



# RADIO TEST REPORT

Report No: FCS202409041W01

Issued for

|                                                                                                                                                                                                                                                                             |                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Applicant:                                                                                                                                                                                                                                                                  | Shenzhen Wang Chu Technology Trading Co., Ltd                                                    |
| Address:                                                                                                                                                                                                                                                                    | 301, No.19-20, Hualong Xincun, Guanghua Community, Jihua St., Longgang District, Shenzhen, China |
| Product Name:                                                                                                                                                                                                                                                               | Music Boxing Machine                                                                             |
| Brand Name:                                                                                                                                                                                                                                                                 | TGLLM                                                                                            |
| Model Name:                                                                                                                                                                                                                                                                 | HJ-005                                                                                           |
| Series Model:                                                                                                                                                                                                                                                               | N/A                                                                                              |
| FCC ID:                                                                                                                                                                                                                                                                     | 2BKOGHJ-005                                                                                      |
| Test Standard:                                                                                                                                                                                                                                                              | FCC Part 15.247                                                                                  |
| Issued By: Flux Compliance Service Laboratory<br>Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road<br>Hi-Tech Industrial, Song shan lake Dongguan<br>Tel: 769-27280901 Fax:769-27280901 <a href="http://www.FCS-lab.com">http://www.FCS-lab.com</a> |                                                                                                  |

## TEST RESULT CERTIFICATION

**Applicant's Name** .....: Shenzhen Wang Chu Technology Trading Co., Ltd  
**Address**.....: 301, No.19-20, Hualong Xincun, Guanghua Community, Jihua St.,  
Longgang District, Shenzhen, China  
**Manufacture's Name** .....: Shenzhen Wang Chu Technology Trading Co., Ltd  
**Address**.....: 301, No.19-20, Hualong Xincun, Guanghua Community, Jihua St.,  
Longgang District, Shenzhen, China

### Product Description

**Product Name** .....: Music Boxing Machine  
**Brand Name**.....: TGLLM  
**Model Name** .....: HJ-005  
**Series Model**.....: N/A

**Test Standards** .....: FCC Part15.247

**Test Procedure**.....: ANSI C63.10-2013

This device described above has been tested by FCS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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**Date of Test** ..... :

**Date (s) of performance of tests** ..... : Sep. 02. 2024 ~ Sep. 03. 2024

**Date of Issue**..... : Sep. 03. 2024

**Test Result** ..... : Pass

Tested by

:

*Scott Shen*

(Scott Shen)

Reviewed by

:

*Duke Qian*

(Duke Qian)

Approved by

:

*Jack Wang*

(Jack Wang)



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**Revision History**

| Rev. | Issue Date   | Effect Page | Contents      |
|------|--------------|-------------|---------------|
| 00   | Sep. 03.2024 | All         | Initial Issue |

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:  
KDB 558074 D01 15.247 Meas Guidance v05r02.

| FCC Part 15.247, Subpart C    |                                         |          |        |
|-------------------------------|-----------------------------------------|----------|--------|
| Standard Section              | Test Item                               | Judgment | Remark |
| 15.207                        | Conducted Emission                      | PASS     | --     |
| 15.247(a)(1)                  | Hopping Channel Separation              | PASS     | --     |
| 15.247(a)(1)&(b)(1)           | Output Power                            | PASS     | --     |
| 15.209                        | Radiated Spurious Emission              | PASS     | --     |
| 15.247(d)                     | Conducted Spurious & Band Edge Emission | PASS     | --     |
| 15.247(a)(1)(iii)             | Number of Hopping Frequency             | PASS     | --     |
| 15.247(a)(1)(iii)             | Dwell Time                              | PASS     | --     |
| 15.247(a)(1)                  | Bandwidth                               | PASS     | --     |
| 15.205                        | Restricted bands of operation           | PASS     | --     |
| Part 15.247(d)/part 15.209(a) | Band Edge Emission                      | PASS     | --     |
| 15.203                        | Antenna Requirement                     | PASS     | --     |

### NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report.
- (2) All tests are according to ANSI C63.10-2013.

## 1.1 TEST FACTORY

| Company Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Flux Compliance Service Laboratory                                                                               |                                                                                                                   |                                                                                                 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------|----------------|---------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Address:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan |                                                                                                                   |                                                                                                 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
| Telephone:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | +86-769-27280901                                                                                                 |                                                                                                                   |                                                                                                 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
| Fax:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | +86-769-27280901                                                                                                 |                                                                                                                   |                                                                                                 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
| FCC Test Firm Registration Number: 514908<br>Designation number: CN0127<br>A2LA accreditation number: 5545.01<br>ISED Number: 25801<br>CAB ID : CN0097                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                  |                                                                                                                   |                                                                                                 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
| <table><tr><th>Organization</th><th>CAB identifier</th><th>Scope / Recognition Date (yyyy-mm-dd)</th><th>Expiration (yyyy-mm-dd)</th></tr><tr><td>FLUX COMPLIANCE SERVICE LABORATORY<br/><br/>Room 105 Floor Bao hao Technology Building<br/>1 NO.15 Gong ye West Road Hi-Tech Industrial,<br/>Song shan lake Dongguan<br/><br/>ISED#: 25801<br/>Contact: Andy Yue<br/>andv-vue@fcs-lab.com</td><td>CN0097</td><td>RSS-102(RFExp)<br/>(2020-01-09)<br/><br/>RSS-GEN<br/>(2020-01-09)<br/><br/>RSS-210 (2020-01-09)<br/>RSS-247 (2020-01-09)</td><td>RECOGNIZED UNTIL:<br/>2023-12-31<br/><br/>A2LA<br/>ISO/IEC<br/>17025: 2017<br/>Expires:<br/>2023-12-31</td></tr></table> |                                                                                                                  |                                                                                                                   |                                                                                                 | Organization | CAB identifier | Scope / Recognition Date (yyyy-mm-dd) | Expiration (yyyy-mm-dd) | FLUX COMPLIANCE SERVICE LABORATORY<br><br>Room 105 Floor Bao hao Technology Building<br>1 NO.15 Gong ye West Road Hi-Tech Industrial,<br>Song shan lake Dongguan<br><br>ISED#: 25801<br>Contact: Andy Yue<br>andv-vue@fcs-lab.com | CN0097 | RSS-102(RFExp)<br>(2020-01-09)<br><br>RSS-GEN<br>(2020-01-09)<br><br>RSS-210 (2020-01-09)<br>RSS-247 (2020-01-09) | RECOGNIZED UNTIL:<br>2023-12-31<br><br>A2LA<br>ISO/IEC<br>17025: 2017<br>Expires:<br>2023-12-31 |
| Organization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CAB identifier                                                                                                   | Scope / Recognition Date (yyyy-mm-dd)                                                                             | Expiration (yyyy-mm-dd)                                                                         |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |
| FLUX COMPLIANCE SERVICE LABORATORY<br><br>Room 105 Floor Bao hao Technology Building<br>1 NO.15 Gong ye West Road Hi-Tech Industrial,<br>Song shan lake Dongguan<br><br>ISED#: 25801<br>Contact: Andy Yue<br>andv-vue@fcs-lab.com                                                                                                                                                                                                                                                                                                                                                                                                                                            | CN0097                                                                                                           | RSS-102(RFExp)<br>(2020-01-09)<br><br>RSS-GEN<br>(2020-01-09)<br><br>RSS-210 (2020-01-09)<br>RSS-247 (2020-01-09) | RECOGNIZED UNTIL:<br>2023-12-31<br><br>A2LA<br>ISO/IEC<br>17025: 2017<br>Expires:<br>2023-12-31 |              |                |                                       |                         |                                                                                                                                                                                                                                   |        |                                                                                                                   |                                                                                                 |

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                                 | Uncertainty          |
|-----|--------------------------------------|----------------------|
| 1   | RF output power, conducted           | $\pm 0.68\text{dB}$  |
| 2   | Unwanted Emissions, conducted        | $\pm 2.988\text{dB}$ |
| 3   | All emissions radiated (9KHz -30MHz) | $\pm 5.1\text{ dB}$  |
| 4   | All emissions, radiated 30-1GHz      | $\pm 5.6\text{dB}$   |
| 5   | All emissions, radiated 1G-6GHz      | $\pm 5.5\text{dB}$   |
| 6   | All emissions, radiated >6G          | $\pm 5.8\text{dB}$   |
| 7   | Conducted Emission (9KHz-150KHz)     | $\pm 3.37\text{dB}$  |
| 8   | Conducted Emission (150KHz-30MHz)    | $\pm 3.83\text{dB}$  |
| 9   | Duty Cycle                           | $\pm 3.2\%$          |
| 10  | Occupied bandwidth                   | 4(%)                 |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF THE EUT

|                              |                                          |                             |
|------------------------------|------------------------------------------|-----------------------------|
| Product Name/PMN             | Music Boxing Machine                     |                             |
| Trade Name                   | TGLLM                                    |                             |
| Model Name/HVIN              | HJ-005                                   |                             |
| Series Model/HVIN            | N/A                                      |                             |
| Model Difference             | N/A                                      |                             |
| Product Description          | Operation Frequency:                     | 2402~2480 MHz               |
|                              | Modulation Type:                         | GFSK, $\pi/4$ -DQPSK, 8DPSK |
|                              | Bit Rate of Transmitter:                 | 1 Mbps/2 Mbps/3 Mbps        |
|                              | Number of Channel:                       | 79CH                        |
|                              | Antenna Designation:                     | Please see Note 4.          |
|                              | Antenna Gain (dBi):                      | 0 dBi                       |
|                              |                                          |                             |
| Channel List                 | Please refer to the Note 2.              |                             |
| Power Supply                 | DC 5V                                    |                             |
| Battery                      | Rated Voltage: 3.7V<br>Capacity: 2000mAh |                             |
| Test sample number           | FCS202409041001                          |                             |
| Hardware version number      | V01                                      |                             |
| Software version number/FVIN | V01                                      |                             |
| Connecting I/O Port(s)       | Please refer to the User's Manual        |                             |



Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.

2.

| Channel List |                 |         |                 |         |                 |
|--------------|-----------------|---------|-----------------|---------|-----------------|
| Channel      | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 00           | 2402            | 27      | 2429            | 54      | 2456            |
| 01           | 2403            | 28      | 2430            | 55      | 2457            |
| 02           | 2404            | 29      | 2431            | 56      | 2458            |
| 03           | 2405            | 30      | 2432            | 57      | 2459            |
| 04           | 2406            | 31      | 2433            | 58      | 2460            |
| 05           | 2407            | 32      | 2434            | 59      | 2461            |
| 06           | 2408            | 33      | 2435            | 60      | 2462            |
| 07           | 2409            | 34      | 2436            | 61      | 2463            |
| 08           | 2410            | 35      | 2437            | 62      | 2464            |
| 09           | 2411            | 36      | 2438            | 63      | 2465            |
| 10           | 2412            | 37      | 2439            | 64      | 2466            |
| 11           | 2413            | 38      | 2440            | 65      | 2467            |
| 12           | 2414            | 39      | 2441            | 66      | 2468            |
| 13           | 2415            | 40      | 2442            | 67      | 2469            |
| 14           | 2416            | 41      | 2443            | 68      | 2470            |
| 15           | 2417            | 42      | 2444            | 69      | 2471            |
| 16           | 2418            | 43      | 2445            | 70      | 2472            |
| 17           | 2419            | 44      | 2446            | 71      | 2473            |
| 18           | 2420            | 45      | 2447            | 72      | 2474            |
| 19           | 2421            | 46      | 2448            | 73      | 2475            |
| 20           | 2422            | 47      | 2449            | 74      | 2476            |
| 21           | 2423            | 48      | 2450            | 75      | 2477            |
| 22           | 2424            | 49      | 2451            | 76      | 2478            |
| 23           | 2425            | 50      | 2452            | 77      | 2479            |
| 24           | 2426            | 51      | 2453            | 78      | 2480            |
| 25           | 2427            | 52      | 2454            |         |                 |
| 26           | 2428            | 53      | 2455            |         |                 |

3. Note:

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

Test Frequency:

| BT      |            |
|---------|------------|
| Channel | Freq.(MHz) |
| 00      | 2402       |
| 39      | 2441       |
| 78      | 2480       |

4.

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE    |
|------|-------|------------|--------------|-----------|------------|---------|
| 1    | TGLLM | HJ-005     | PCB          | N/A       | 0          | Antenna |

Note: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report. Due to the incorrect antenna information, a series of problems such as the accuracy of the test results will be borne by the customer.

## 2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Worst Mode | Description | Data Rate/Modulation   |
|------------|-------------|------------------------|
| Mode 1     | TX CH00     | 1Mbps/GFSK             |
| Mode 2     | TX CH39     | 1Mbps/GFSK             |
| Mode 3     | TX CH78     | 1Mbps/GFSK             |
| Mode 4     | TX CH00     | 2 Mbps/ $\pi/4$ -DQPSK |
| Mode 5     | TX CH39     | 2 Mbps/ $\pi/4$ -DQPSK |
| Mode 6     | TX CH78     | 2 Mbps/ $\pi/4$ -DQPSK |
| Mode7      | TX CH00     | 3 Mbps/8DPSK           |
| Mode 8     | TX CH39     | 3 Mbps/8DPSK           |
| Mode 9     | TX CH78     | 3 Mbps/8DPSK           |
| Mode 10    | Hopping     | GFSK                   |
| Mode 11    | Hopping     | $\pi/4$ -DQPSK         |
| Mode 12    | Hopping     | 8DPSK                  |

Note:

- (1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.
- (2) We tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/ 60Hz is shown in the report.
- (3) The battery is fully-charged during the radiated and RF conducted test.

For AC Conducted Emission

| Test Case             |                         |
|-----------------------|-------------------------|
| AC Conducted Emission | Mode 13 : Keeping BT TX |

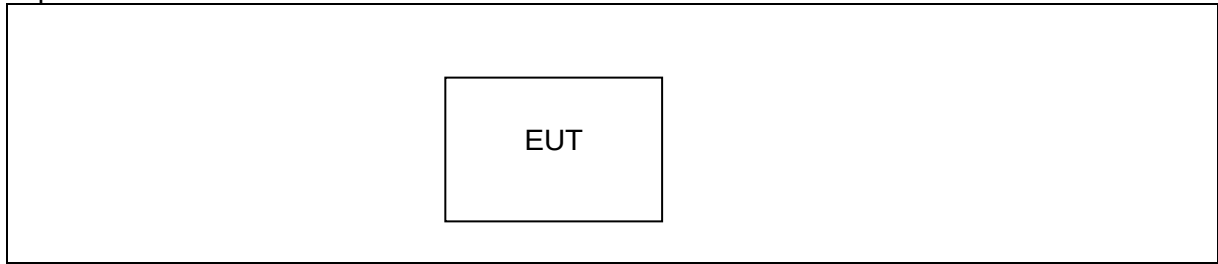
TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

| Test software Version                             | Test program: Bluetooth                                             |                                                                         |                                                                          |
|---------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|
| (Power control software)<br>Parameters(1/2/3Mbps) | Power class:<br>DH1 rate:4:27<br>2DH1 rate:20:54<br>3DH1 rate:24:83 | Power class:<br>DH3 rate:11:183<br>2DH3 rate:26:367<br>3DH3 rate:27:552 | Power class:<br>DH5 rate:15:339<br>2DH5 rate:30:679<br>3DH5 rate:31:1021 |

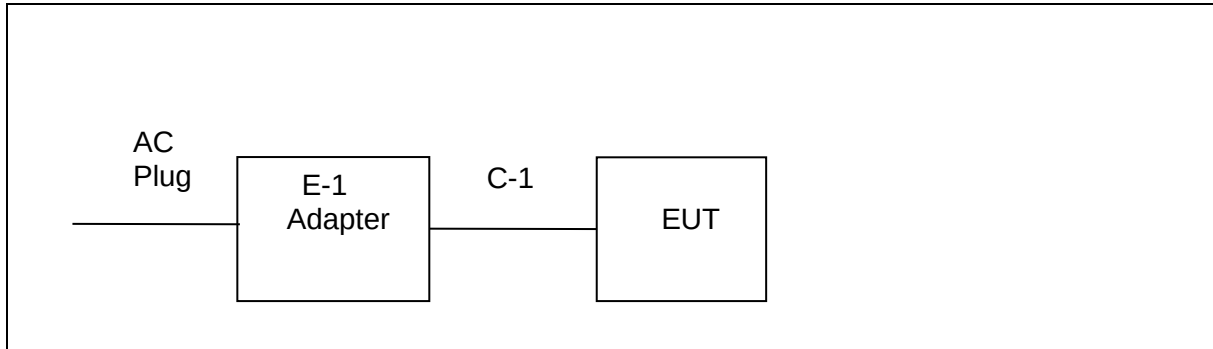
| RF Function | Type   | Mode Or Modulation type | ANT Gain(dBi) | Power Class | Software For Testing |
|-------------|--------|-------------------------|---------------|-------------|----------------------|
| BT          | BR+EDR | GFSK                    | 0             | Default     | FCC_assist_1.0.2.2   |
|             |        | $\pi/4$ -DQPSK          | 0             | Default     |                      |
|             |        | 8DPSK                   | 0             | Default     |                      |

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Radiated Spurious Emission Test



### Conducted Emission Test



## 2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

### Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| N/A  | N/A       | N/A       | N/A            | N/A        | N/A  |
|      |           |           |                |            |      |

### Support units

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| E-1  | Adapter   | DOKE      | ADLX45DLC      | N/A        | N/A  |
| C-1  | USB Cable | TGLLM     | HJ-005         | N/A        | N/A  |
|      |           |           |                |            |      |

### Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation Test equipment

| Kind of Equipment                | Manufacturer | Type No.     | Company No. | Last calibration | Calibrated until |
|----------------------------------|--------------|--------------|-------------|------------------|------------------|
| EMI Test Receiver                | R&S          | ESRP 3       | FCS-E001    | 2024.08.28       | 2025.08.27       |
| Signal Analyzer                  | R&S          | FSV40-N      | FCS-E012    | 2024.08.28       | 2025.08.27       |
| Active loop Antenna              | ZHINAN       | ZN30900C     | FCS-E013    | 2024.08.28       | 2025.08.27       |
| Bilog Antenna                    | SCHWARZBECK  | VULB 9168    | FCS-E002    | 2024.08.28       | 2025.08.27       |
| Horn Antenna                     | SCHWARZBECK  | BBHA 9120D   | FCS-E003    | 2024.08.28       | 2025.08.27       |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO       | LB-180400-KF | FCS-E018    | 2024.08.28       | 2025.08.27       |
| Pre-Amplifier(0.1M-3G Hz)        | EMCI         | EM330N       | FCS-E004    | 2024.08.28       | 2025.08.27       |
| Pre-Amplifier (1G-18GHz)         | N/A          | TSAMP-0518SE | FCS-E014    | 2024.08.28       | 2025.08.27       |
| Pre-Amplifier (18G-40GHz)        | TERA-MW      | TRLA-0400    | FCS-E019    | 2024.08.28       | 2025.08.27       |
| Temperature & Humidity           | HTC-1        | victor       | FCS-E005    | 2024.08.28       | 2025.08.27       |

### Conduction Test equipment

| Kind of Equipment      | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|------------------------|--------------|----------|-------------|------------------|------------------|
| EMI Test Receiver      | R&S          | ESCI     | FCS-E020    | 2024.08.28       | 2025.08.27       |
| LISN                   | R&S          | ENV216   | FCS-E007    | 2024.08.28       | 2025.08.27       |
| LISN                   | ETS          | 3810/2NM | FCS-E009    | 2024.08.28       | 2025.08.27       |
| Temperature & Humidity | HTC-1        | victor   | FCS-E008    | 2024.08.28       | 2025.08.27       |

### RF Connected Test

| Kind of Equipment   | Manufacturer | Type No. | Company No. | Last calibration | Calibrated until |
|---------------------|--------------|----------|-------------|------------------|------------------|
| MXA SIGNAL Analyzer | Keysight     | N9020A   | FCS-E015    | 2024.08.28       | 2025.08.27       |
| Spectrum Analyzer   | Agilent      | E4447A   | MY50180039  | 2024.08.28       | 2025.08.27       |
| Spectrum Analyzer   | R&S          | FSV-40   | 101499      | 2024.08.28       | 2025.08.27       |

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

| FREQUENCY (MHz) | Conducted Emissionlimit (dBuV) |           |
|-----------------|--------------------------------|-----------|
|                 | Quasi-peak                     | Average   |
| 0.15 -0.5       | 66 - 56 *                      | 56 - 46 * |
| 0.50 -5.0       | 56.00                          | 46.00     |
| 5.0 -30.0       | 60.00                          | 50.00     |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of “ \* ” marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

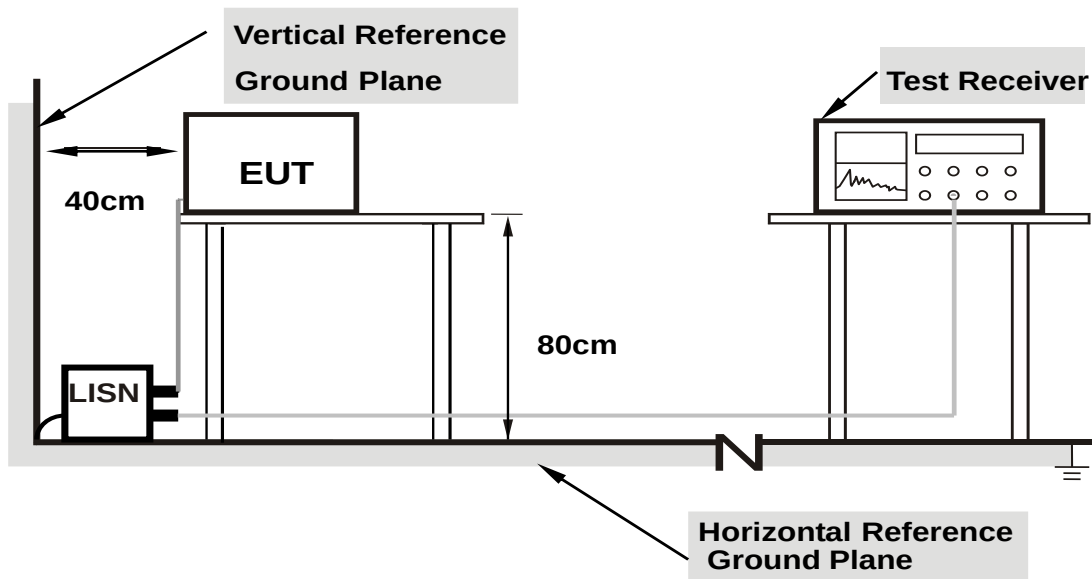
The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

### 3.1.2 TEST PROCEDURE

- The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN is at least 80 cm from the nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes support units.**

### 3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

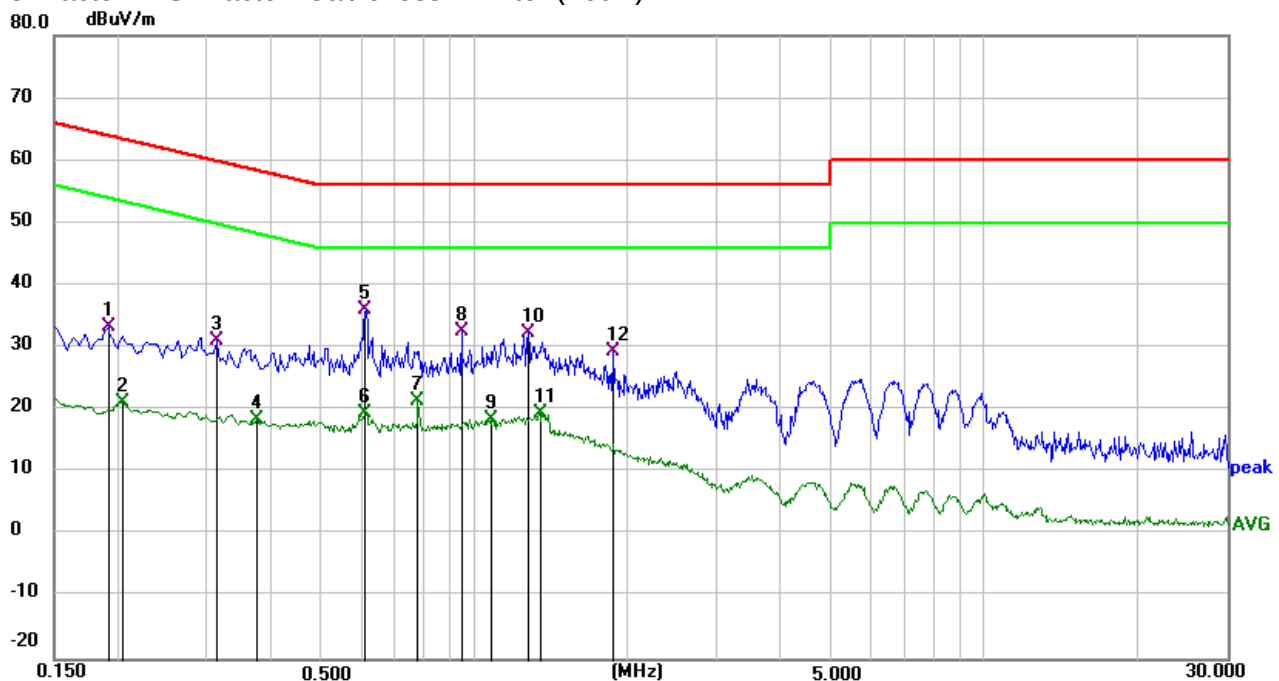
### 3.1.5 TEST RESULT

|               |              |                    |       |
|---------------|--------------|--------------------|-------|
| Temperature:  | 24.2(C)      | Relative Humidity: | 47%RH |
| Test Voltage: | AC 120V/60Hz | Phase:             | L     |
| Test Mode:    | Mode 13      |                    |       |

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 0.1905             | 22.38             | 10.84                 | 33.22            | 64.01           | -30.79         | QP     |
| 2   | 0.2040             | 10.40             | 10.84                 | 21.24            | 53.45           | -32.21         | AVG    |
| 3   | 0.3120             | 20.30             | 10.84                 | 31.14            | 59.92           | -28.78         | QP     |
| 4   | 0.3750             | 7.72              | 10.84                 | 18.56            | 48.39           | -29.83         | AVG    |
| 5 * | 0.6134             | 25.28             | 10.85                 | 36.13            | 56.00           | -19.87         | QP     |
| 6   | 0.6134             | 8.67              | 10.85                 | 19.52            | 46.00           | -26.48         | AVG    |
| 7   | 0.7753             | 10.56             | 10.85                 | 21.41            | 46.00           | -24.59         | AVG    |
| 8   | 0.9465             | 21.74             | 10.85                 | 32.59            | 56.00           | -23.41         | QP     |
| 9   | 1.0859             | 7.70              | 10.86                 | 18.56            | 46.00           | -27.44         | AVG    |
| 10  | 1.2795             | 21.38             | 10.86                 | 32.24            | 56.00           | -23.76         | QP     |
| 11  | 1.3513             | 8.62              | 10.86                 | 19.48            | 46.00           | -26.52         | AVG    |
| 12  | 1.8780             | 18.48             | 10.87                 | 29.35            | 56.00           | -26.65         | QP     |

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result = Reading + Factor) – Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)



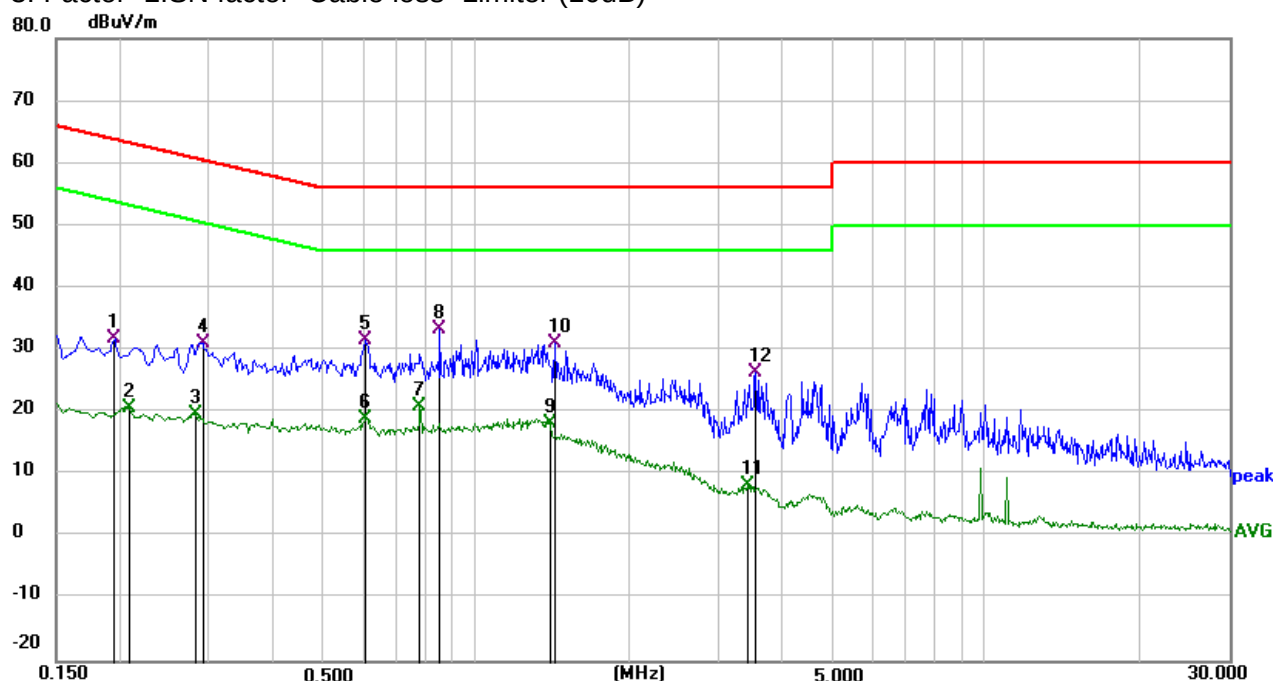


|               |              |                    |       |
|---------------|--------------|--------------------|-------|
| Temperature:  | 24.2(C)      | Relative Humidity: | 47%RH |
| Test Voltage: | AC 120V/60Hz | Phase:             | N     |
| Test Mode:    | Mode 13      |                    |       |

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 0.1949             | 21.02             | 10.84                 | 31.86            | 63.83           | -31.97         | QP     |
| 2   | 0.2085             | 9.97              | 10.83                 | 20.80            | 53.26           | -32.46         | AVG    |
| 3   | 0.2805             | 8.88              | 10.83                 | 19.71            | 50.80           | -31.09         | AVG    |
| 4   | 0.2895             | 20.38             | 10.83                 | 31.21            | 60.54           | -29.33         | QP     |
| 5   | 0.6045             | 20.89             | 10.84                 | 31.73            | 56.00           | -24.27         | QP     |
| 6   | 0.6090             | 8.20              | 10.84                 | 19.04            | 46.00           | -26.96         | AVG    |
| 7   | 0.7755             | 10.12             | 10.84                 | 20.96            | 46.00           | -25.04         | AVG    |
| 8 * | 0.8520             | 22.61             | 10.84                 | 33.45            | 56.00           | -22.55         | QP     |
| 9   | 1.3965             | 7.43              | 10.85                 | 18.28            | 46.00           | -27.72         | AVG    |
| 10  | 1.4280             | 20.24             | 10.85                 | 31.09            | 56.00           | -24.91         | QP     |
| 11  | 3.4080             | -2.69             | 11.06                 | 8.37             | 46.00           | -37.63         | AVG    |
| 12  | 3.5430             | 15.40             | 11.07                 | 26.47            | 56.00           | -29.53         | QP     |

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result =Reading + Factor )–Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)



## 3.2 RADIATED EMISSION MEASUREMENT

### 3.2.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed.

#### LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

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

#### LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

| FREQUENCY (MHz) | (dBuV/m) (at 3M) |         |
|-----------------|------------------|---------|
|                 | PEAK             | AVERAGE |
| Above 1000      | 74               | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### LIMITS OF RESTRICTED FREQUENCY BANDS

| FREQUENCY (MHz)   | FREQUENCY (MHz)     | FREQUENCY (MHz) | FREQUENCY (GHz) |
|-------------------|---------------------|-----------------|-----------------|
| 0.090-0.110       | 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       |                     |                 |                 |

### For Radiated Emission

| Spectrum Parameter                    | Setting                                                                                                                         |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Attenuation                           | Auto                                                                                                                            |
| Detector                              | Peak/QP/AV                                                                                                                      |
| Start Frequency                       | 9 KHz/150KHz(Peak/QP/AV)                                                                                                        |
| Stop Frequency                        | 150KHz/30MHz(Peak/QP/AV)                                                                                                        |
| RB / VB (emission in restricted band) | 200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz);<br>200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz) |

| Spectrum Parameter                    | Setting            |
|---------------------------------------|--------------------|
| Attenuation                           | Auto               |
| Detector                              | Peak/QP            |
| Start Frequency                       | 30 MHz(Peak/QP)    |
| Stop Frequency                        | 1000 MHz (Peak/QP) |
| RB / VB (emission in restricted band) | 120 KHz / 300 KHz  |

| Spectrum Parameter                    | Setting                                   |
|---------------------------------------|-------------------------------------------|
| Attenuation                           | Auto                                      |
| Detector                              | Peak/AV                                   |
| Start Frequency                       | 1000 MHz(Peak/AV)                         |
| Stop Frequency                        | 10th carrier hamonic(Peak/AV)             |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG) |

### For Restricted band

| Spectrum Parameter   | Setting                                                                |
|----------------------|------------------------------------------------------------------------|
| Detector             | Peak/AV                                                                |
| Start/Stop Frequency | Lower Band Edge: 2310 to 2410 MHz<br>Upper Band Edge: 2476 to 2500 MHz |
| RB / VB              | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG)                              |

| Receiver Parameter     | Setting                              |
|------------------------|--------------------------------------|
| Attenuation            | Auto                                 |
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV    |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP       |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP        |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP     |

### 3.2.2 TEST PROCEDURE

- The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.

