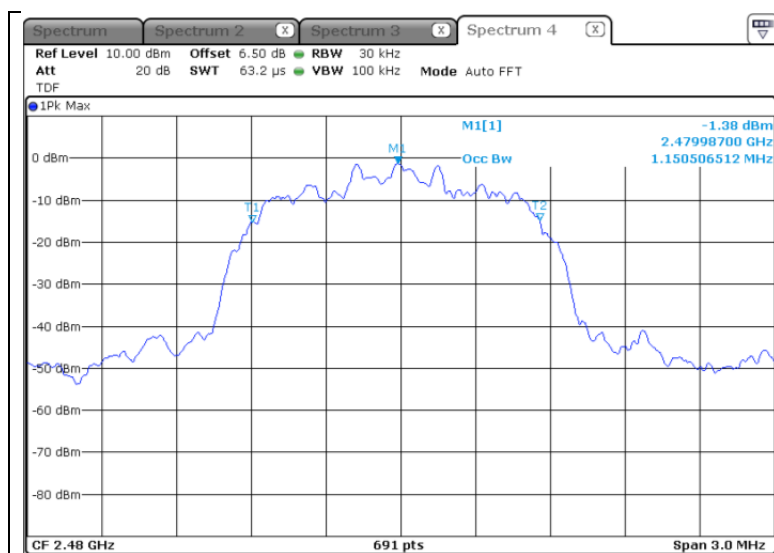
Lowest Channel( 2 402 MHz)



Middle Channel( 2 441 MHz)

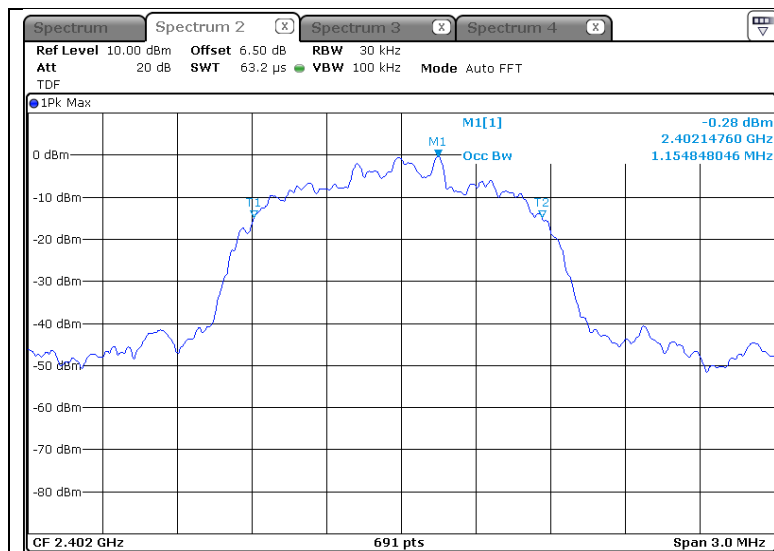


Highest Channel ( 2 480 MHz)

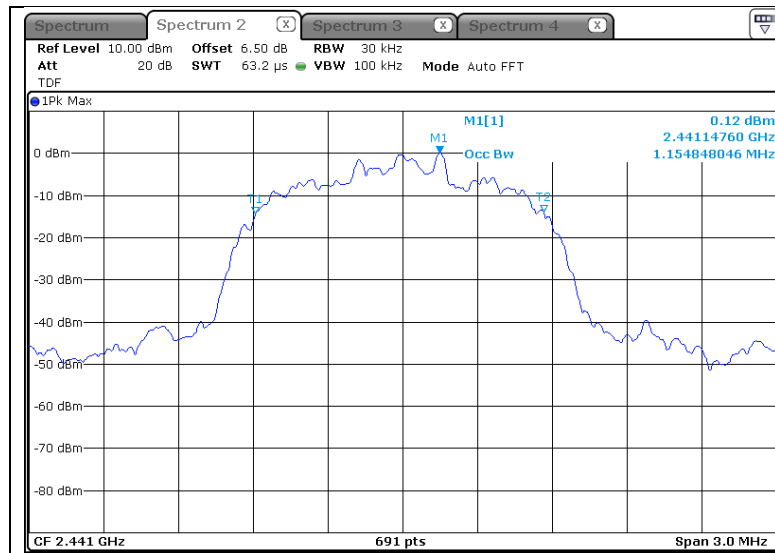


**\* 8DPSK (Occupied Bandwidth)**

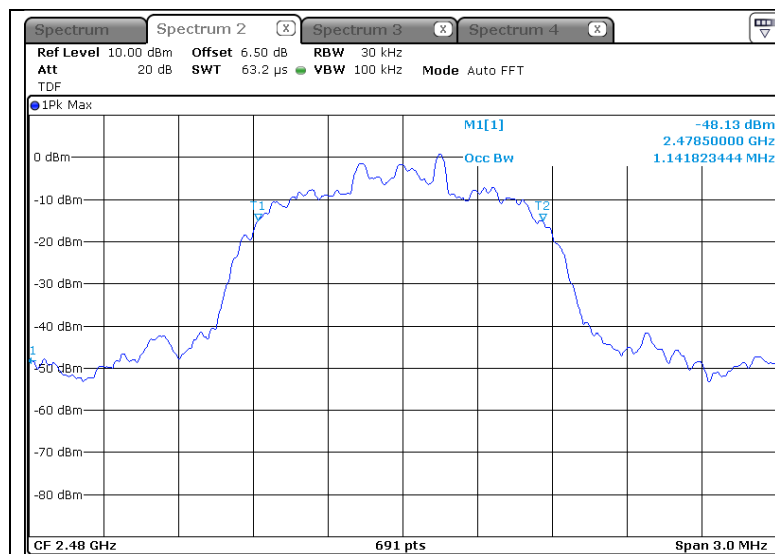
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)



Highest Channel (2 480 MHz)



## 5.5 Number of Hopping Channels

### 5.5.1 Regulation

According to §15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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. 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.

### 5.5.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable and attenuator.
3. Turn on the EUT and set the hopping function enabled by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = the frequency band of operation  $RBW \geq 1\%$  of the span  $VBW \geq RBW$  Sweep = auto Detector function = peak Trace = max hold
5. Record the number of hopping channels.

### 5.5.3 Test Result

- Complied

| Mode          | Frequency         | Number of hopping channel | Limit     |
|---------------|-------------------|---------------------------|-----------|
| GFSK          | 2 402 – 2 480 MHz | 79                        | $\geq 15$ |
| $\pi/4$ DQPSK | 2 402 – 2 480 MHz | 79                        | $\geq 15$ |
| 8DPSK         | 2 402 – 2 480 MHz | 79                        | $\geq 15$ |

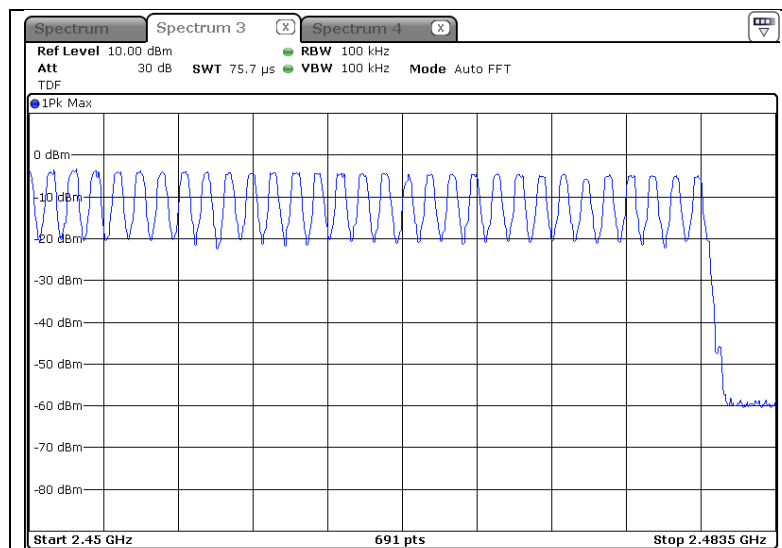
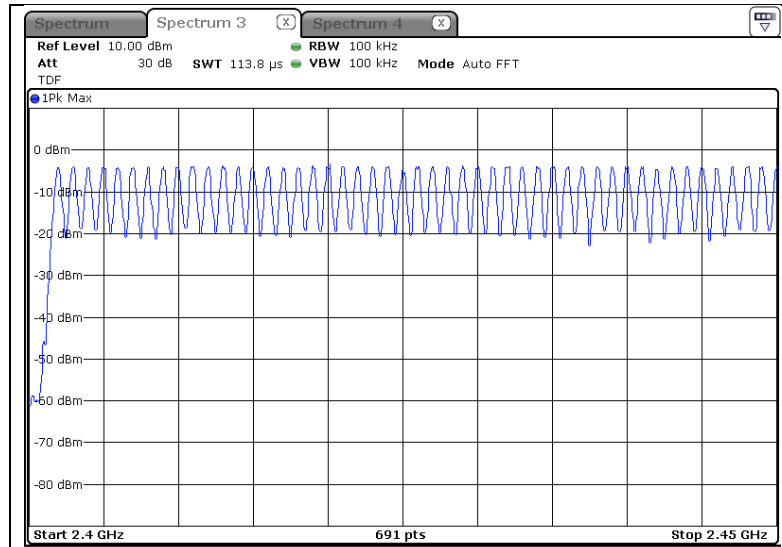
NOTE:

1. We took the insertion loss of the cable loss into consideration within the measuring instrument.
2. Measurement is made with EUT operating in hopping mode between 79 channels providing a worse case scenario as compared to AFH mode hopping between 20 channels.