- e. If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

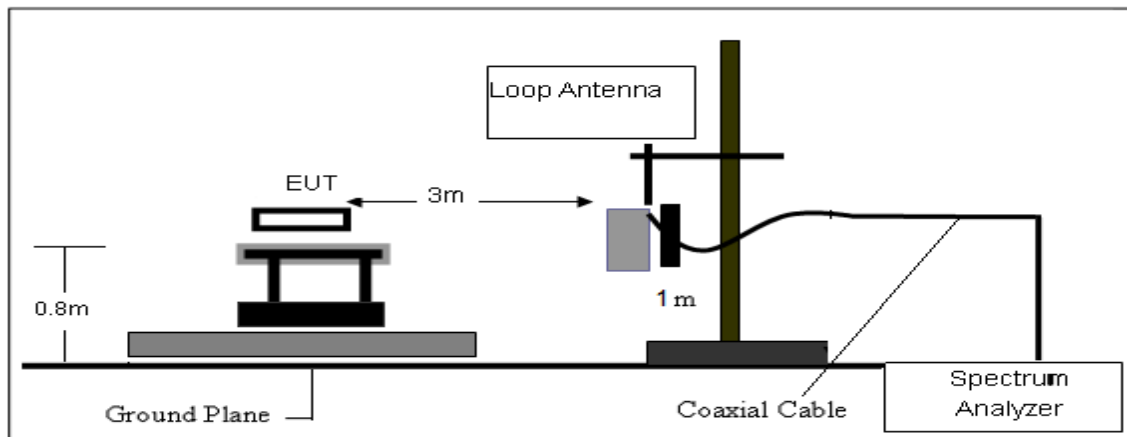
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

### 3.2.3 DEVIATION FROM TEST STANDARD

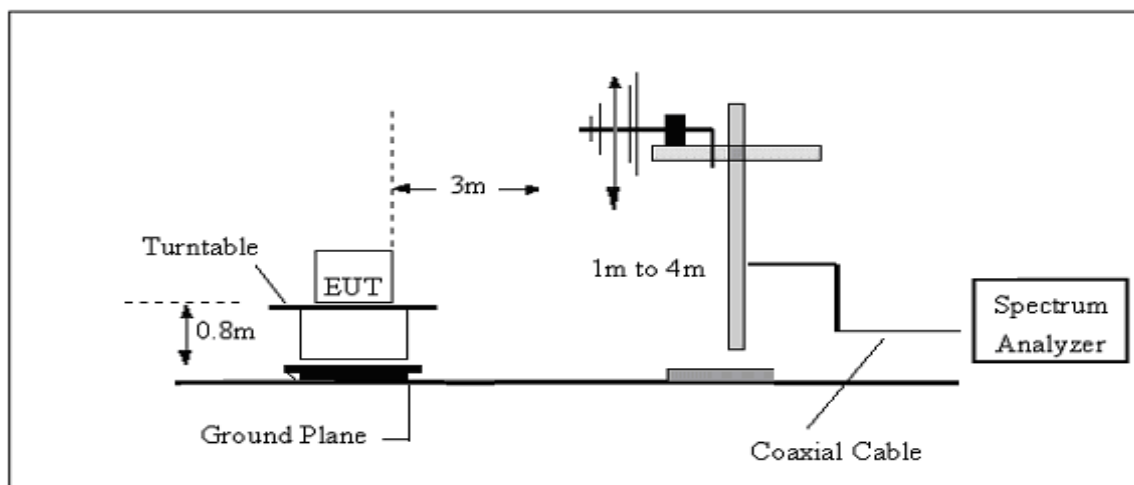
No deviation.

### 3.2.4 TESTSETUP

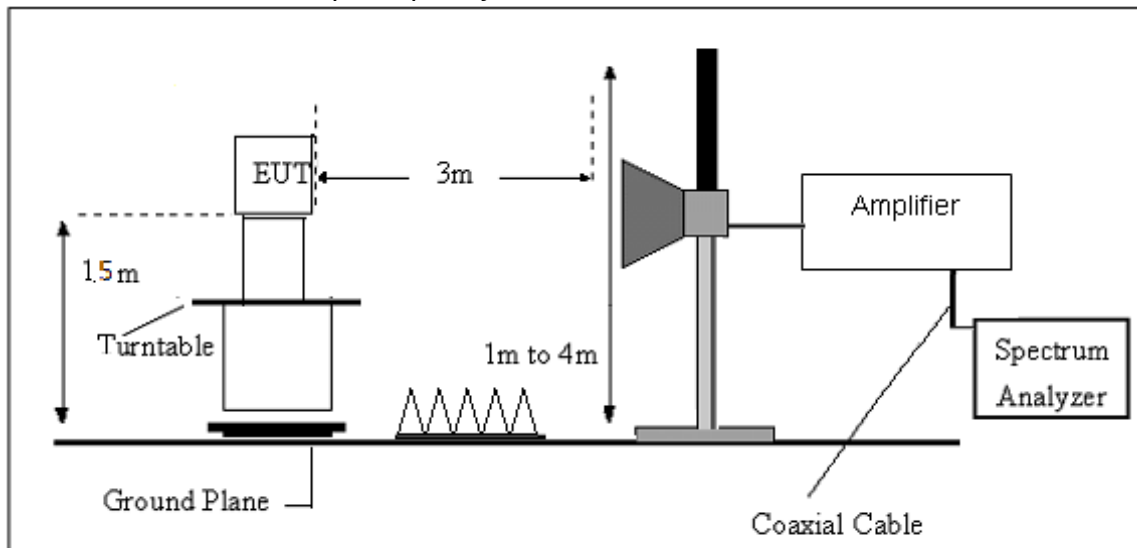
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



#### (C) Radiated Emission Test-Up Frequency Above 1GHz



### 3.2.5 EUT OPERATING CONDITIONS

Please refer to section 3.1.4 of this report.

### 3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency<br>(MHz) | FS<br>(dBμV/m) | RA<br>(dBμV/m) | AF<br>(dB) | CL<br>(dB) | AG<br>(dB) | Factor<br>(dB) |
|--------------------|----------------|----------------|------------|------------|------------|----------------|
| 300                | 40             | 58.1           | 12.2       | 1.6        | 31.9       | -18.1          |

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$

### 3.2.7 TEST RESULTS

(9KHz-30MHz)

|               |         |                    |         |
|---------------|---------|--------------------|---------|
| Temperature:  | 23.1(C) | Relative Humidity: | 60%RH   |
| Test Voltage: | DC 3.7V | Test Mode:         | TX Mode |

| Freq. | Reading  | Limit    | Margin | State | Test Result |
|-------|----------|----------|--------|-------|-------------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |             |
| --    | --       | --       | --     | --    | PASS        |
| --    | --       | --       | --     | --    | PASS        |

Note:

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

Distance extrapolation factor =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

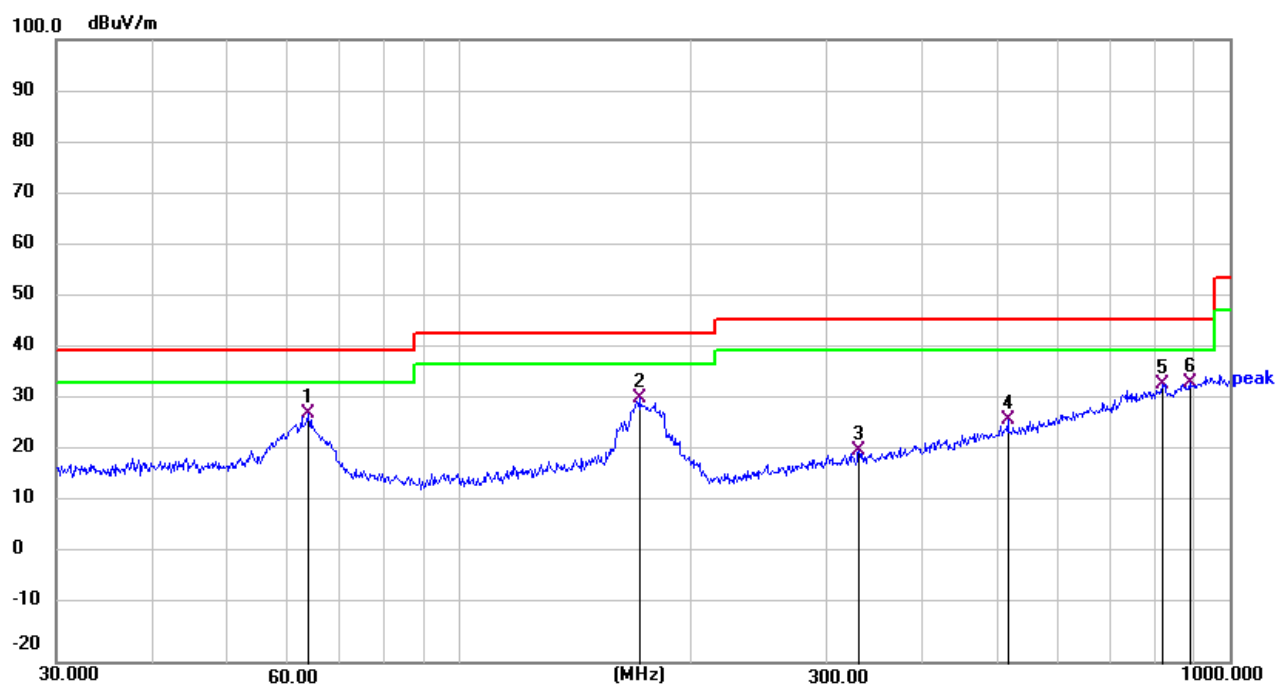
(30MHz-1000MHz)

|               |                                           |                    |            |
|---------------|-------------------------------------------|--------------------|------------|
| Temperature:  | 23.1(C)                                   | Relative Humidity: | 60%RH      |
| Test Voltage: | DC 3.7V                                   | Phase:             | Horizontal |
| Test Mode:    | Mode 1/2/3/4/5/6/7/8/9(Mode 2 worst mode) |                    |            |

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1   | 63.7588            | 45.85             | -17.88                  | 27.97              | 40.00             | -12.03         | QP     |
| 2   | 171.3925           | 47.89             | -17.04                  | 30.85              | 43.50             | -12.65         | QP     |
| 3   | 330.1947           | 36.89             | -16.13                  | 20.76              | 46.00             | -25.24         | QP     |
| 4   | 515.4373           | 38.93             | -12.19                  | 26.74              | 46.00             | -19.26         | QP     |
| 5   | 818.8340           | 39.33             | -5.77                   | 33.56              | 46.00             | -12.44         | QP     |
| 6 * | 887.6096           | 38.96             | -4.96                   | 34.00              | 46.00             | -12.00         | QP     |

Remark:

- Margin = Result (Result =Reading + Factor )-Limit
- Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain



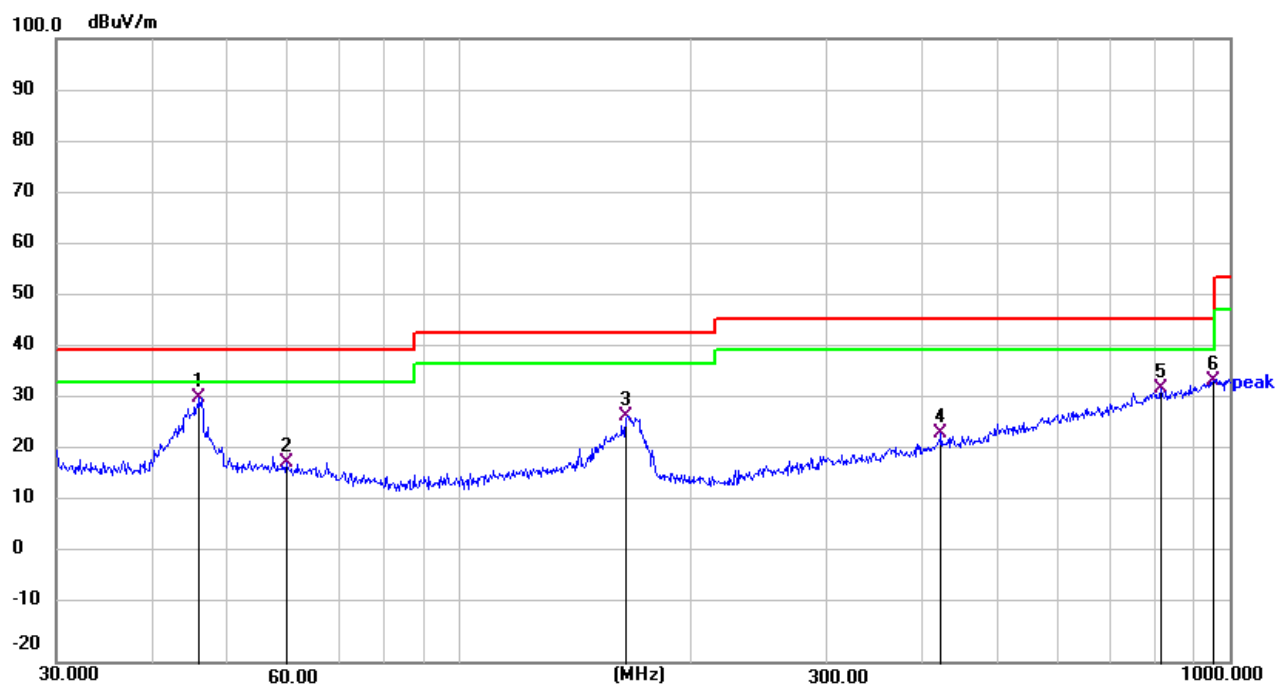


|               |                                           |                    |          |
|---------------|-------------------------------------------|--------------------|----------|
| Temperature:  | 23.1(C)                                   | Relative Humidity: | 60%RH    |
| Test Voltage: | DC 3.7V                                   | Phase:             | Vertical |
| Test Mode:    | Mode 1/2/3/4/5/6/7/8/9(Mode 2 worst mode) |                    |          |

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 * | 46.0162            | 47.67             | -16.69                  | 30.98              | 40.00             | -9.02          | QP     |
| 2   | 59.6492            | 35.64             | -17.23                  | 18.41              | 40.00             | -21.59         | QP     |
| 3   | 165.4866           | 44.14             | -16.71                  | 27.43              | 43.50             | -16.07         | QP     |
| 4   | 422.0577           | 37.97             | -13.99                  | 23.98              | 46.00             | -22.02         | QP     |
| 5   | 813.1114           | 38.48             | -5.83                   | 32.65              | 46.00             | -13.35         | QP     |
| 6   | 952.0937           | 37.61             | -3.51                   | 34.10              | 46.00             | -11.90         | QP     |

Remark:

- Margin = Result (Result = Reading + Factor) – Limit
- Factor = Antenna factor + Cable attenuation factor (cable loss) - Amplifier gain



## (1GHz~25GHz) Spurious emission Requirements

| Frequency                      | Meter Reading | Amplifier | Loss  | Antenna Factor | Corrected Factor | Emission Level | Limits   | Margin | Detector | Comment    |
|--------------------------------|---------------|-----------|-------|----------------|------------------|----------------|----------|--------|----------|------------|
| (MHz)                          | (dBμV)        | (dB)      | (dB)  | (dB/m)         | (dB)             | (dBμV/m)       | (dBμV/m) | (dB)   | Type     |            |
| Low Channel (GFSK/2402 MHz)    |               |           |       |                |                  |                |          |        |          |            |
| 3264.83                        | 60.91         | 44.70     | 6.70  | 28.20          | -9.80            | 51.11          | 74.00    | -22.89 | PK       | Vertical   |
| 3264.83                        | 51.13         | 44.70     | 6.70  | 28.20          | -9.80            | 41.33          | 54.00    | -12.67 | AV       | Vertical   |
| 3264.80                        | 61.64         | 44.70     | 6.70  | 28.20          | -9.80            | 51.84          | 74.00    | -22.16 | PK       | Horizontal |
| 3264.80                        | 50.39         | 44.70     | 6.70  | 28.20          | -9.80            | 40.59          | 54.00    | -13.41 | AV       | Horizontal |
| 4804.55                        | 59.13         | 44.20     | 9.04  | 31.60          | -3.56            | 55.57          | 74.00    | -18.43 | PK       | Vertical   |
| 4804.55                        | 50.50         | 44.20     | 9.04  | 31.60          | -3.56            | 46.94          | 54.00    | -7.06  | AV       | Vertical   |
| 4804.35                        | 59.21         | 44.20     | 9.04  | 31.60          | -3.56            | 55.65          | 74.00    | -18.35 | PK       | Horizontal |
| 4804.35                        | 50.32         | 44.20     | 9.04  | 31.60          | -3.56            | 46.76          | 54.00    | -7.24  | AV       | Horizontal |
| 5359.72                        | 48.61         | 44.20     | 9.86  | 32.00          | -2.34            | 46.27          | 74.00    | -27.73 | PK       | Vertical   |
| 5359.72                        | 40.30         | 44.20     | 9.86  | 32.00          | -2.34            | 37.96          | 54.00    | -16.04 | AV       | Vertical   |
| 5359.73                        | 47.79         | 44.20     | 9.86  | 32.00          | -2.34            | 45.45          | 74.00    | -28.55 | PK       | Horizontal |
| 5359.73                        | 39.19         | 44.20     | 9.86  | 32.00          | -2.34            | 36.85          | 54.00    | -17.15 | AV       | Horizontal |
| 7205.71                        | 53.88         | 43.50     | 11.40 | 35.50          | 3.40             | 57.28          | 74.00    | -16.72 | PK       | Vertical   |
| 7205.71                        | 44.57         | 43.50     | 11.40 | 35.50          | 3.40             | 47.97          | 54.00    | -6.03  | AV       | Vertical   |
| 7205.94                        | 54.31         | 43.50     | 11.40 | 35.50          | 3.40             | 57.71          | 74.00    | -16.29 | PK       | Horizontal |
| 7205.94                        | 44.34         | 43.50     | 11.40 | 35.50          | 3.40             | 47.74          | 54.00    | -6.26  | AV       | Horizontal |
| Middle Channel (GFSK/2441 MHz) |               |           |       |                |                  |                |          |        |          |            |
| 3264.71                        | 61.25         | 44.70     | 6.70  | 28.20          | -9.80            | 51.45          | 74.00    | -22.55 | PK       | Vertical   |
| 3264.71                        | 51.60         | 44.70     | 6.70  | 28.20          | -9.80            | 41.80          | 54.00    | -12.20 | AV       | Vertical   |
| 3264.78                        | 61.89         | 44.70     | 6.70  | 28.20          | -9.80            | 52.09          | 74.00    | -21.91 | PK       | Horizontal |
| 3264.78                        | 50.82         | 44.70     | 6.70  | 28.20          | -9.80            | 41.02          | 54.00    | -12.98 | AV       | Horizontal |
| 4882.50                        | 59.13         | 44.20     | 9.04  | 31.60          | -3.56            | 55.57          | 74.00    | -18.43 | PK       | Vertical   |
| 4882.50                        | 50.54         | 44.20     | 9.04  | 31.60          | -3.56            | 46.98          | 54.00    | -7.02  | AV       | Vertical   |
| 4882.53                        | 58.19         | 44.20     | 9.04  | 31.60          | -3.56            | 54.63          | 74.00    | -19.37 | PK       | Horizontal |
| 4882.53                        | 49.21         | 44.20     | 9.04  | 31.60          | -3.56            | 45.65          | 54.00    | -8.35  | AV       | Horizontal |
| 5359.61                        | 48.78         | 44.20     | 9.86  | 32.00          | -2.34            | 46.44          | 74.00    | -27.56 | PK       | Vertical   |
| 5359.61                        | 39.15         | 44.20     | 9.86  | 32.00          | -2.34            | 36.81          | 54.00    | -17.19 | AV       | Vertical   |
| 5359.86                        | 47.88         | 44.20     | 9.86  | 32.00          | -2.34            | 45.54          | 74.00    | -28.46 | PK       | Horizontal |
| 5359.86                        | 38.92         | 44.20     | 9.86  | 32.00          | -2.34            | 36.58          | 54.00    | -17.42 | AV       | Horizontal |
| 7323.93                        | 53.70         | 43.50     | 11.40 | 35.50          | 3.40             | 57.10          | 74.00    | -16.90 | PK       | Vertical   |
| 7323.93                        | 43.88         | 43.50     | 11.40 | 35.50          | 3.40             | 47.28          | 54.00    | -6.72  | AV       | Vertical   |
| 7323.82                        | 53.79         | 43.50     | 11.40 | 35.50          | 3.40             | 57.19          | 74.00    | -16.81 | PK       | Horizontal |
| 7323.82                        | 43.58         | 43.50     | 11.40 | 35.50          | 3.40             | 46.98          | 54.00    | -7.02  | AV       | Horizontal |

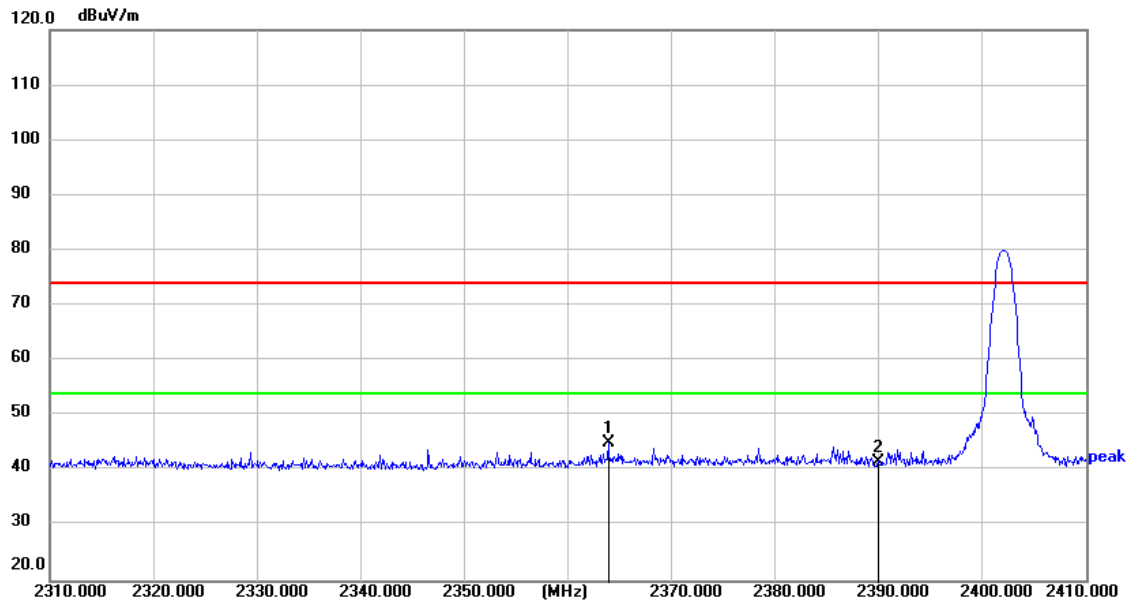
| High Channel (GFSK/2480 MHz) |       |       |       |       |       |       |       |        |    |            |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|--------|----|------------|
| 3264.84                      | 61.76 | 44.70 | 6.70  | 28.20 | -9.80 | 51.96 | 74.00 | -22.04 | PK | Vertical   |
| 3264.84                      | 51.57 | 44.70 | 6.70  | 28.20 | -9.80 | 41.77 | 54.00 | -12.23 | AV | Vertical   |
| 3264.63                      | 62.02 | 44.70 | 6.70  | 28.20 | -9.80 | 52.22 | 74.00 | -21.78 | PK | Horizontal |
| 3264.63                      | 50.54 | 44.70 | 6.70  | 28.20 | -9.80 | 40.74 | 54.00 | -13.26 | AV | Horizontal |
| 4960.36                      | 59.10 | 44.20 | 9.04  | 31.60 | -3.56 | 55.54 | 74.00 | -18.46 | PK | Vertical   |
| 4960.36                      | 49.27 | 44.20 | 9.04  | 31.60 | -3.56 | 45.71 | 54.00 | -8.29  | AV | Vertical   |
| 4960.52                      | 58.19 | 44.20 | 9.04  | 31.60 | -3.56 | 54.63 | 74.00 | -19.37 | PK | Horizontal |
| 4960.52                      | 49.66 | 44.20 | 9.04  | 31.60 | -3.56 | 46.10 | 54.00 | -7.90  | AV | Horizontal |
| 5359.68                      | 48.68 | 44.20 | 9.86  | 32.00 | -2.34 | 46.34 | 74.00 | -27.66 | PK | Vertical   |
| 5359.68                      | 39.92 | 44.20 | 9.86  | 32.00 | -2.34 | 37.58 | 54.00 | -16.42 | AV | Vertical   |
| 5359.69                      | 47.13 | 44.20 | 9.86  | 32.00 | -2.34 | 44.79 | 74.00 | -29.21 | PK | Horizontal |
| 5359.69                      | 38.37 | 44.20 | 9.86  | 32.00 | -2.34 | 36.03 | 54.00 | -17.97 | AV | Horizontal |
| 7439.78                      | 53.94 | 43.50 | 11.40 | 35.50 | 3.40  | 57.34 | 74.00 | -16.66 | PK | Vertical   |
| 7439.78                      | 43.74 | 43.50 | 11.40 | 35.50 | 3.40  | 47.14 | 54.00 | -6.86  | AV | Vertical   |
| 7439.78                      | 54.78 | 43.50 | 11.40 | 35.50 | 3.40  | 58.18 | 74.00 | -15.82 | PK | Horizontal |
| 7439.78                      | 43.64 | 43.50 | 11.40 | 35.50 | 3.40  | 47.04 | 54.00 | -6.96  | AV | Horizontal |

# Note:

- 1) Scan with GFSK,  $\pi/4$ -DQPSK, and 8DPSK, the worst case is GFSK Mode.
- 2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.  
Emission Level = Reading + Factor
- 3) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

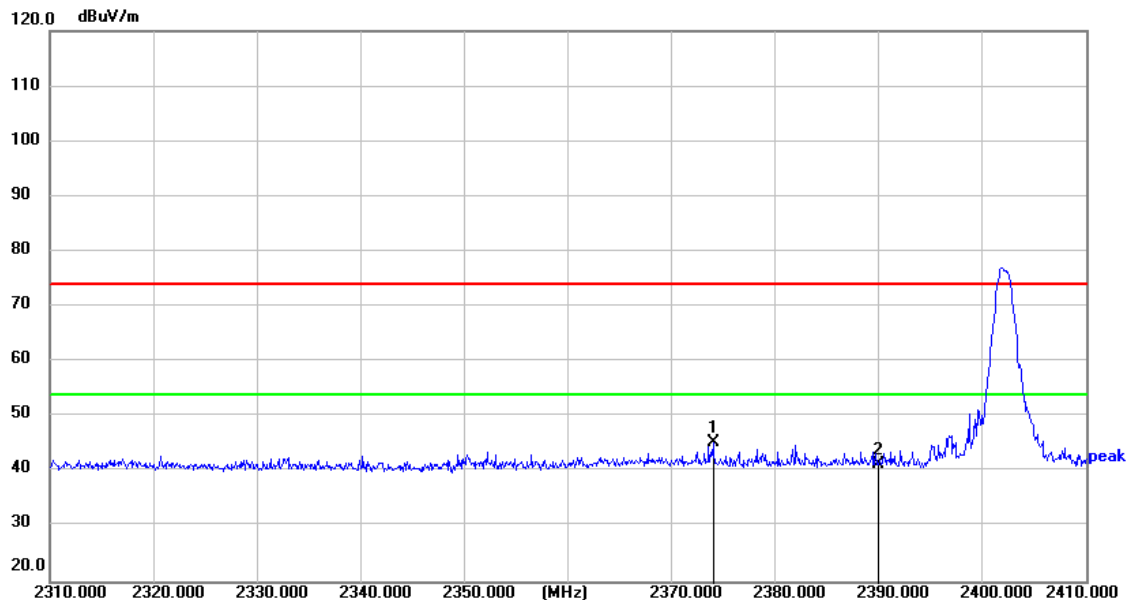
# Restricted band Requirements

## GFSK-Low Horizontal



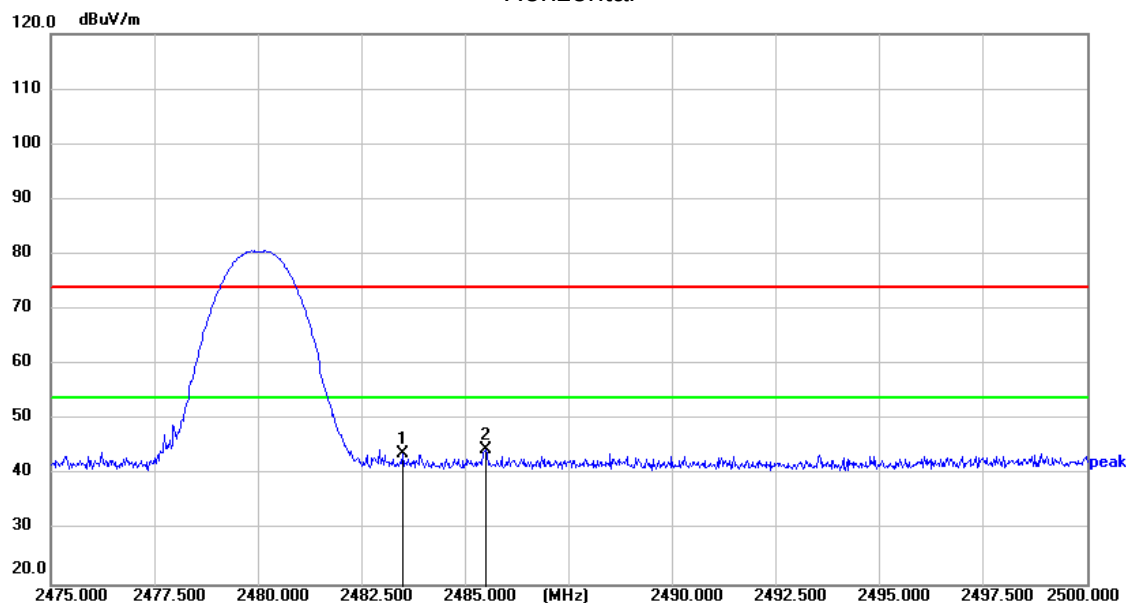
| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 * | 2363.900           | 41.17             | 3.95                    | 45.12              | 74.00             | -28.88         | peak   |
| 2   | 2390.000           | 37.29             | 4.34                    | 41.63              | 74.00             | -32.37         | peak   |

## Vertical



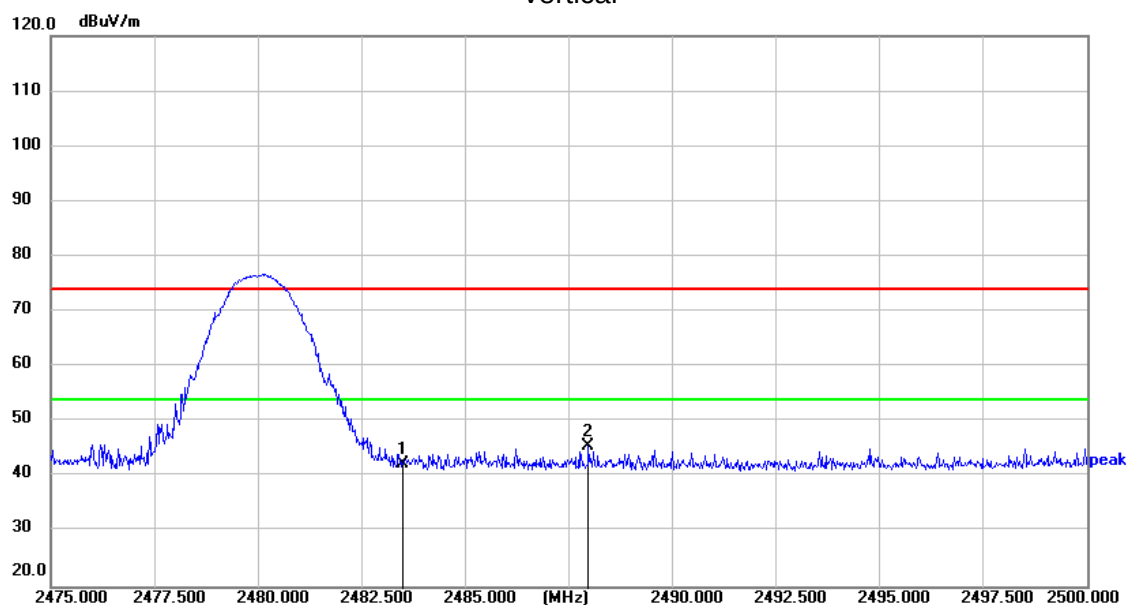
| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 * | 2374.000           | 41.19             | 4.10                    | 45.29              | 74.00             | -28.71         | peak   |
| 2   | 2390.000           | 36.99             | 4.34                    | 41.33              | 74.00             | -32.67         | peak   |

### GFSK-High Horizontal



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1   | 2483.500           | 39.23             | 4.60                    | 43.83              | 74.00             | -30.17         | peak   |
| 2 * | 2485.500           | 40.03             | 4.61                    | 44.64              | 74.00             | -29.36         | peak   |

### Vertical



| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB/m) | Result<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1   | 2483.500           | 37.87             | 4.60                    | 42.47              | 74.00             | -31.53         | peak   |
| 2 * | 2487.975           | 41.00             | 4.62                    | 45.62              | 74.00             | -28.38         | peak   |

Note: GFSK,  $\pi/4$ -DQPSK and 8DPSK of the no hopping and hopping mode all have been test, the worst case is GFSK of the no hopping mode, this report only show the worst case.

#### 4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

##### 4.1 LIMIT

According to FCC section 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.

##### 4.2 TEST PROCEDURE

| Spectrum Parameter                    | Setting                         |
|---------------------------------------|---------------------------------|
| Detector                              | Peak                            |
| Start/Stop Frequency                  | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz                 |
| Trace-Mode:                           | Max hold                        |

For Band edge

| Spectrum Parameter                    | Setting                                                              |
|---------------------------------------|----------------------------------------------------------------------|
| Detector                              | Peak                                                                 |
| Start/Stop Frequency                  | Lower Band Edge: 2300 – 2407 MHz<br>Upper Band Edge: 2475 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz                                                      |
| Trace-Mode:                           | Max hold                                                             |

For Hopping Band edge

| Spectrum Parameter                    | Setting                                                             |
|---------------------------------------|---------------------------------------------------------------------|
| Detector                              | Peak                                                                |
| Start/Stop Frequency                  | Lower Band Edge: 2300– 2403 MHz<br>Upper Band Edge: 2479 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz                                                     |
| Trace-Mode:                           | Max hold                                                            |

##### 4.3 TEST SETUP



The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Tune the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, the span is set to be greater than RBW.

##### 4.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

#### 4.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

## 5. NUMBER OF HOPPING CHANNEL

### 5.1 LIMIT

| FCC Part 15.247, Subpart C |                           |           |                       |        |
|----------------------------|---------------------------|-----------|-----------------------|--------|
| Section                    | Test Item                 | Limit     | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(iii)         | Number of Hopping Channel | $\geq 15$ | 2400-2483.5           | PASS   |

| Spectrum Parameters | Setting                     |
|---------------------|-----------------------------|
| Attenuation         | Auto                        |
| Span Frequency      | > Operating Frequency Range |
| RB                  | 100KHz                      |
| VB                  | 300KHz                      |
| Detector            | Peak                        |
| Trace               | Max Hold                    |
| Sweep Time          | Auto                        |

### 5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

### 5.3 TEST SETUP



### 5.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

### 5.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.



## 6. AVERAGE TIME OF OCCUPANCY

### 6.1 LIMIT

| FCC Part 15.247, Subpart C |                           |        |                       |        |
|----------------------------|---------------------------|--------|-----------------------|--------|
| Section                    | Test Item                 | Limit  | Frequency Range (MHz) | Result |
| 15.247<br>(a)(1)(iii)      | Average Time of Occupancy | 0.4sec | 2400-2483.5           | PASS   |

### 6.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW =1MHz/VBW =3MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- Set the EUT for DH5, DH3 and DH1 packet transmitting.
- Measure the maximum time duration of one single pulse.
- DH5 Packet permit maximum  $1600 / 79 / 6 = 3.37$  hops per second in each channel (5 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is  $3.37 \times 31.6 = 106.6$ .
- DH3 Packet permit maximum  $1600 / 79 / 4 = 5.06$  hops per second in each channel (3 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is  $5.06 \times 31.6 = 160$ .
- DH1 Packet permit maximum  $1600 / 79 / 2 = 10.12$  hops per second in each channel (1 time slot RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is  $10.12 \times 31.6 = 320$ .