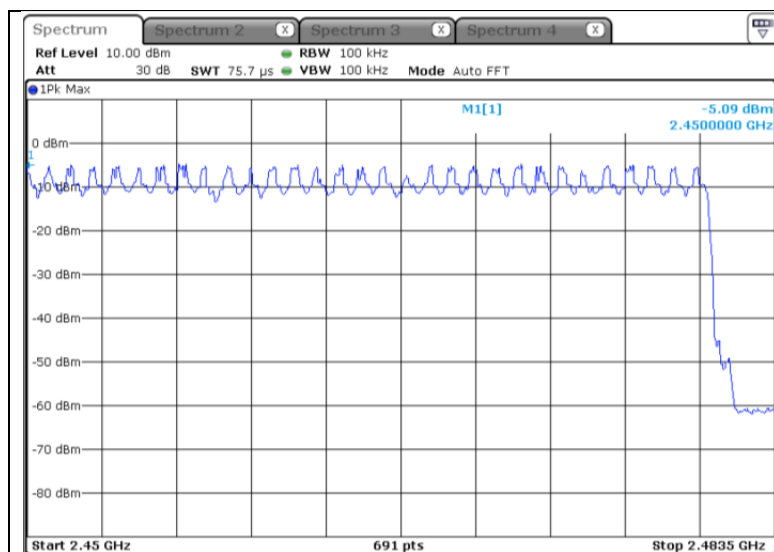
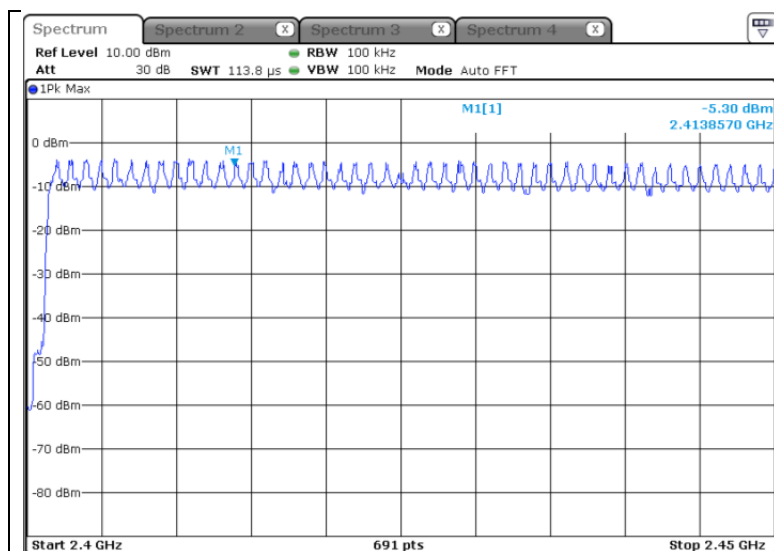
#### 5.5.4 Test Plot

Figure 4. Plot of the Number of Hopping Channels (Conducted)

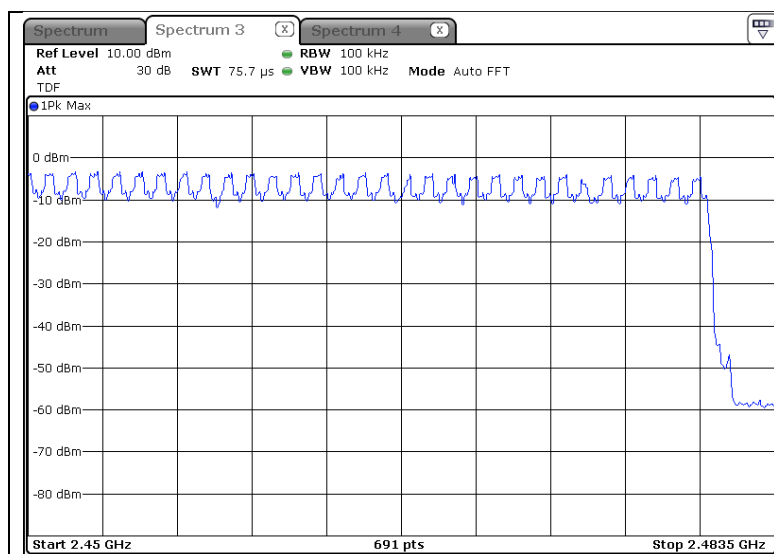
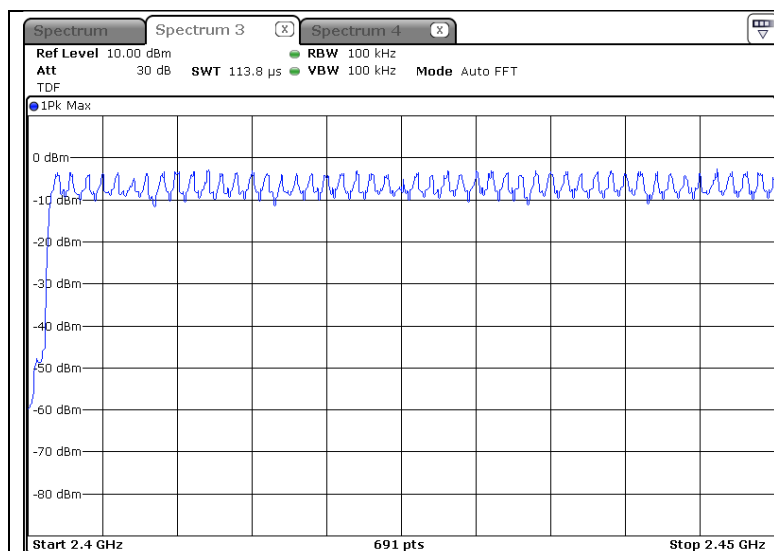
**\* GFSK**



\*  $\pi/4$ DQPSK



**\* 8DPSK**



## 5.6 Time of Occupancy(Dwell Time)

### 5.6.1 Regulation

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

### 5.6.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via UART interface or Bluetooth tester.
4. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel RBW = 1 MHz  
VBW  $\geq$  RBW Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak Trace = max hold
5. Measure the dwell time using the marker-delta function.
6. Repeat above procedures until all frequencies measured were complete.
7. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

### 5.6.3 Test Result

#### - Complied

| Hopping mode | Modulation    | Channel | Reading[ms] | Hopping rate [hop/s] | Number of Channels | Actual[s] | Limit[s] |
|--------------|---------------|---------|-------------|----------------------|--------------------|-----------|----------|
| Non-AFH      | GFSK          | Low     | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | Middle  | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | High    | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              | $\pi/4$ DQPSK | Low     | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              |               | Middle  | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              |               | High    | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              | 8DPSK         | Low     | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | Middle  | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | High    | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |

| Hopping mode | Modulation    | Channel | Reading[ms] | Hopping rate [hop/s] | Number of Channels | Actual[s] | Limit[s] |
|--------------|---------------|---------|-------------|----------------------|--------------------|-----------|----------|
| AFH          | GFSK          | Low     | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | Middle  | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | High    | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              | $\pi/4$ DQPSK | Low     | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              |               | Middle  | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              |               | High    | 2.892       | 266.667              | 79                 | 0.308     | 0.40     |
|              | 8DPSK         | Low     | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | Middle  | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |
|              |               | High    | 2.893       | 266.667              | 79                 | 0.309     | 0.40     |

NOTE 1. Non AFH

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period

Hopping rate = 1 600/time slot

Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds]