### 6.3 TEST SETUP



### 6.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

### 6.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

## 7. HOPPING CHANNEL SEPARATION MEASUREMENT

### 7.1 LIMIT

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.

| Spectrum Parameter | Setting                                                 |
|--------------------|---------------------------------------------------------|
| Attenuation        | Auto                                                    |
| Span Frequency     | > 20 dB Bandwidth or Channel Separation                 |
| RB                 | 30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)   |
| VB                 | 100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| Detector           | Peak                                                    |
| Trace              | Max Hold                                                |
| Sweep Time         | Auto                                                    |

### 7.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

### 7.3 TEST SETUP



### 7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 7.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

## 8. BANDWIDTH TEST

### 8.1 LIMIT

| FCC Part15 15.247, Subpart C |           |       |                      |        |
|------------------------------|-----------|-------|----------------------|--------|
| Section                      | Test Item | Limit | FrequencyRange (MHz) | Result |
| 15.247 (a)(1)                | Bandwidth | N/A   | 2400-2483.5          | PASS   |

| Spectrum Parameter | Setting                                                 |
|--------------------|---------------------------------------------------------|
| Attenuation        | Auto                                                    |
| Span Frequency     | > Measurement Bandwidth or Channel Separation           |
| RB                 | 30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)   |
| VB                 | 100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| Detector           | Peak                                                    |
| Trace              | Max Hold                                                |
| Sweep Time         | Auto                                                    |

### 8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

### 8.3 TEST SETUP



### 8.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

### 8.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

## 9. OUTPUT POWER TEST

### 9.1 LIMIT

| FCC Part 15.247, Subpart C |              |                                                                                                                           |                       |        |
|----------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------|--------|
| Section                    | Test Item    | Limit                                                                                                                     | Frequency Range (MHz) | Result |
| 15.247<br>(a)(1)&(b)(1)    | Output Power | 1 W or 0.125W                                                                                                             | 2400-2483.5           | PASS   |
|                            |              | if channel separation > 2/3 bandwidth provided the systems operate with an output power no greater than 125 mW (20.97dBm) |                       |        |

### 9.2 TEST PROCEDURE

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW ≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.

b) Allow trace to stabilize.

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

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

e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.

### 9.3 TEST SETUP



### 9.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

### 9.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

## 10. ANTENNA REQUIREMENT

### 10.1 STANDARD REQUIREMENT

FCC part 15.203 requirement: For intentional device, according to FCC part 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.

### 10.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.

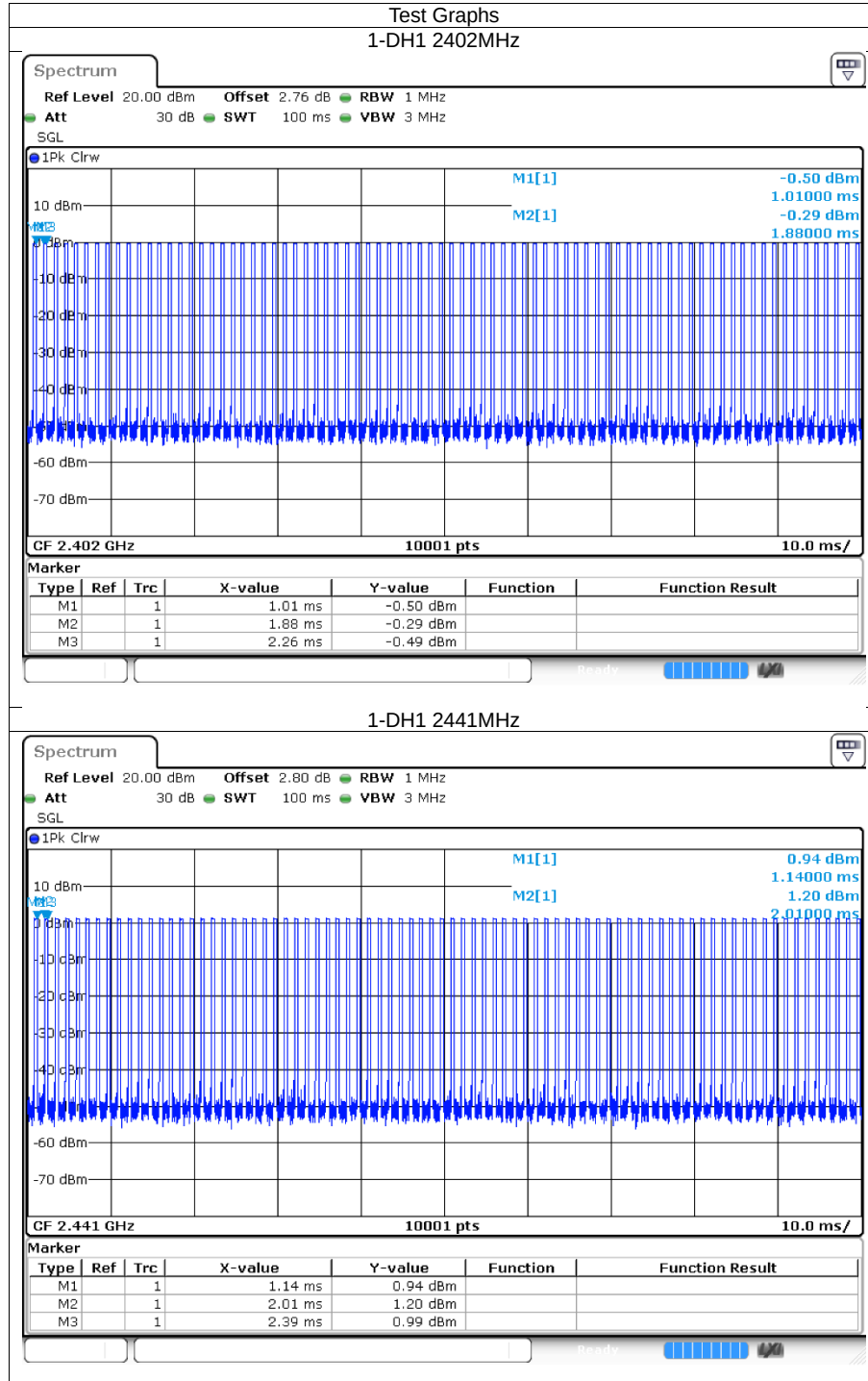
## APPENDIX 1-TEST DATA

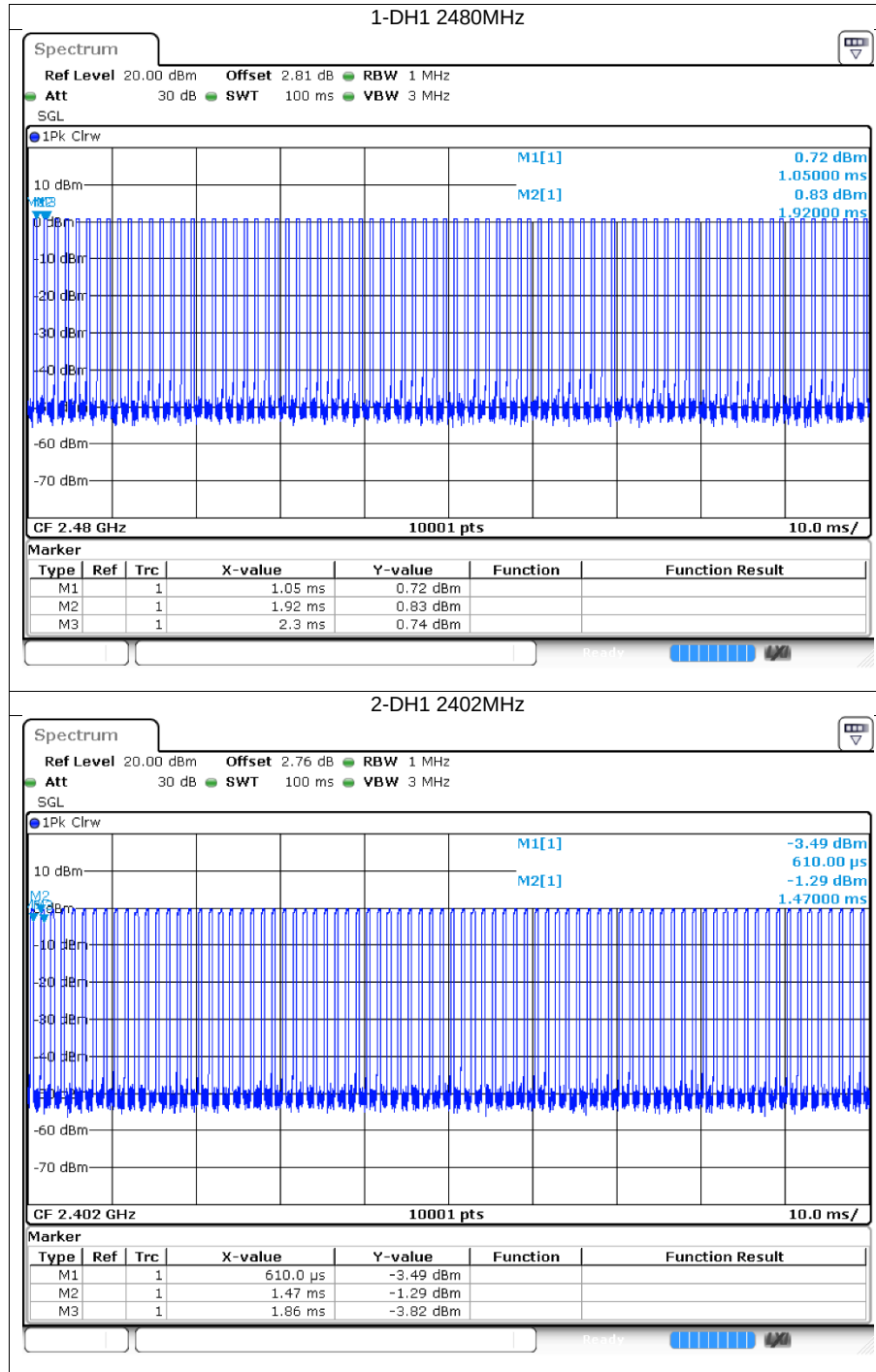
### 1 Duty Cycle

#### Test Result

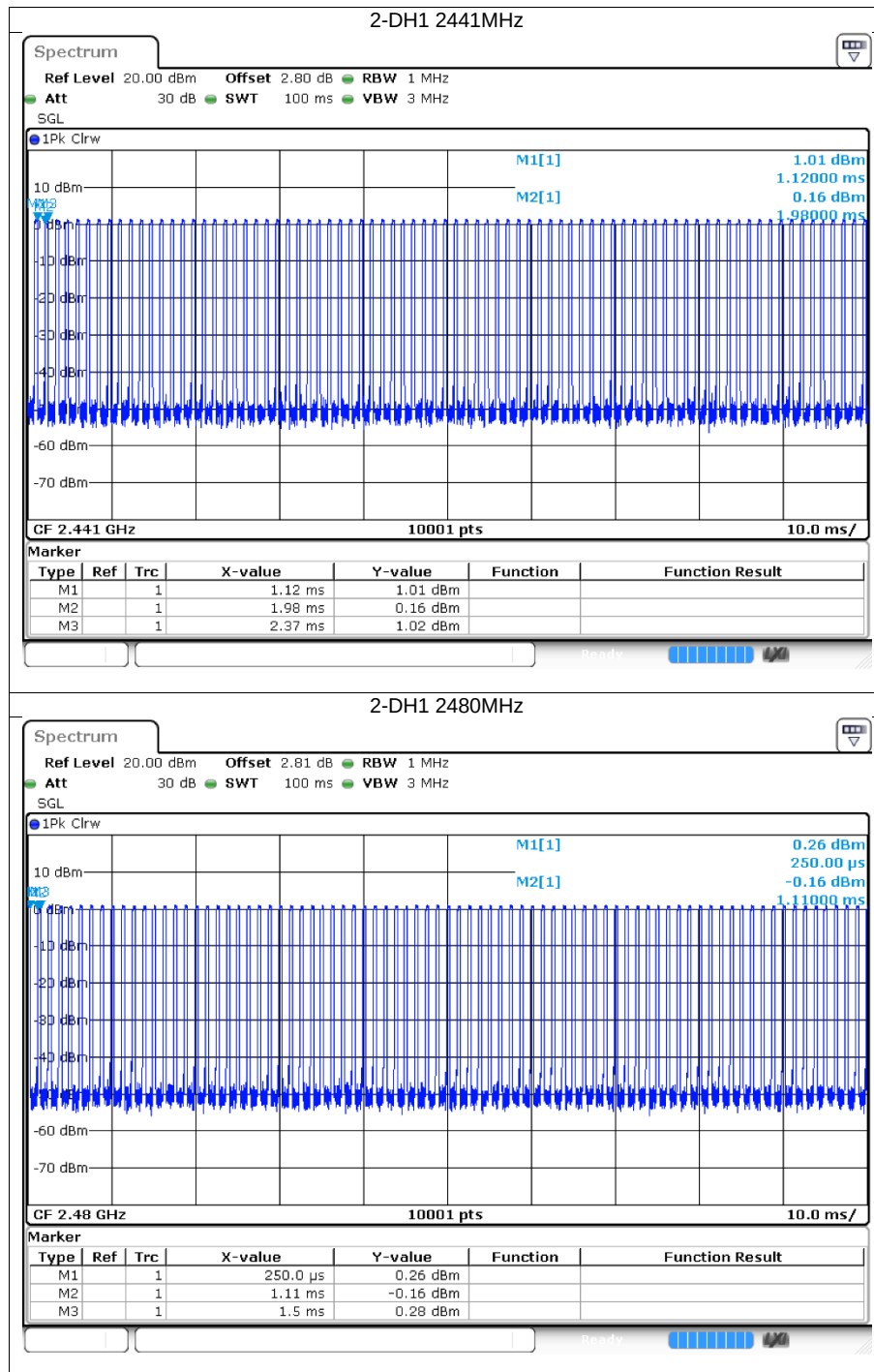
| Mode  | Frequency (MHz) | Duty Cycle (%) | Correction Factor | 1/T (kHz) |
|-------|-----------------|----------------|-------------------|-----------|
| 1-DH1 | 2402            | 31.2           | 5.06              | 2.63      |
| 1-DH1 | 2441            | 31.2           | 5.06              | 2.63      |
| 1-DH1 | 2480            | 31.2           | 5.06              | 2.63      |
| 2-DH1 | 2402            | 32             | 4.95              | 2.56      |
| 2-DH1 | 2441            | 32             | 4.95              | 2.56      |
| 2-DH1 | 2480            | 32.01          | 4.95              | 2.56      |
| 3-DH1 | 2402            | 32             | 4.95              | 2.56      |
| 3-DH1 | 2441            | 32.01          | 4.95              | 2.56      |
| 3-DH1 | 2480            | 32             | 4.95              | 2.56      |

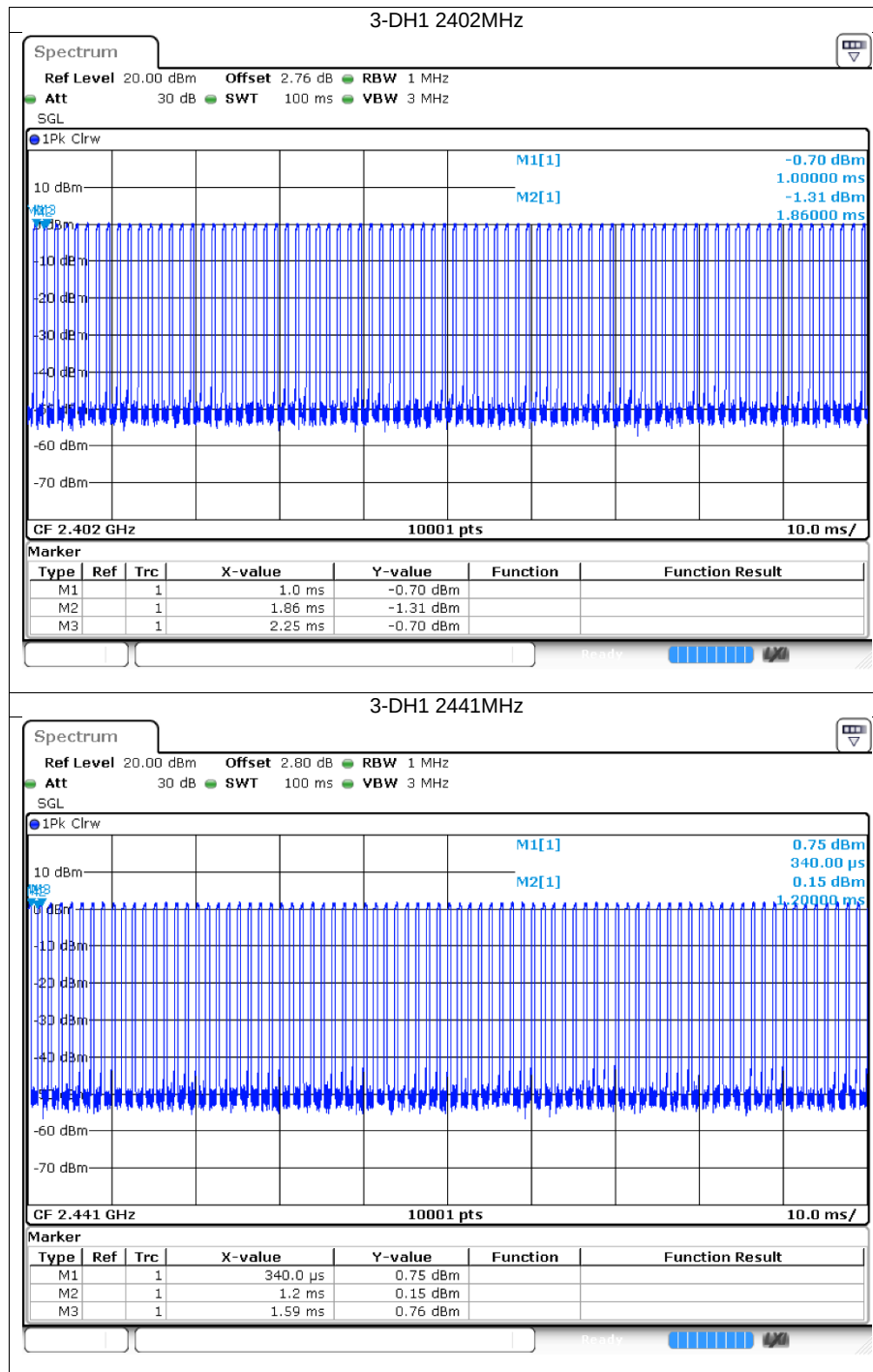
# Test Graphs

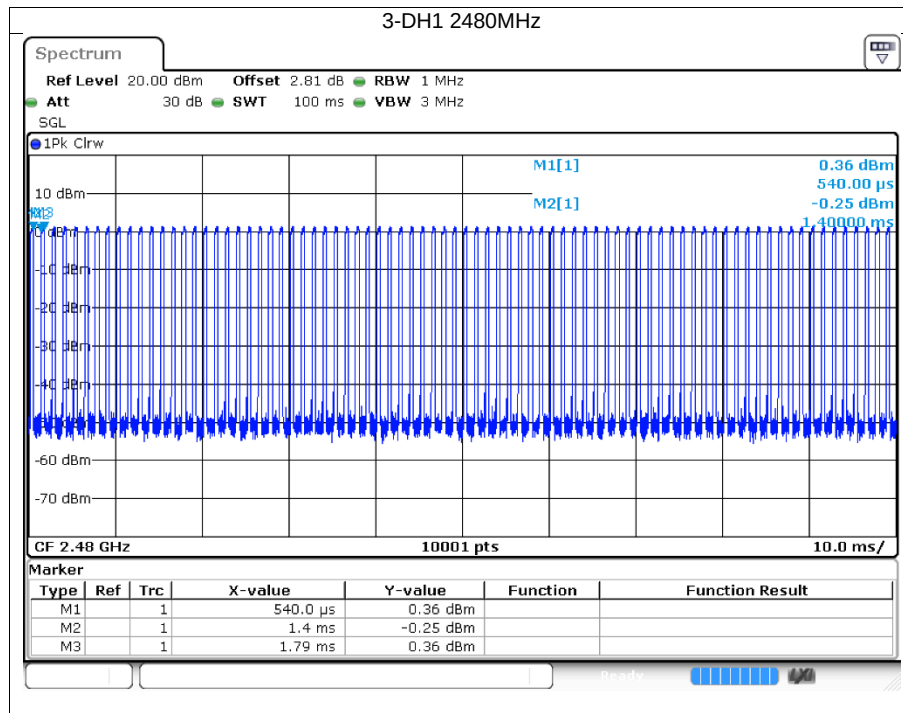










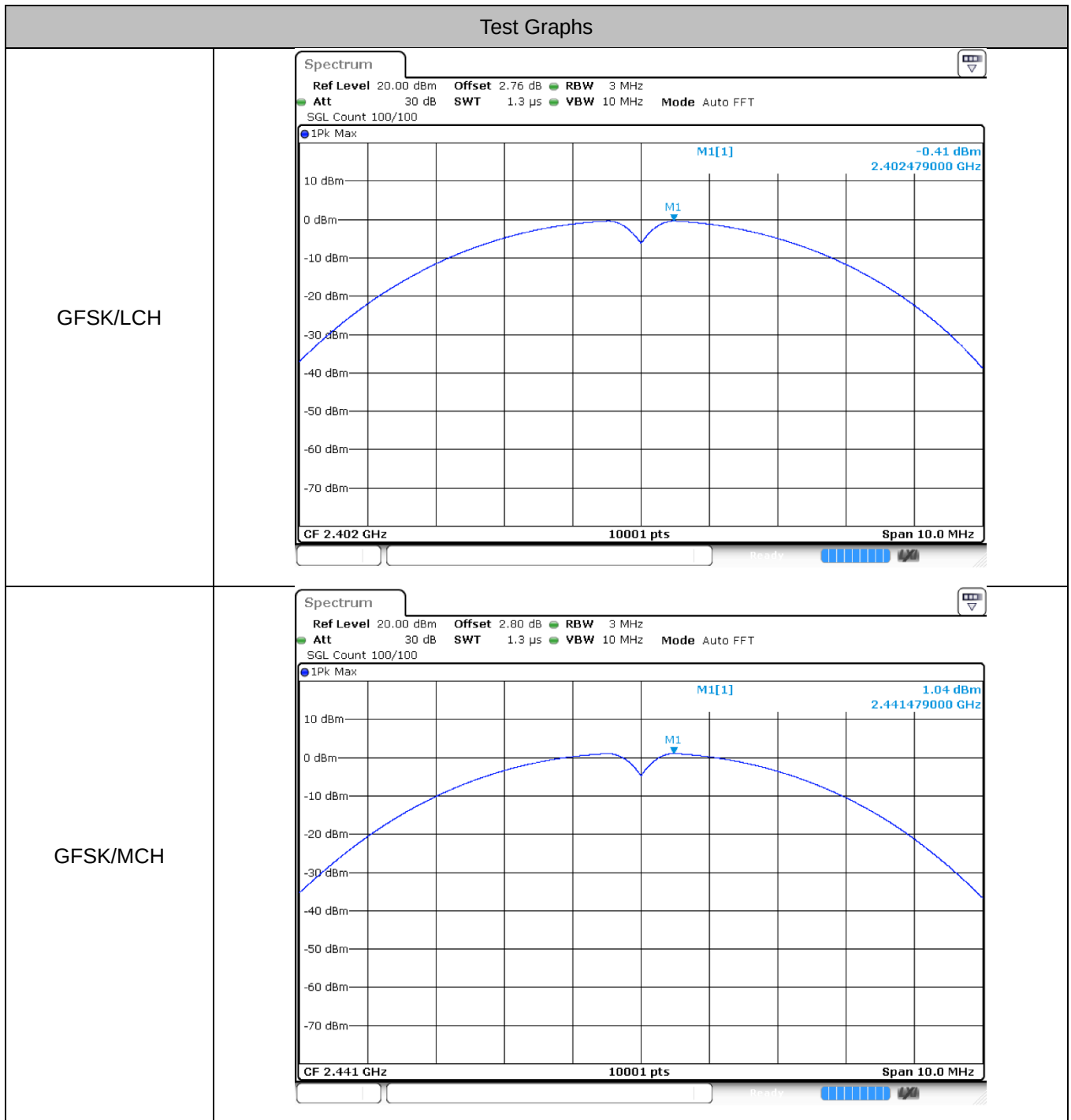


## 2 Maximum Conducted Peak Output Power

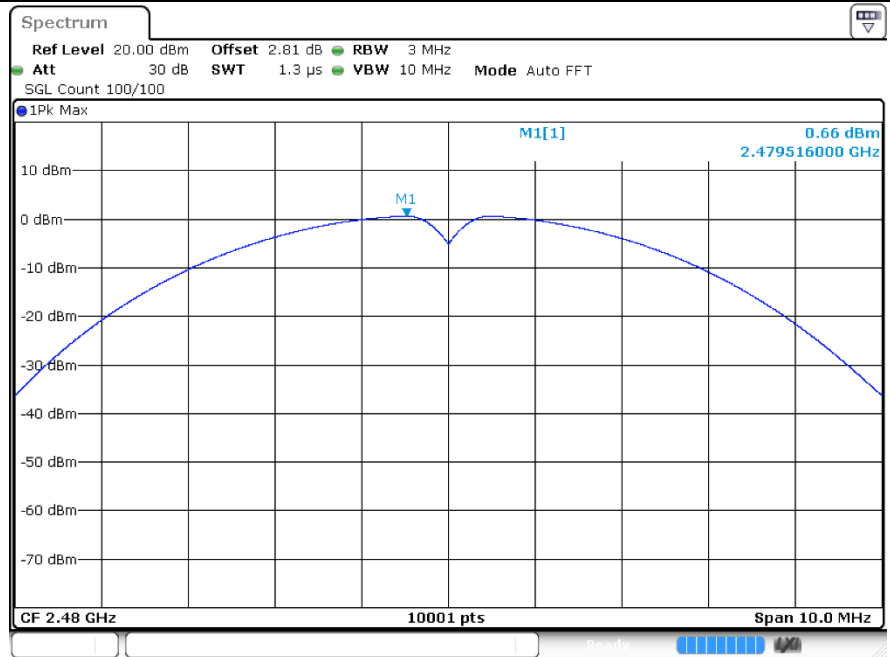
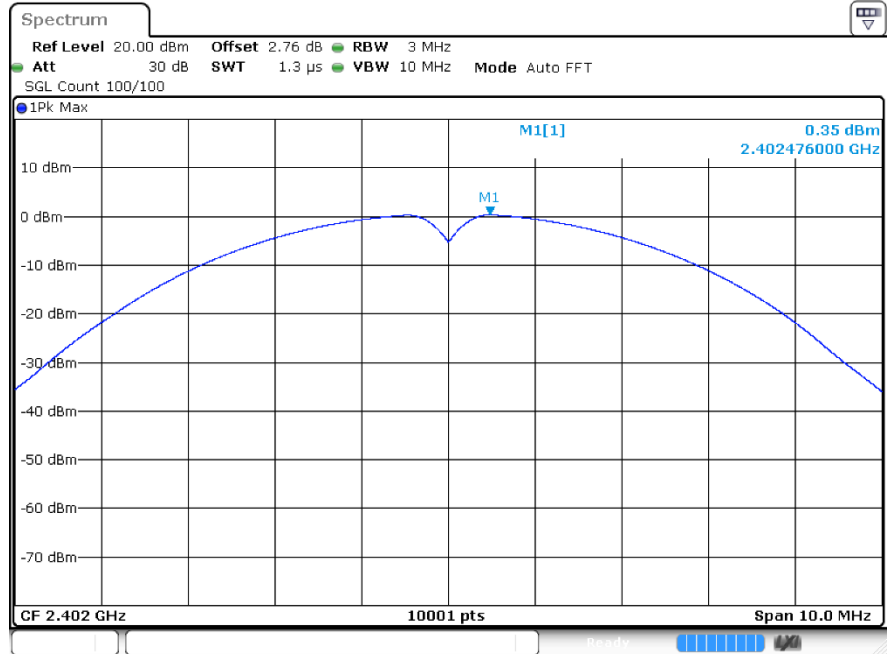
### Test Result

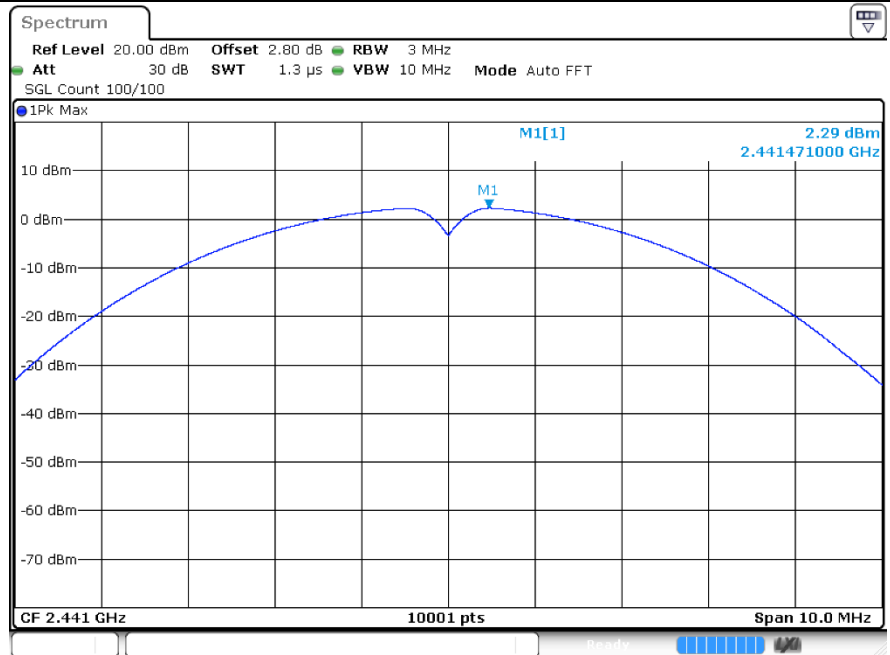
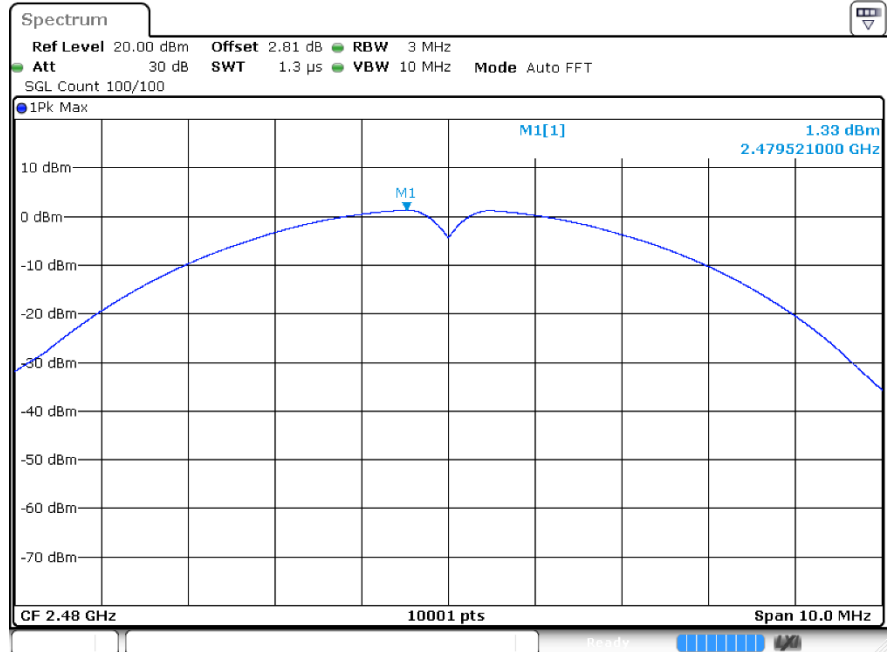
| Mode          | Channel. | Maximum Peak Output Power [dBm] | Limit [dBm] | Verdict |
|---------------|----------|---------------------------------|-------------|---------|
| GFSK          | LCH      | -0.41                           | 21          | Pass    |
|               | MCH      | 1.04                            | 21          | Pass    |
|               | HCH      | 0.66                            | 21          | Pass    |
| $\pi/4$ DQPSK | LCH      | 0.35                            | 21          | Pass    |
|               | MCH      | 2.29                            | 21          | Pass    |
|               | HCH      | 1.33                            | 21          | Pass    |
| 8DPSK         | LCH      | 0.62                            | 21          | Pass    |
|               | MCH      | 2.27                            | 21          | Pass    |
|               | HCH      | 1.83                            | 21          | Pass    |