2. AFH

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period

Hopping rate = 800/time slot

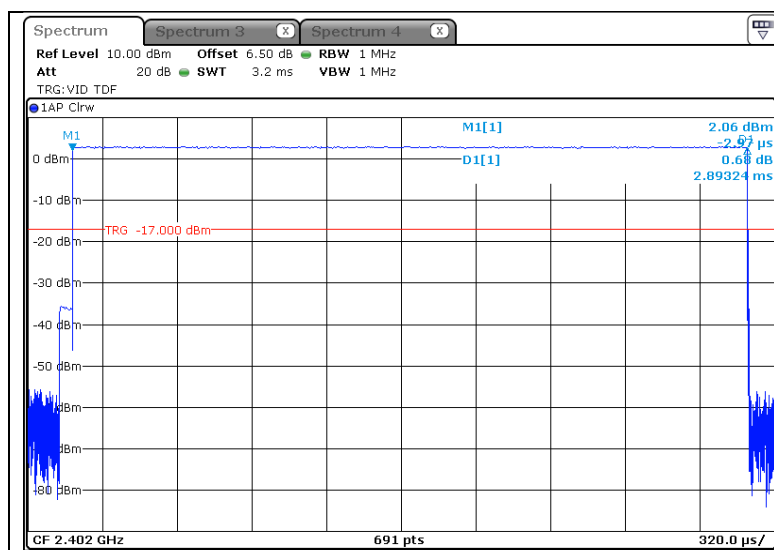
Test period = 0.4 [seconds / channel]  $\times$  20 [channel] = 8 [seconds]

## 5.6.4 Test Plot

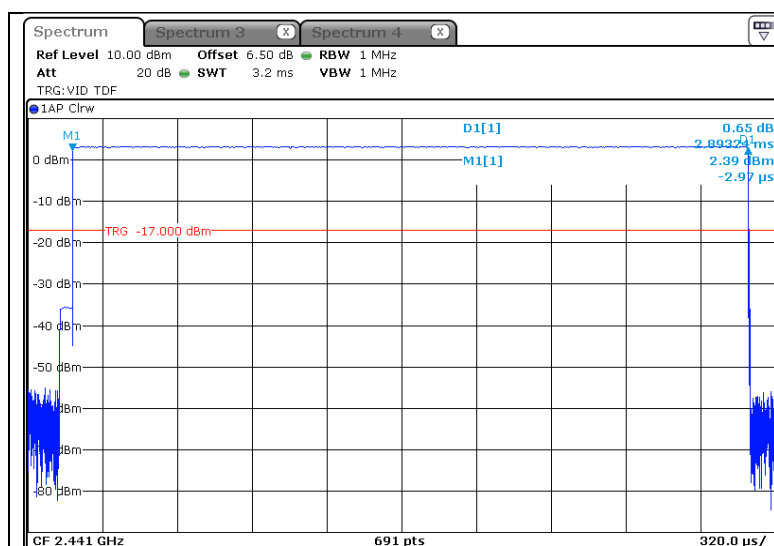
Figure 5. Plot of the Time of Occupancy (Conducted)

**\* GFSK**

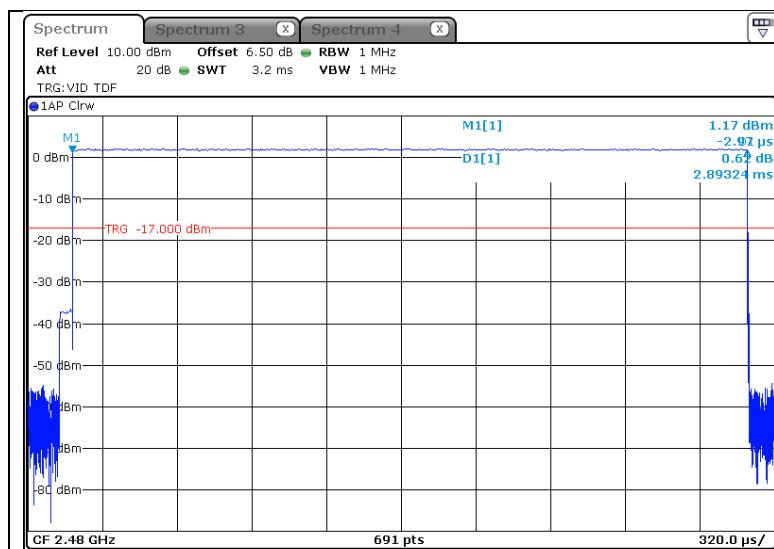
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

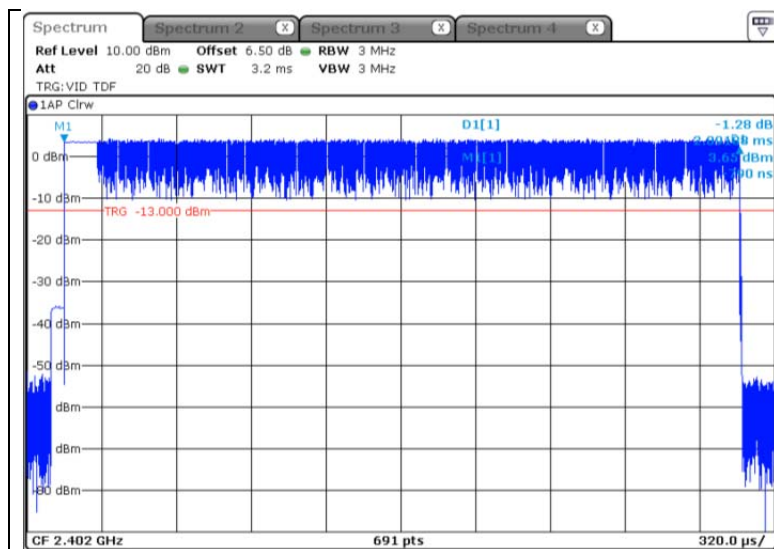


Highest Channel ( 2 480 MHz)

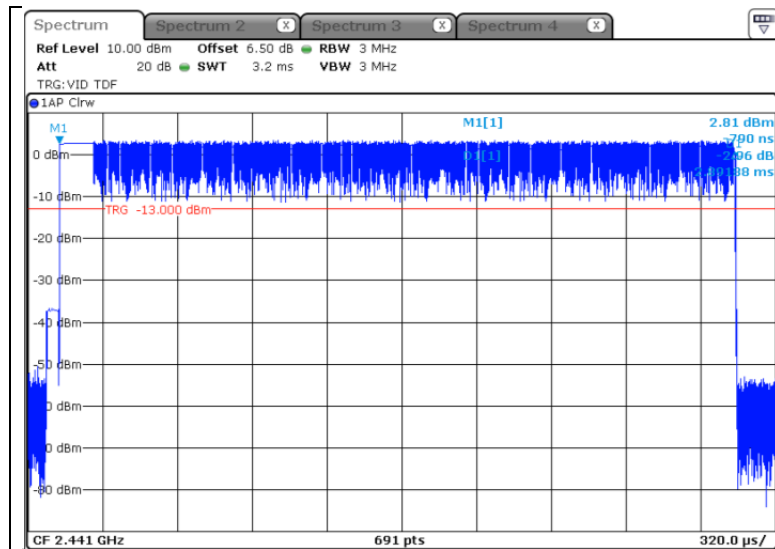


\*  $\pi/4$ DQPSK

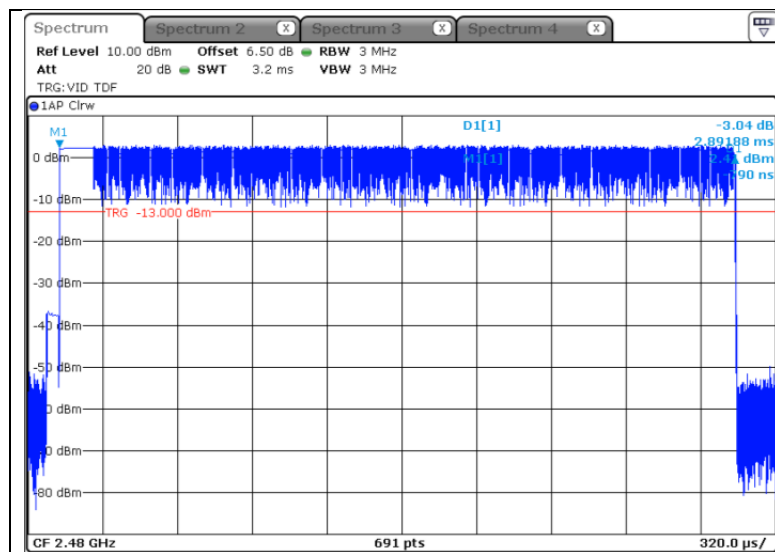
Lowest Channel( 2 402 MHz)



Middle Channel (2 441 MHz)

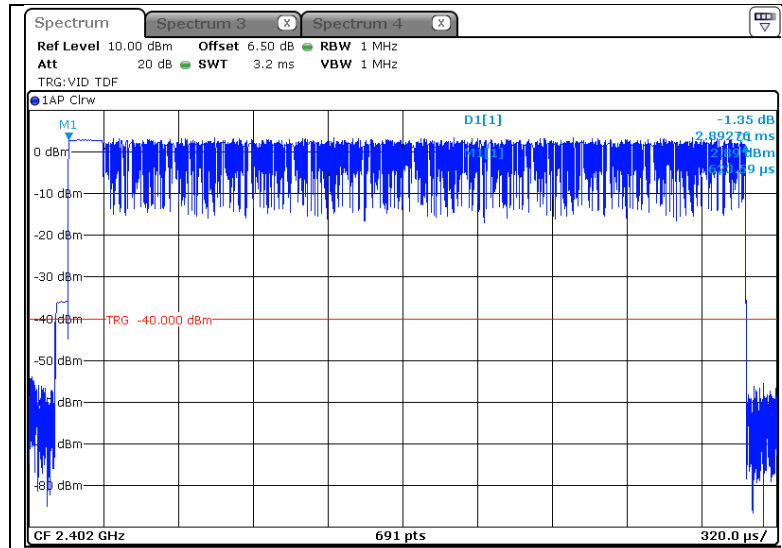


Highest Channel ( 2 480 MHz)

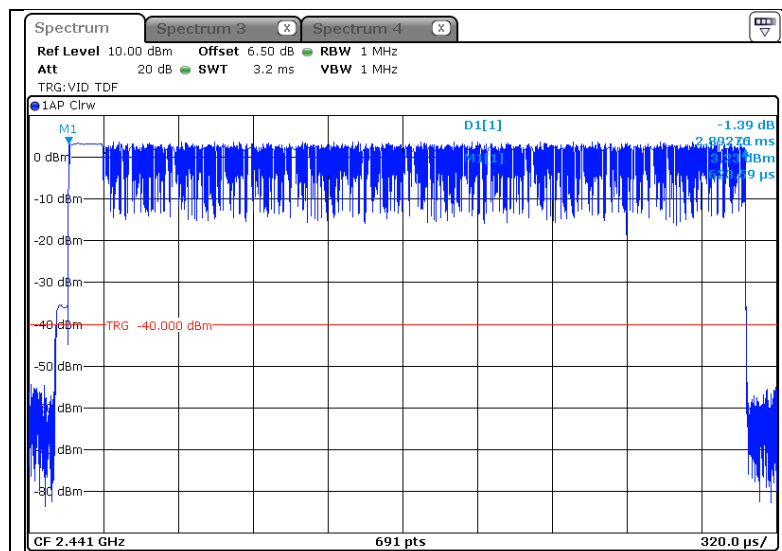


\* 8DPSK

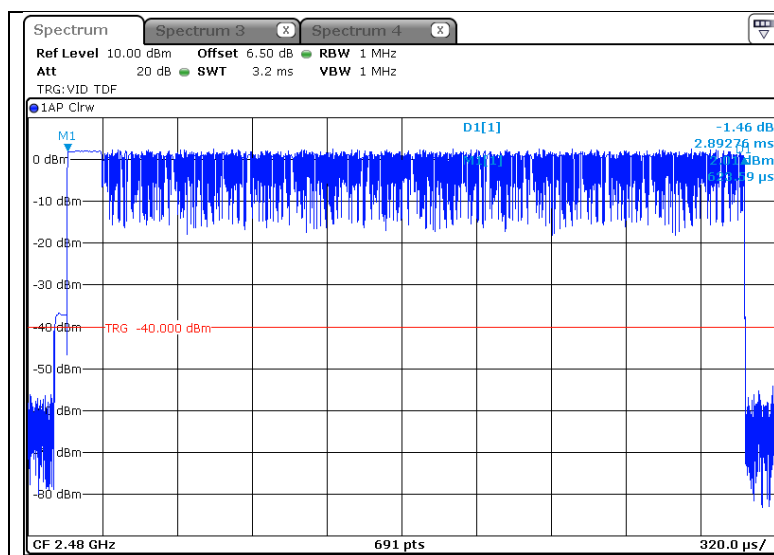
Lowest Channel( 2 402 MHz)



### Middle Channel (2 441 MHz)



Highest Channel ( 2 480 MHz)



## 5.7 Spurious Emission, Band edge and Restricted bands

### 5.7.1 Regulation

According to §15.247(d), 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to §15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field strength ( $\mu V/m$ ) | Measurement distance (m) |
|-----------------|------------------------------|--------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                  | 300                      |
| 0.490 - 1.705   | 24000/F(kHz)                 | 30                       |
| 1.705 - 30      | 30                           | 30                       |
| 30 - 88         | 100**                        | 3                        |
| 88 - 216        | 150**                        | 3                        |
| 216 - 960       | 200**                        | 3                        |
| Above 960       | 500                          | 3                        |

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.009 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15    |
| 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     | Above 38.6    |
| 13.36 - 13.41       |                       |                 |               |

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

## 5.7.2 Measurement Procedure

The method of measurement used to test this DSS device is FCC Public Notice DA 00-705.

### 1) Band-edge Compliance of RF Conducted Emissions

#### 1. Set the spectrum analyzer as follows:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation  
 RBW ≥ 1% of the span  
 VBW ≥ RBW  
 Sweep = auto  
 Detector function = peak  
 Trace = max hold

2. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

## 2) Spurious RF Conducted Emissions:

### 1. Set the spectrum analyzer as follows:

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  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

### 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

### 3. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

## 3) Spurious Radiated Emissions:

### 1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

### 2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

### 3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 26500 MHz using the horn antenna.

### 4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.

### 5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

## Note

### 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 GHz.

### 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.

### 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

### 5.7.3 Test Result

#### - Complied

1. Band edge compliance of RF Conducted Emissions was shown in figure 6.
2. Measured value of the Field strength of spurious Emissions (Radiated)
3. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

#### \* Below 1 GHz data (Worst-case: GFSK)

##### GFSK\_Lowest channel (2 402 MHz)

| Frequency<br>[MHz]                             | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|------------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Quasi-Peak DATA. Emissions below 30 MHz</b> |                                |               |                     |                |                      |                     |                |
| Below<br>30.00                                 | Not<br>Detected                | -             | -                   | -              | -                    | -                   | -              |
| <b>Quasi-Peak DATA. Emissions below 1 GHz</b>  |                                |               |                     |                |                      |                     |                |
| 39.94                                          | 120                            | V             | 41.80               | -14.70         | 27.10                | 40.00               | 12.90          |
| 46.13                                          | 120                            | V             | 43.80               | -13.70         | 30.10                | 40.00               | 9.90           |
| 66.50                                          | 120                            | V             | 35.10               | -16.80         | 18.30                | 40.00               | 21.70          |
| 449.89                                         | 120                            | H             | 30.60               | -8.30          | 22.30                | 46.00               | 23.70          |
| 599.88                                         | 120                            | V             | 20.40               | -5.00          | 15.40                | 46.00               | 30.60          |
| Above<br>600.00                                | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |

**\* Above 1 GHz data**

**GFSK \_Low channel (2 402 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| *2325.46                                   | 1 000                          | H             | 48.80               | 0.10           | 48.90                | 74.00               | 25.10          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| *2325.46                                   | 1 000                          | H             | 29.20               | 0.10           | 29.30                | 54.00               | 24.70          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |

\* This Asterisk means restricted band.

**GFSK \_Middle channel (2 441 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| -                                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| -                                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |

**GFSK \_High channel (2 480 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| *2483.68                                   | 1 000                          | H             | 53.40               | 0.70           | 54.10                | 74.00               | 19.90          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| *2483.68                                   | 1 000                          | H             | 29.00               | 0.70           | 29.70                | 54.00               | 24.30          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |

\* This Asterisk means restricted band.

**8DPSK \_Low channel (2 402 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| *2332.75                                   | 1 000                          | H             | 48.40               | 0.10           | 48.50                | 74.00               | 25.50          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| *2332.75                                   | 1 000                          | H             | 29.20               | 0.10           | 29.30                | 54.00               | 24.70          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        |               |                     |                |                      |                     |                |

**8DPSK \_Middle channel (2 441 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| -                                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| -                                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |

**8DPSK \_High channel (2 480 MHz)**

| Frequency<br>[MHz]                         | Receiver<br>Bandwidth<br>[kHz] | Pol.<br>[V/H] | Reading<br>[dB(μV)] | Factor<br>[dB] | Result<br>[dB(μV/m)] | Limit<br>[dB(μV/m)] | Margin<br>[dB] |
|--------------------------------------------|--------------------------------|---------------|---------------------|----------------|----------------------|---------------------|----------------|
| <b>Peak DATA. Emissions above 1 GHz</b>    |                                |               |                     |                |                      |                     |                |
| *2489.84                                   | 1 000                          | H             | 56.60               | 0.70           | 57.30                | 74.00               | 16.70          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        | -             | -                   | -              | -                    | -                   | -              |
| <b>Average DATA. Emissions above 1 GHz</b> |                                |               |                     |                |                      |                     |                |
| *2489.84                                   | 1 000                          | H             | 30.20               | 0.70           | 30.90                | 54.00               | 23.10          |
| Above<br>3 000.00                          | <b>Not<br/>Detected</b>        |               |                     |                |                      |                     |                |

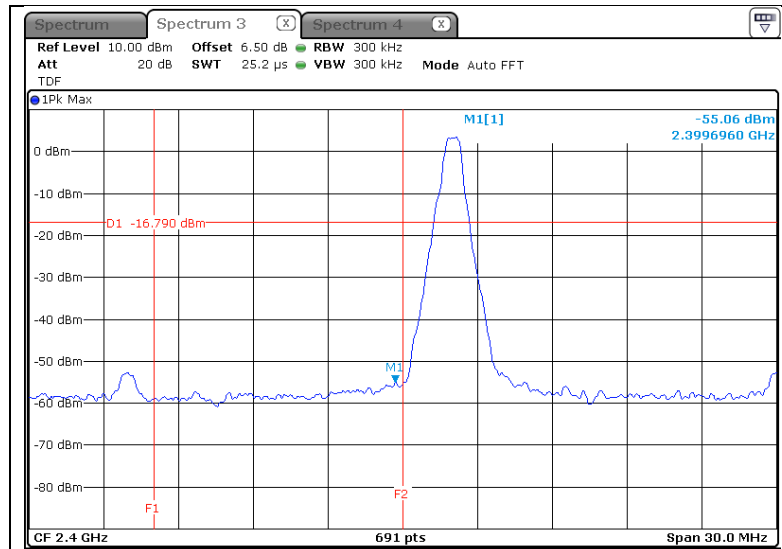
\* This Asterisk means restricted band.

## 5.7.4 Test Plot

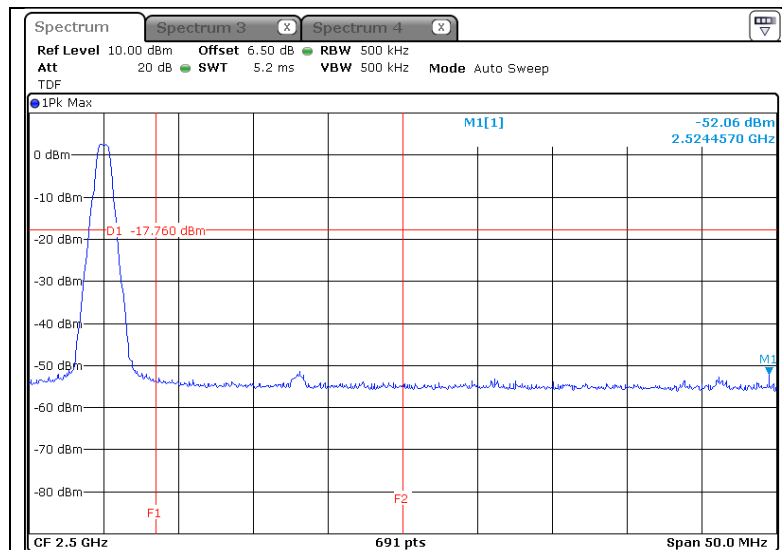
Figure 6. Plot of the Band Edge (Conducted)

**\* GFSK (Without hopping)**

Lowest Channel( 2 402 MHz)

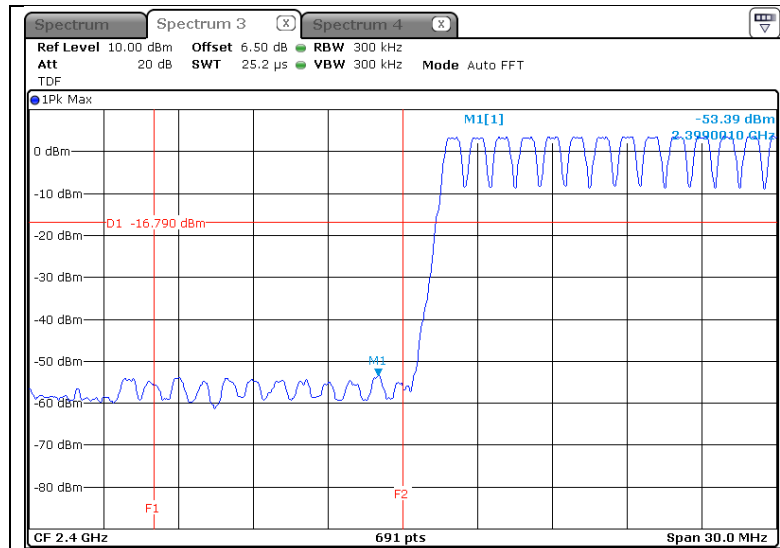


Highest Channel (2 480 MHz)

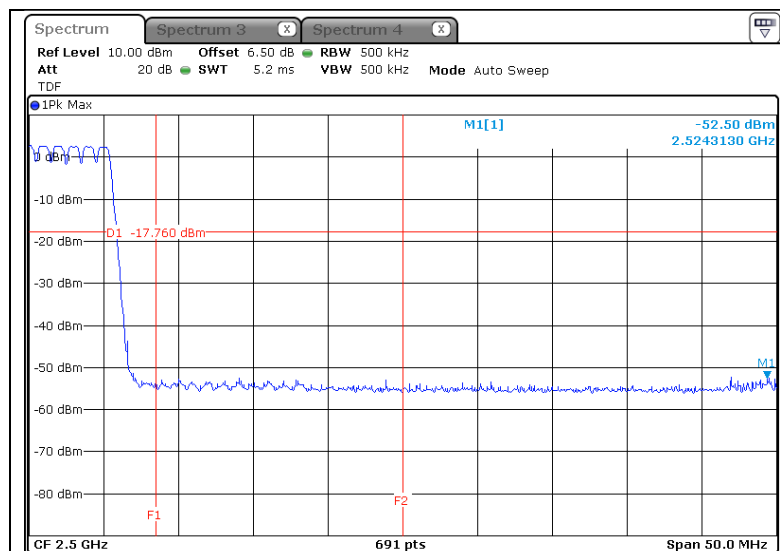


**\* GFSK (With hopping)**

Lowest Channel( 2 402 MHz)

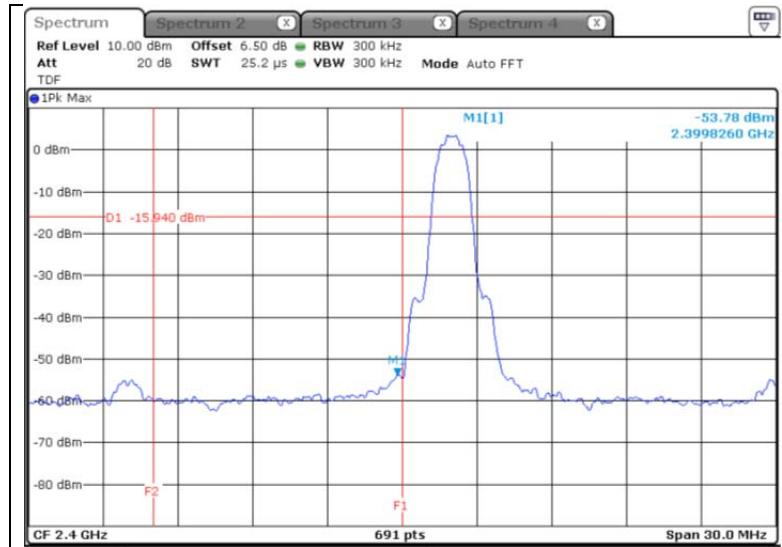


Highest Channel (2 480 MHz)

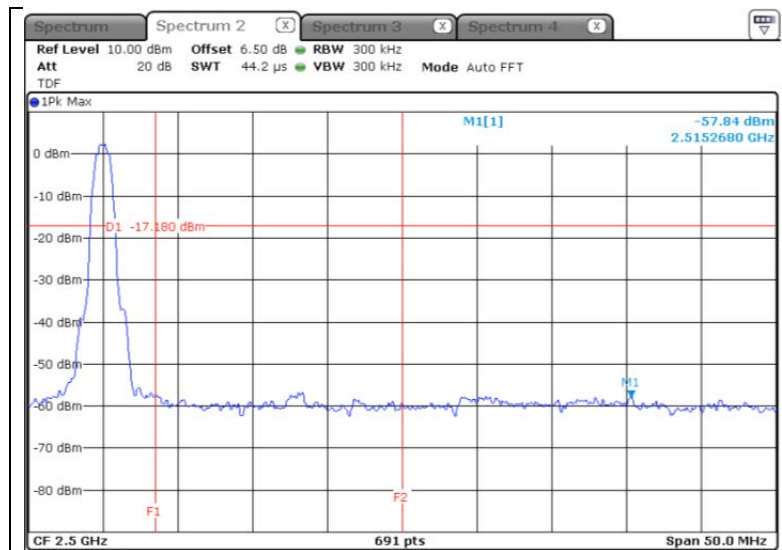


**\*  $\pi/4$ DQPSK (Without hopping)**

Lowest Channel( 2 402 MHz)

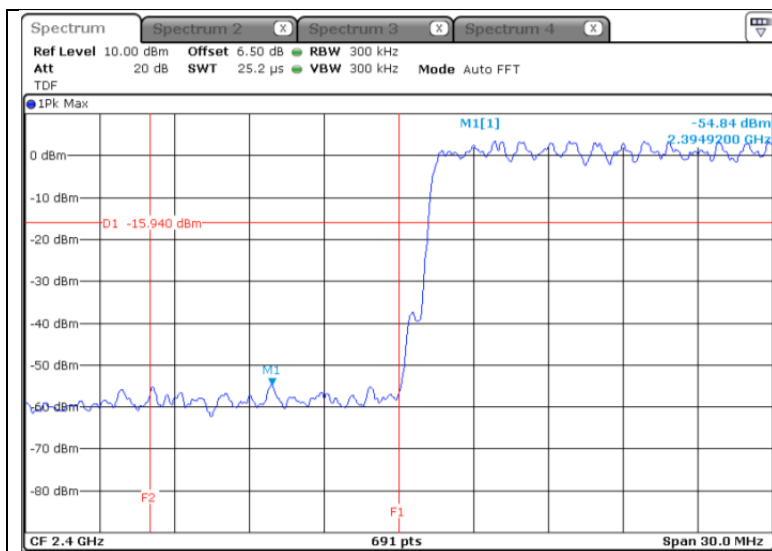


Highest Channel (2 480 MHz)

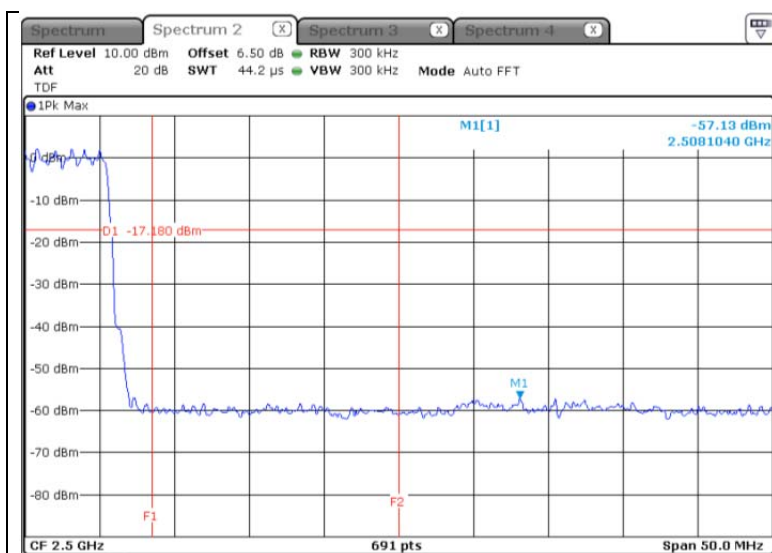


## \* $\pi/4$ DQPSK (With hopping)

Lowest Channel( 2 402 MHz)

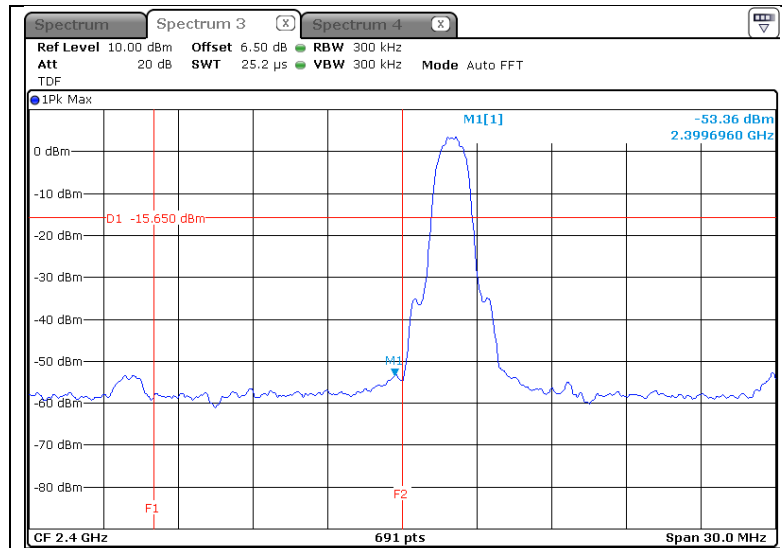


Highest Channel (2 480 MHz)

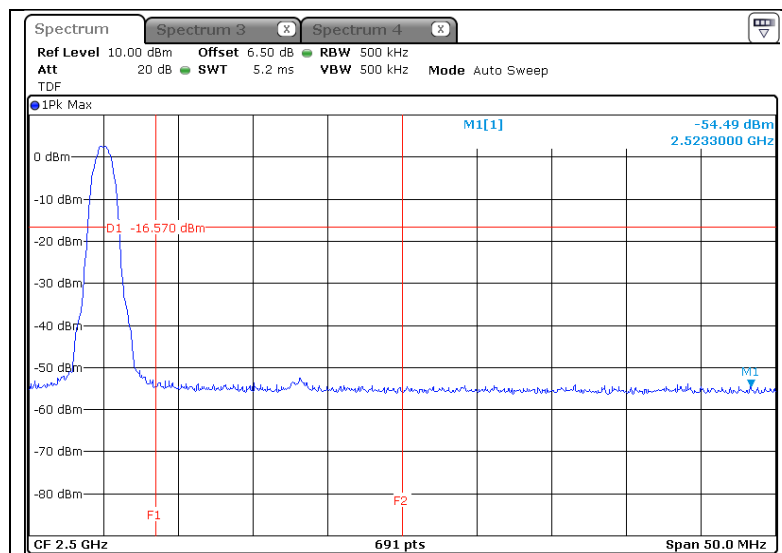


**\* 8DPSK (Without hopping)**

Lowest Channel( 2 402 MHz)

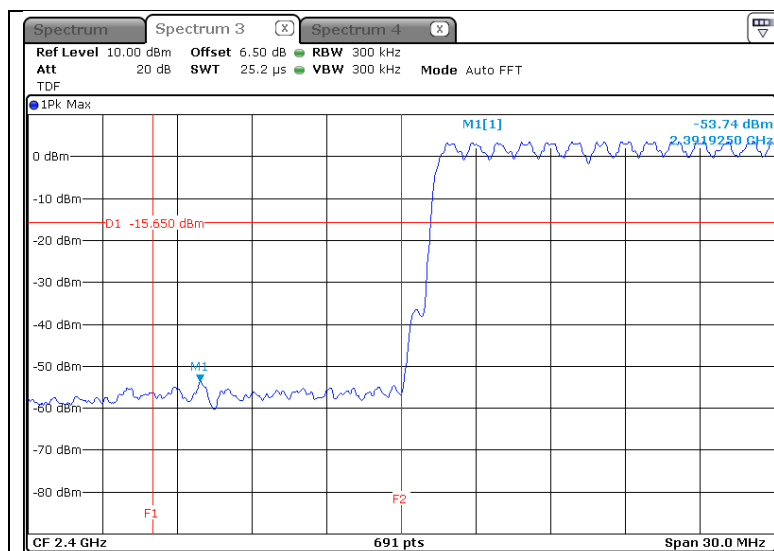


Highest Channel (2 480 MHz)



**\* 8DPSK (With hopping)**

Lowest Channel( 2 402 MHz)



Highest Channel (2 480 MHz)

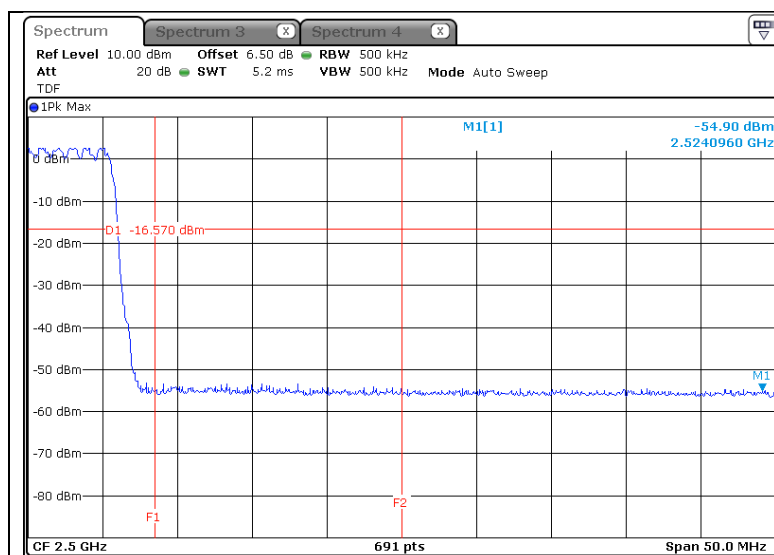
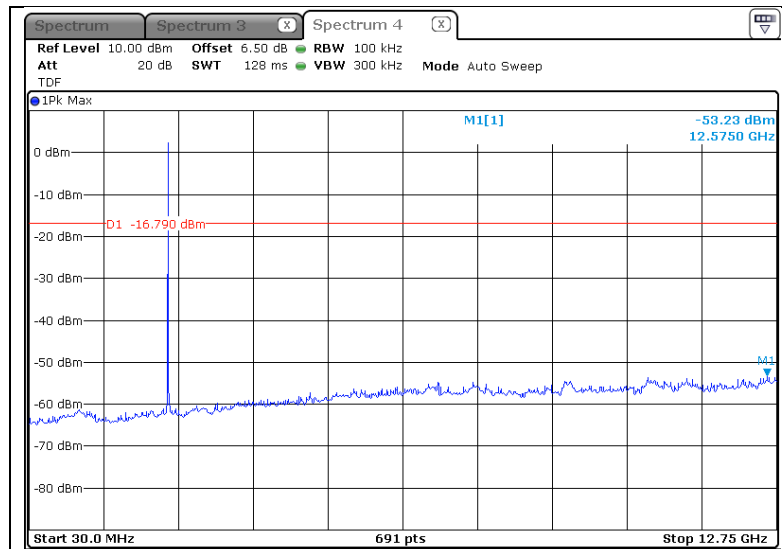


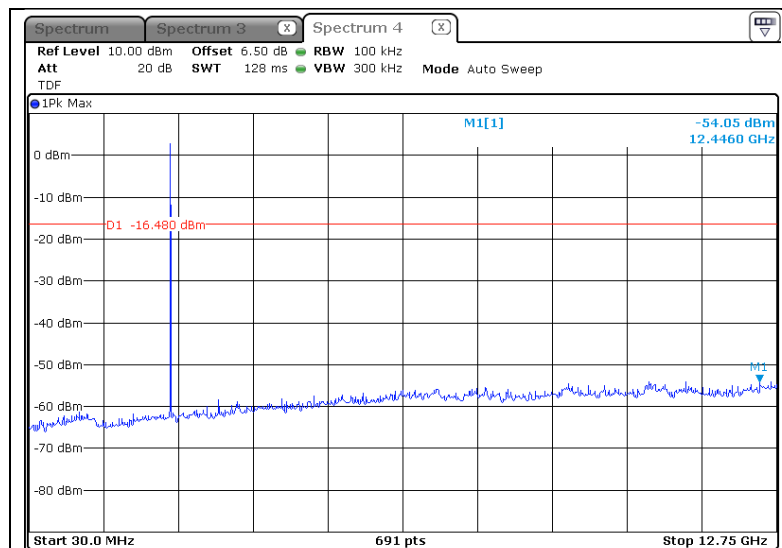
Figure 7. Plot of the Spurious RF conducted emissions

**\* GFSK**

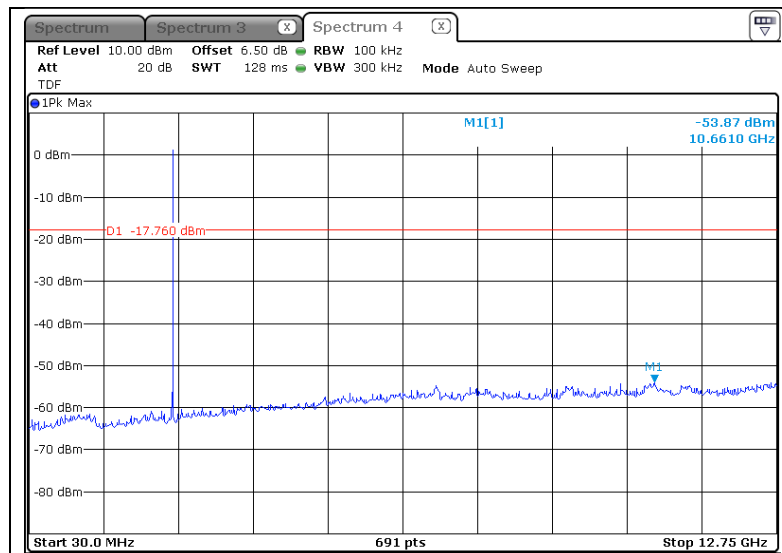
Lowest Channel ( 2 402 MHz)



Middle Channel (2 441 MHz)

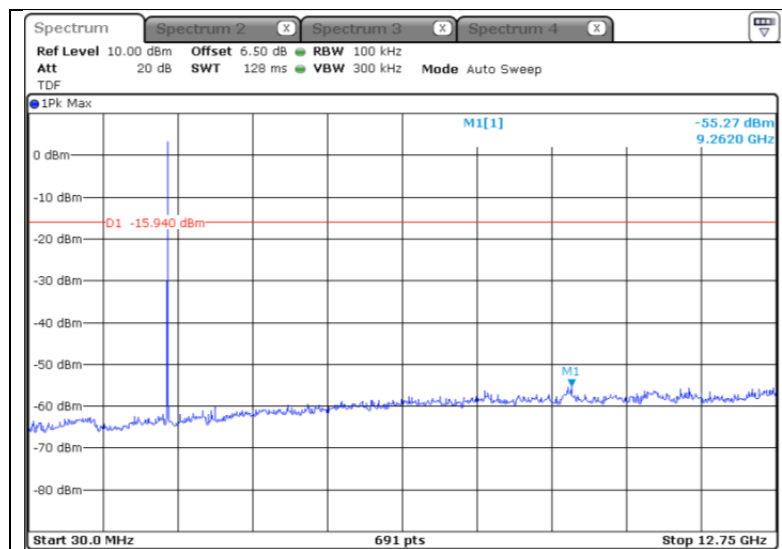


Highest Channel ( 2 480 MHz)

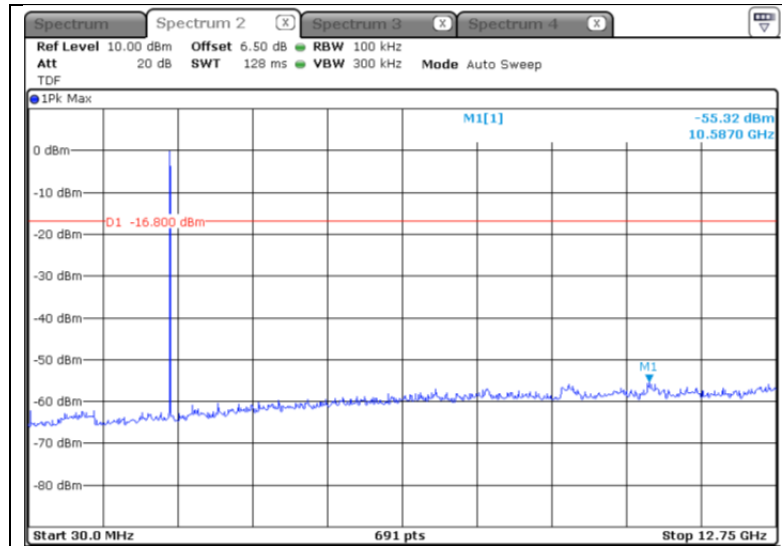


\*  $\pi/4$ DQPSK

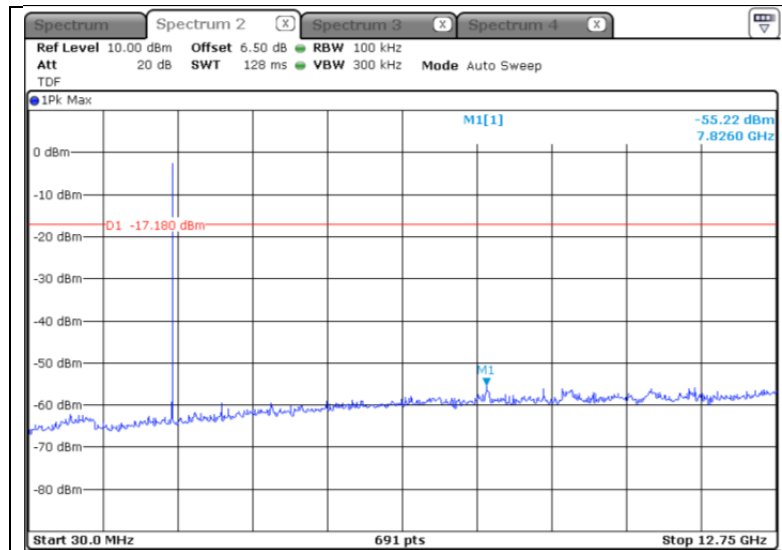
Lowest Channel ( 2 402 MHz)



Middle Channel (2 441 MHz)

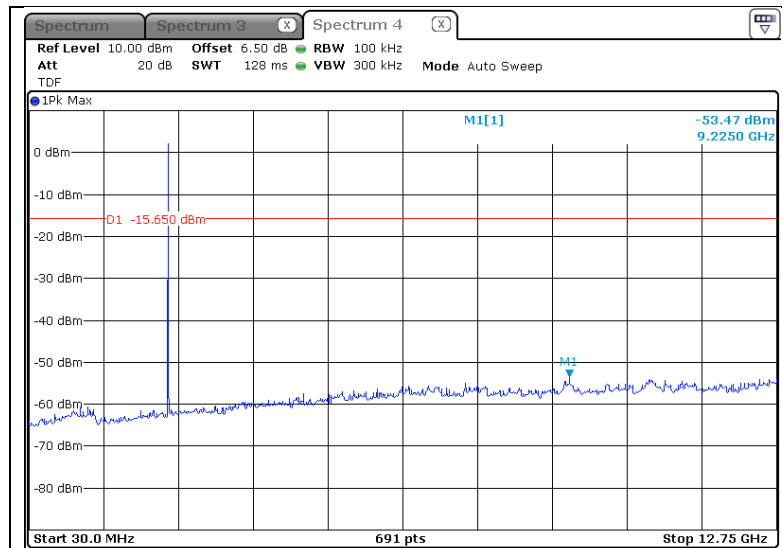


Highest Channel ( 2 480 MHz)

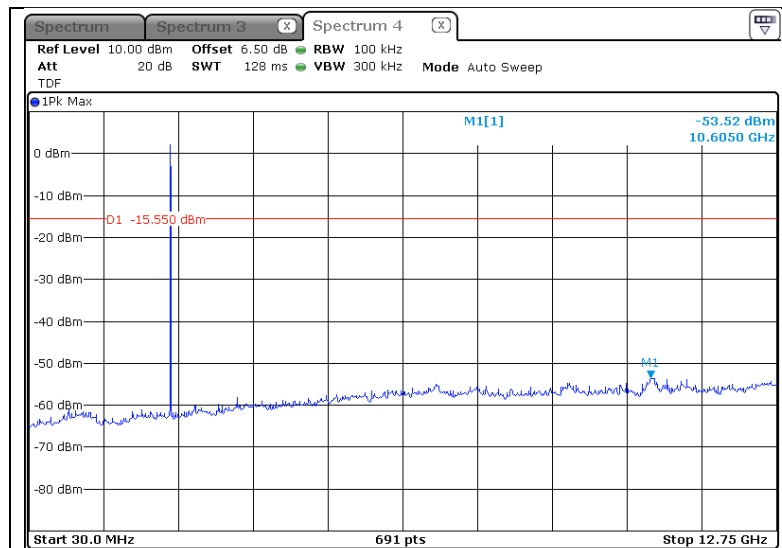


**\* 8DPSK**

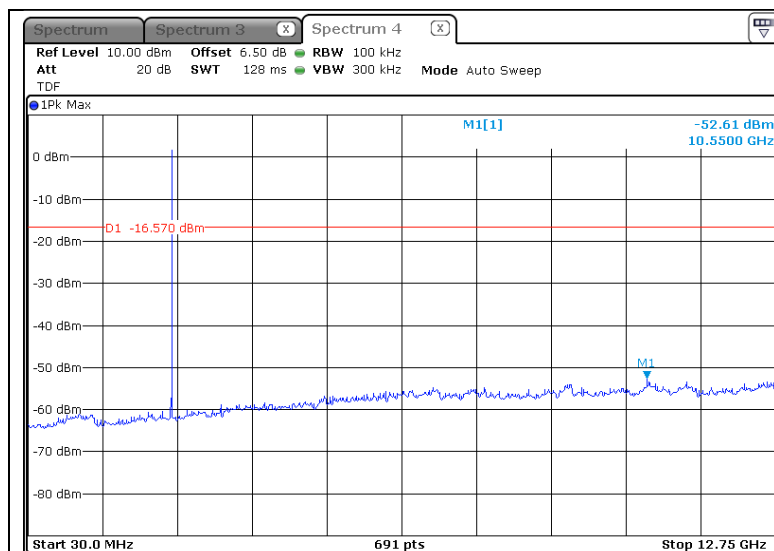
Lowest Channel ( 2 402 MHz)



Middle Channel (2 441 MHz)



Highest Channel ( 2 480 MHz)



## 6. Test equipment used for test

|   | Description             | Manufacturer                | Model No.         | Serial No. | Next Cal Date. |
|---|-------------------------|-----------------------------|-------------------|------------|----------------|
| ■ | Temp & humidity chamber | ESPEC CORP.                 | SH-641            | 92005476   | 15.12.26       |
| ■ | Spectrum Analyzer       | R&S                         | FSV40             | 100988     | 16.01.26       |
| ■ | Wideband Power Sensor   | R&S                         | NRP-Z81           | 102398     | 15.11.27       |
| ■ | DC Power Supply         | AGILENT                     | E3632A            | MY40004399 | 16.01.06       |
| ■ | Loop Antenna            | R&S                         | HFH2-Z2           | 861971/003 | 17.03.03       |
| ■ | Bi-Log Antenna          | SCHWARZBECK                 | VULB9163          | 552        | 16.06.14       |
| ■ | Horn Antenna            | SCHWARZBECK                 | 3117              | 155787     | 16.02.05       |
| ■ | Horn Antenna            | ETS.lindgren                | 3116              | 86632      | 15.10.20       |
| ■ | Amplifier               | SONOMA INSTRUMENT           | 310               | 293004     | 15.09.25       |
| ■ | Emi Test Receiver       | R&S                         | ESCI              | 101078     | 16.02.16       |
| ■ | Vector Signal Generator | R&S                         | SMBV100A          | 257566     | 16.01.06       |
| ■ | Broadband Preamplifier  | SCHWARZBECK                 | BBV9721           | 2          | 16.05.19       |
| ■ | Broadband Preamplifier  | SCHWARZBECK                 | BBV9718           | 9718-233   | 16.04.13       |
| ■ | Power Divider           | Aeroflex/Weinschel, Inc     | 1580-1            | NX375      | 15.10.14       |
| ■ | Power Divider           | Aeroflex/Weinschel, Inc     | 1580-1            | RM986      | 16.04.08       |
| ■ | Attenuator              | HP                          | 8494A             | 2631A09825 | 15.10.14       |
| ■ | Attenuator              | HP                          | 8496A             | 3308A16640 | 15.10.14       |
| ■ | Antenna Mast            | Innco Systems               | MA4000-EP         | -          | -              |
| ■ | Turn Table              | Innco Systems               | DT2000            | -          | -              |
| ■ | Highpass Filter         | Wainwright Instruments GmbH | WHKX3.0 /18G-12SS | 44         | 16.02.02       |
| ■ | Highpass Filter         | Wainwright Instruments GmbH | WHKX6.5/18G-8SS   | 2          | 16.06.15       |