# Test Graphs

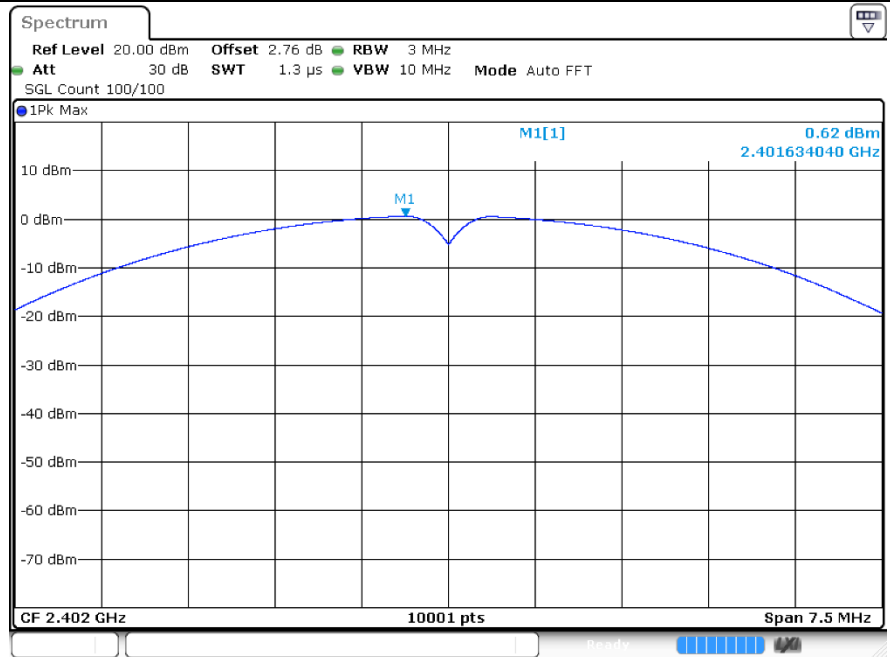


GFSK/HCH

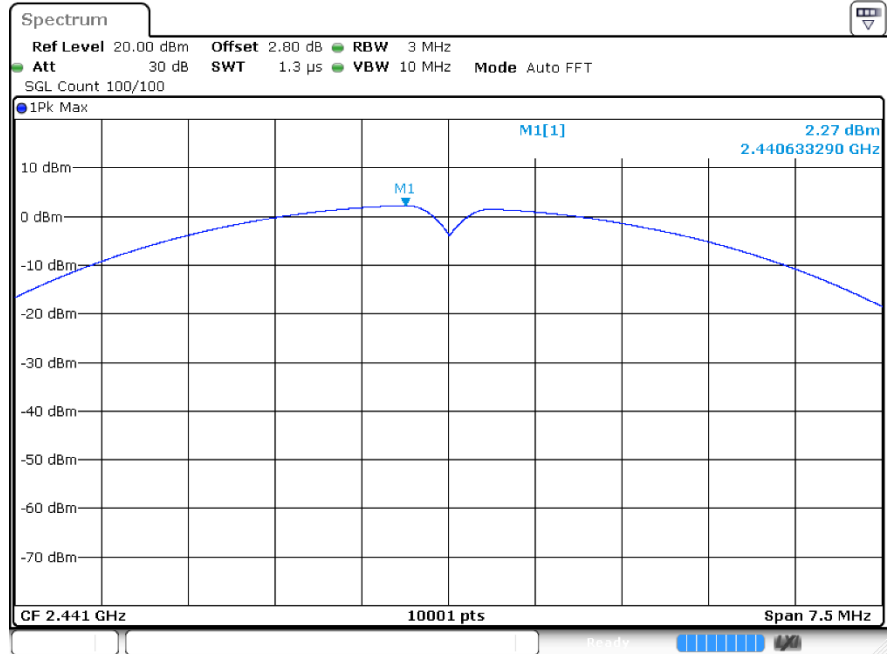

 $\pi$ /4DQPSK/LCH


$\pi/4$ DQPSK/MCH

 $\pi/4$ DQPSK/HCH


8DPSK/LCH

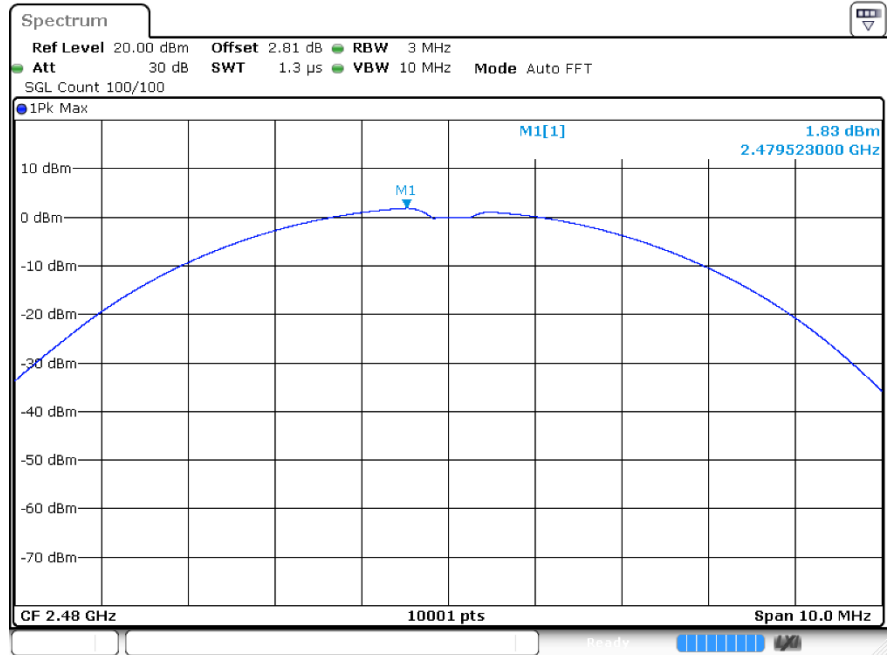


8DPSK/MCH





8DPSK/HCH

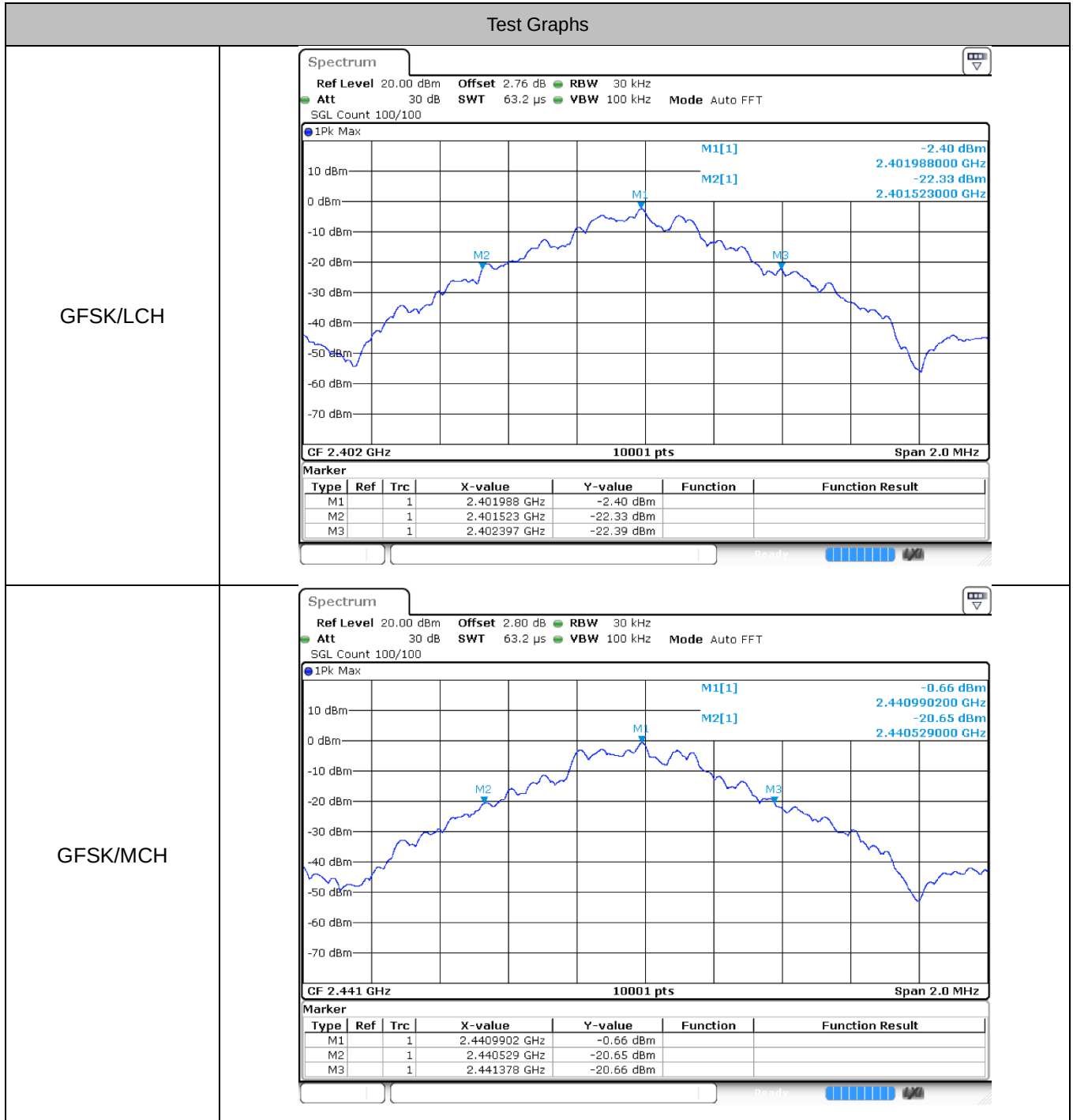


### 3 20dB Bandwidth

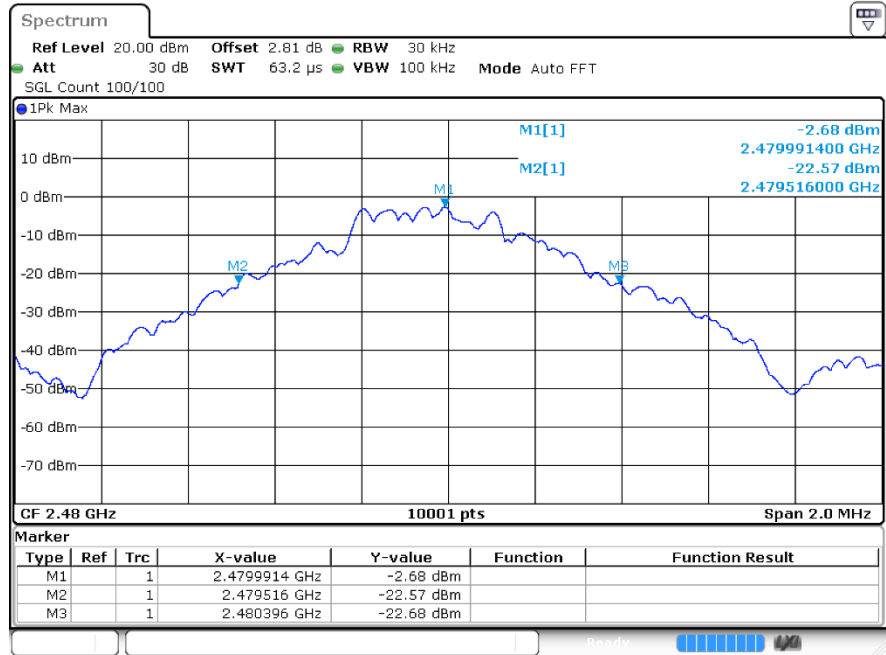
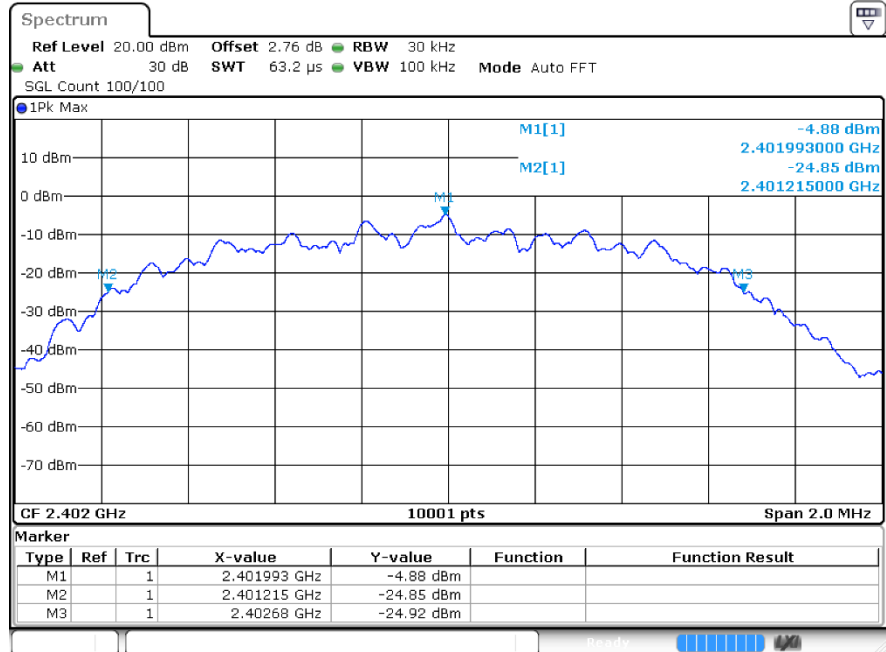
#### Test Result

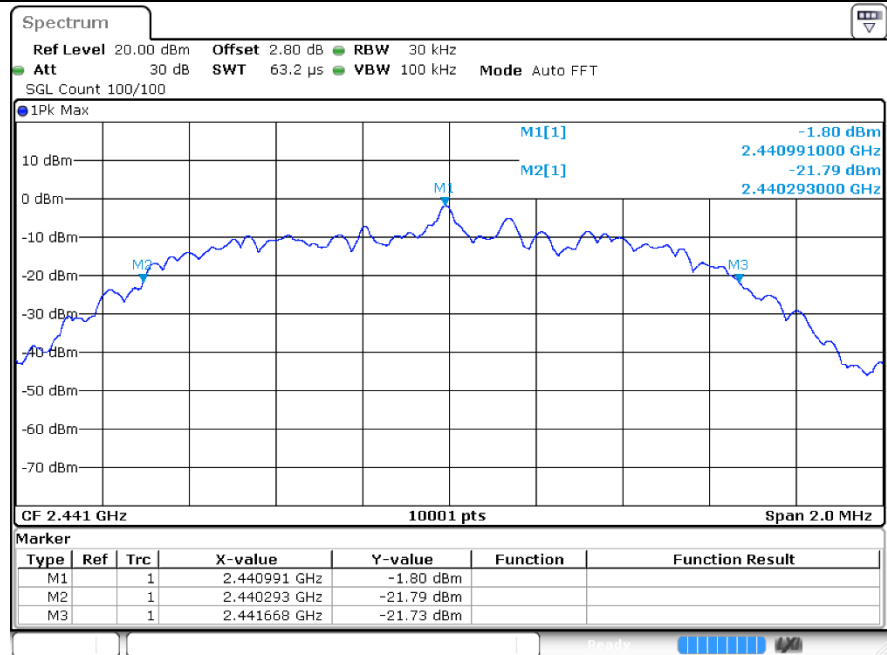
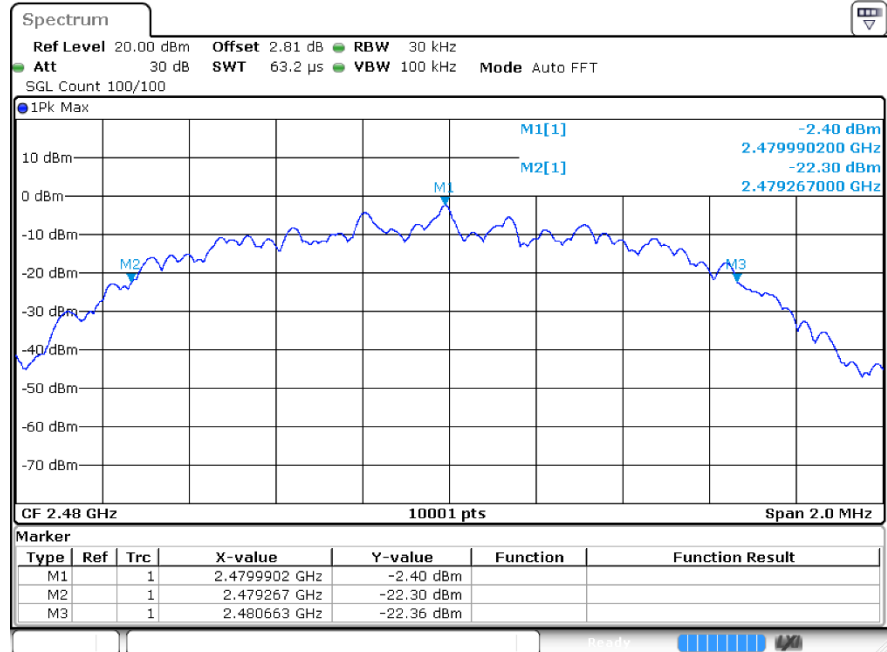
| Mode          | Channel. | 20dB Bandwidth [MHz] | Limit [MHz]   | Verdict |
|---------------|----------|----------------------|---------------|---------|
| GFSK          | LCH      | 0.874                | Not Specified | Pass    |
|               | MCH      | 0.849                | Not Specified | Pass    |
|               | HCH      | 0.88                 | Not Specified | Pass    |
| $\pi/4$ DQPSK | LCH      | 1.465                | Not Specified | Pass    |
|               | MCH      | 1.375                | Not Specified | Pass    |
|               | HCH      | 1.396                | Not Specified | Pass    |
| 8DPSK         | LCH      | 1.443                | Not Specified | Pass    |
|               | MCH      | 1.428                | Not Specified | Pass    |
|               | HCH      | 1.441                | Not Specified | Pass    |

# Test Graphs

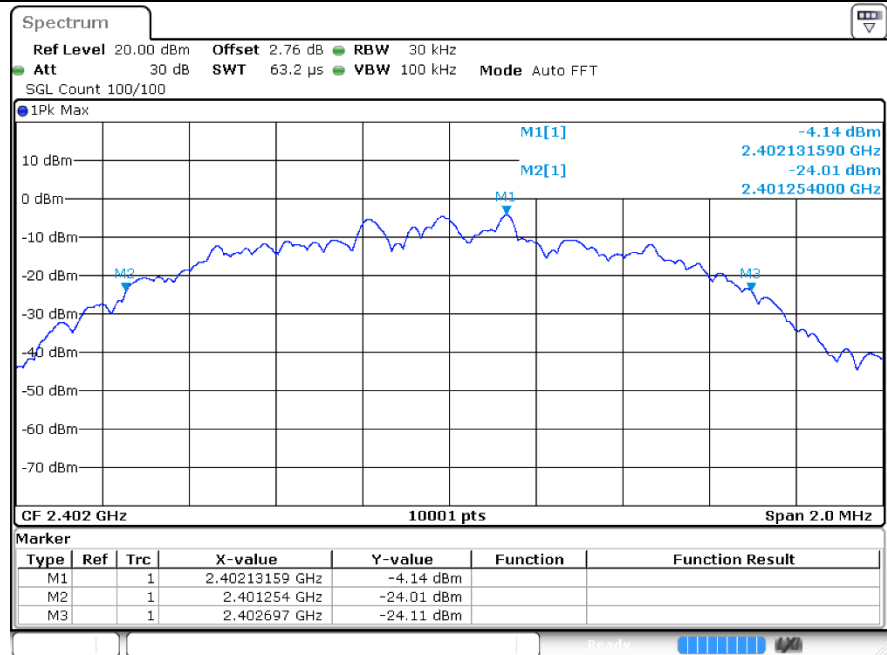


GFSK/HCH

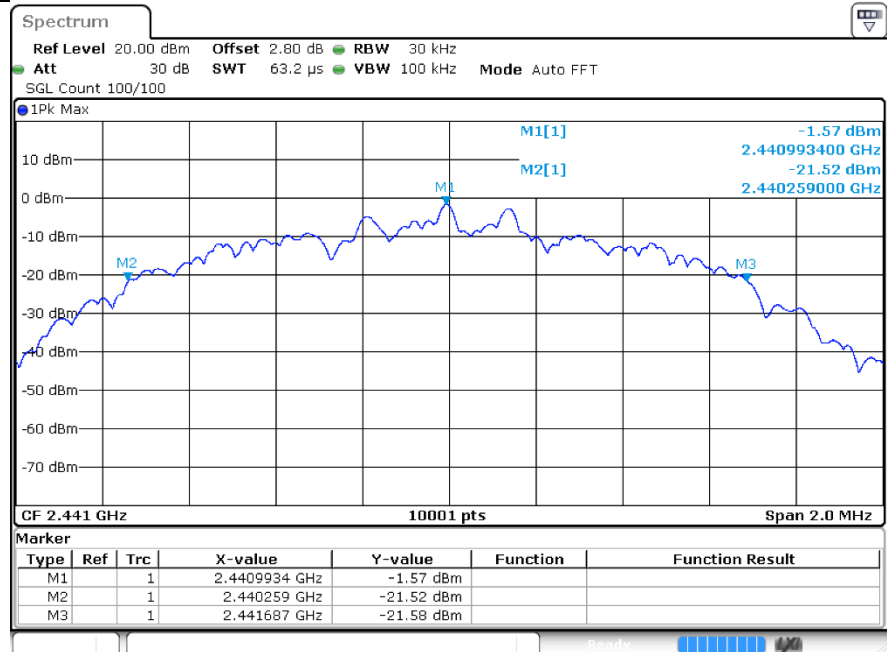

 $\pi/4$ DQPSK/LCH


$\pi/4$ DQPSK/MCH

 $\pi/4$ DQPSK/HCH


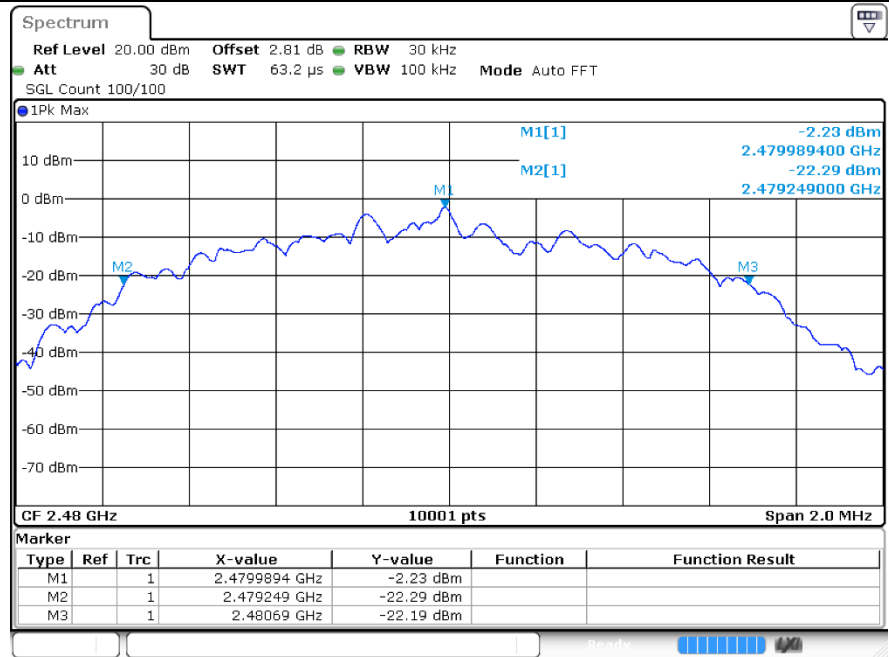
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH



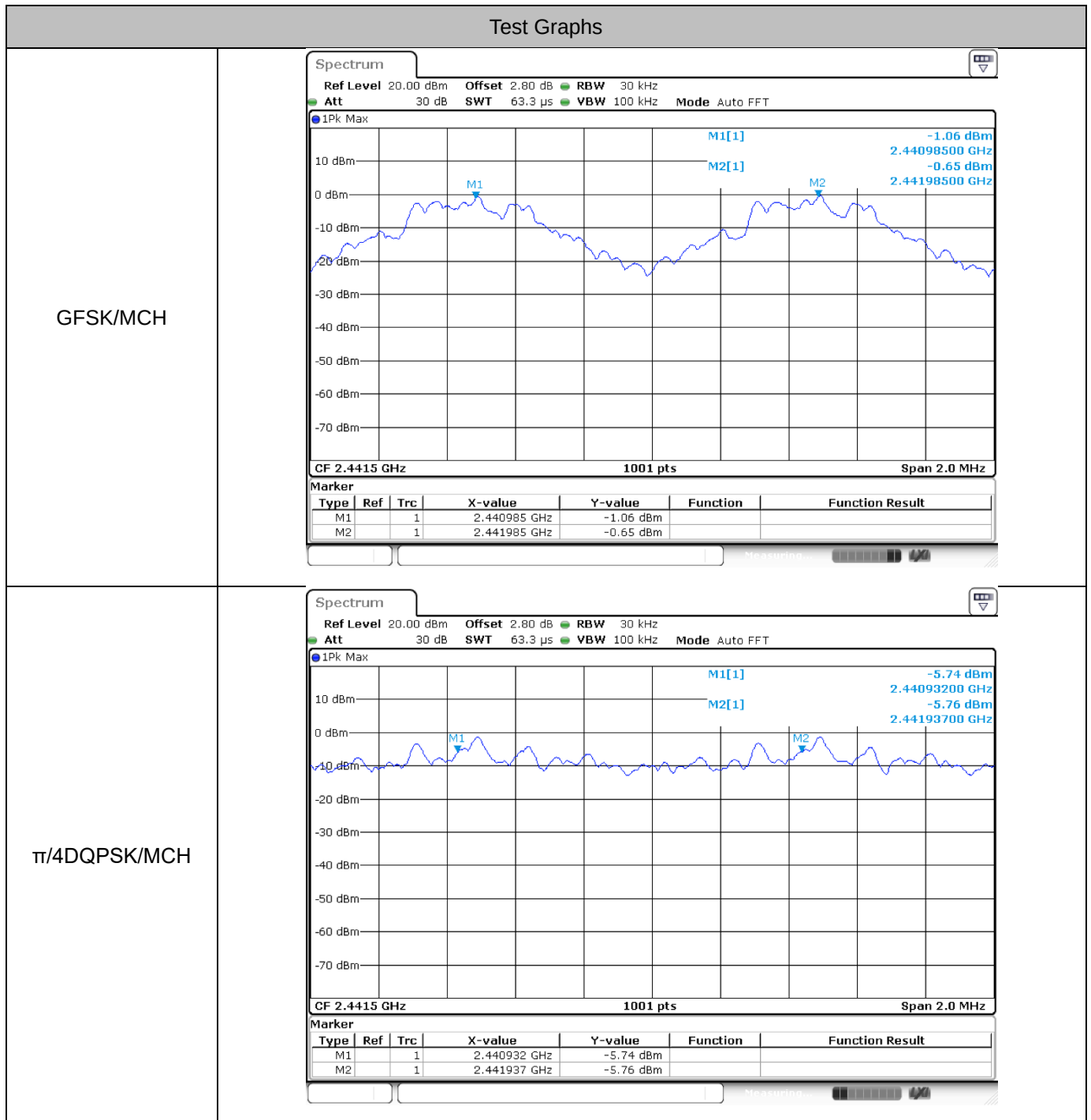
## 4 Carrier Frequency Separation

### Test Result

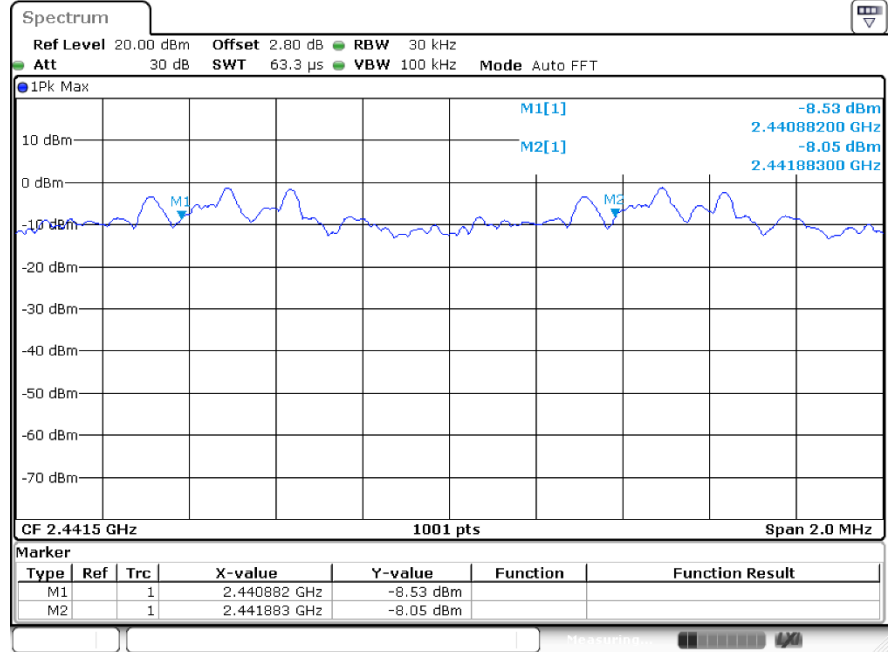
| Mode          | Channel. | Carrier Frequency Separation [MHz] | Limit [MHz] | Verdict |
|---------------|----------|------------------------------------|-------------|---------|
| GFSK          | MCH      | 1                                  | 0.566       | Pass    |
| $\pi/4$ DQPSK | MCH      | 1.005                              | 0.917       | Pass    |
| 8DPSK         | MCH      | 1.001                              | 0.952       | Pass    |



# Test Graphs



8DPSK/MCH

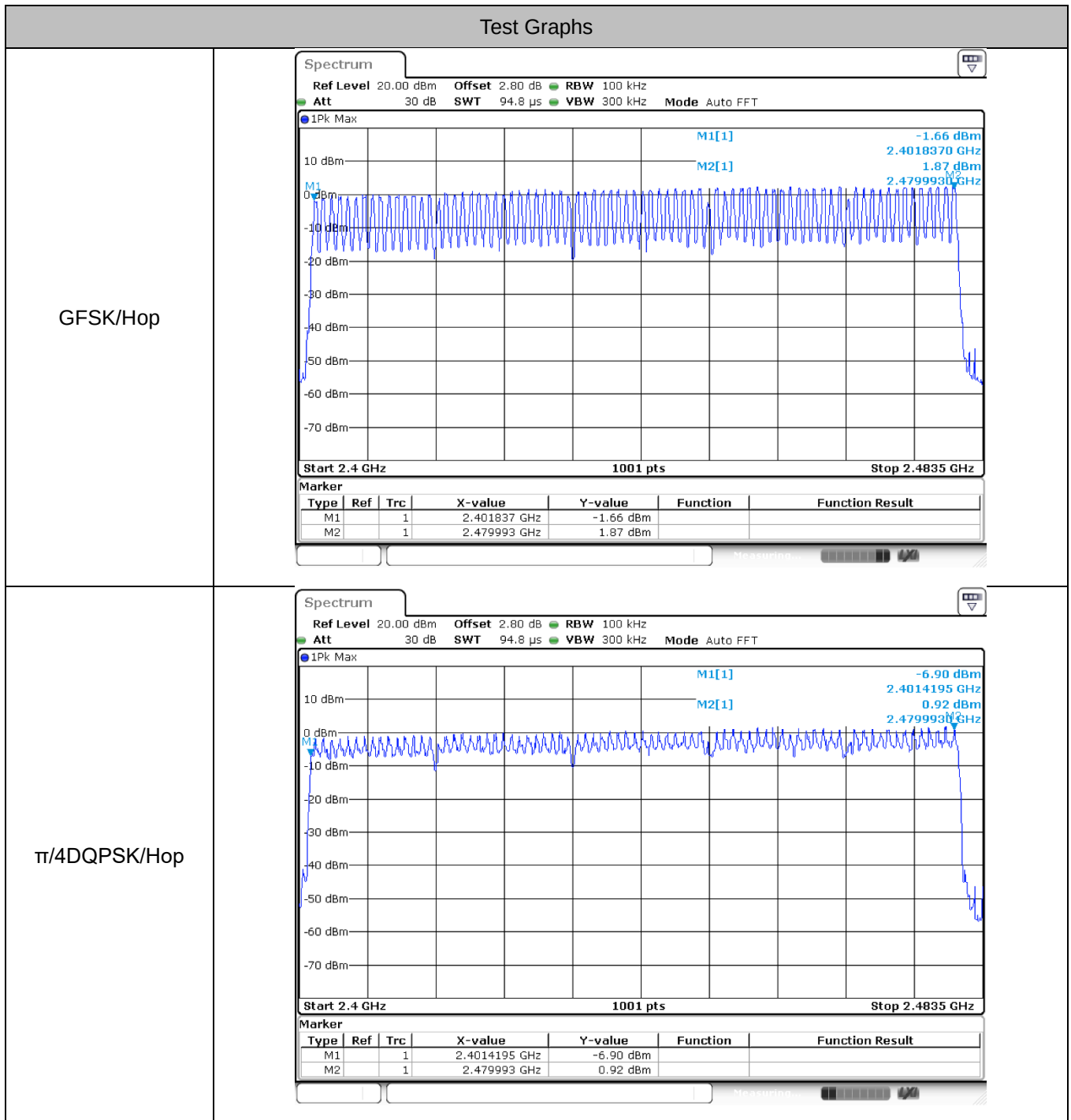


## 5 Hopping Channel Number

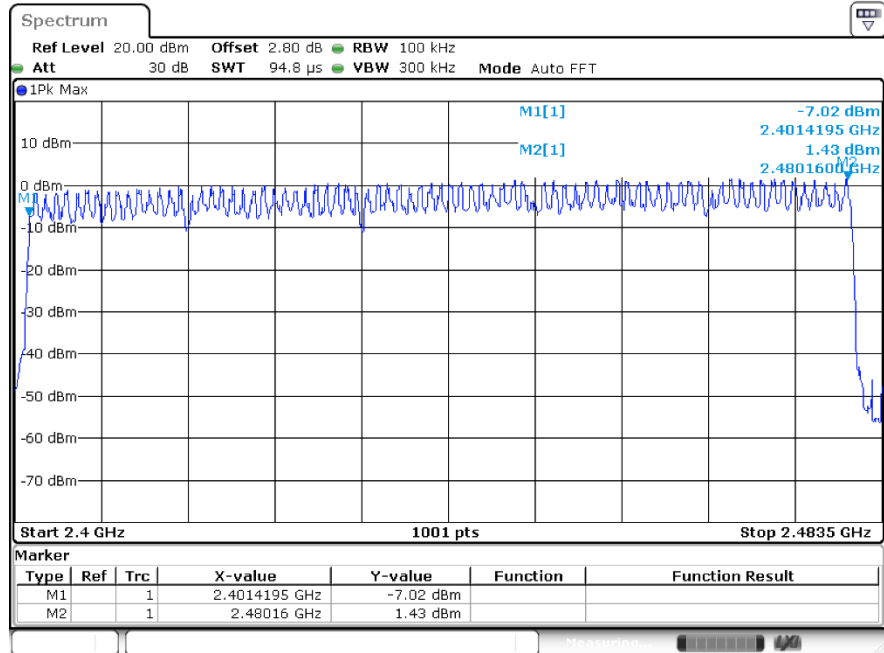
### Test Result

| Mode          | Channel. | Number of Hopping Channel [N] | Limit [N] | Verdict |
|---------------|----------|-------------------------------|-----------|---------|
| GFSK          | Hop      | 79                            | $\geq 15$ | PASS    |
| $\pi/4$ DQPSK | Hop      | 79                            | $\geq 15$ | PASS    |
| 8DPSK         | Hop      | 79                            | $\geq 15$ | PASS    |

# Test Graphs



8DPSK/Hop

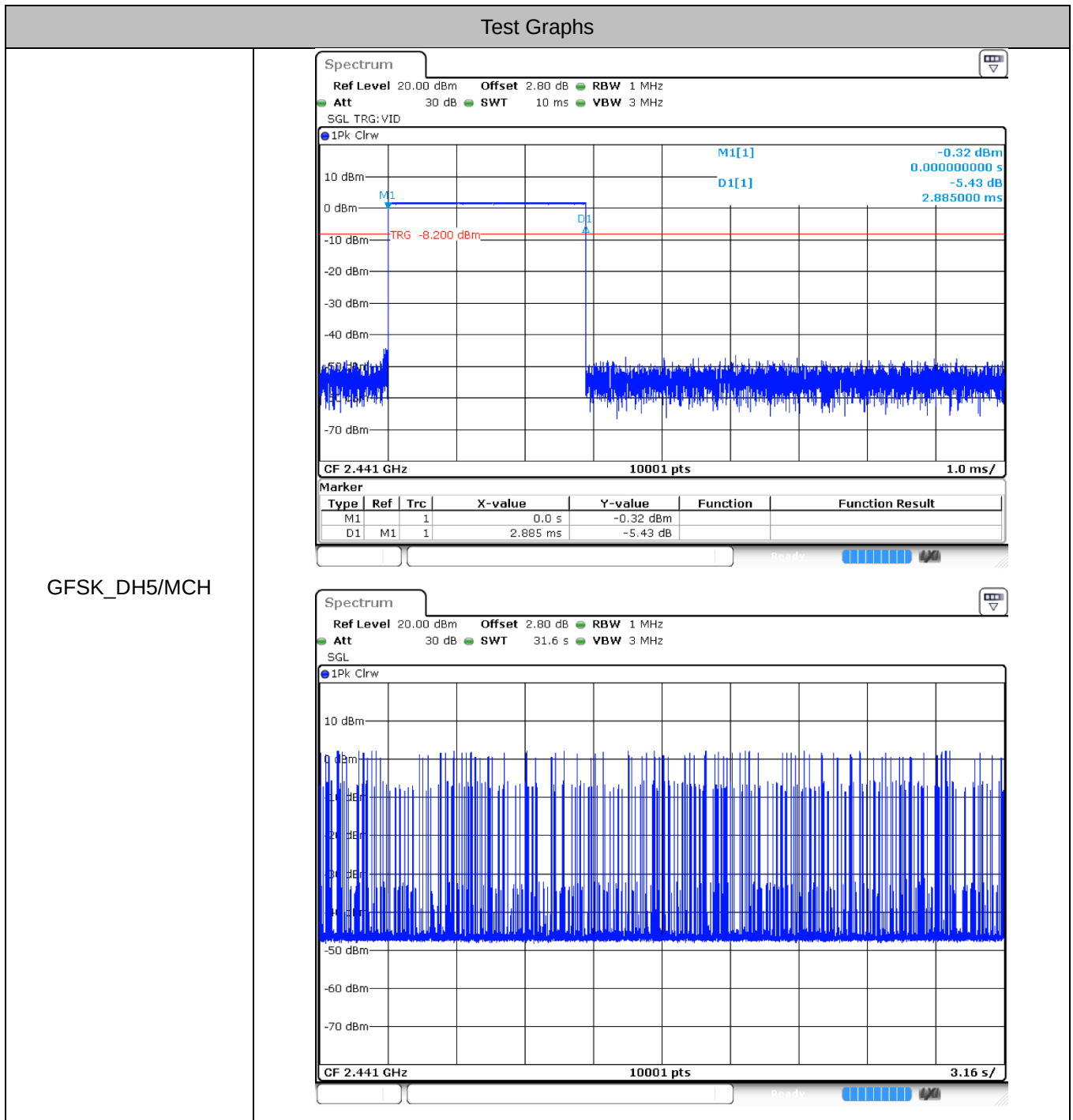


## 6 Dwell Time

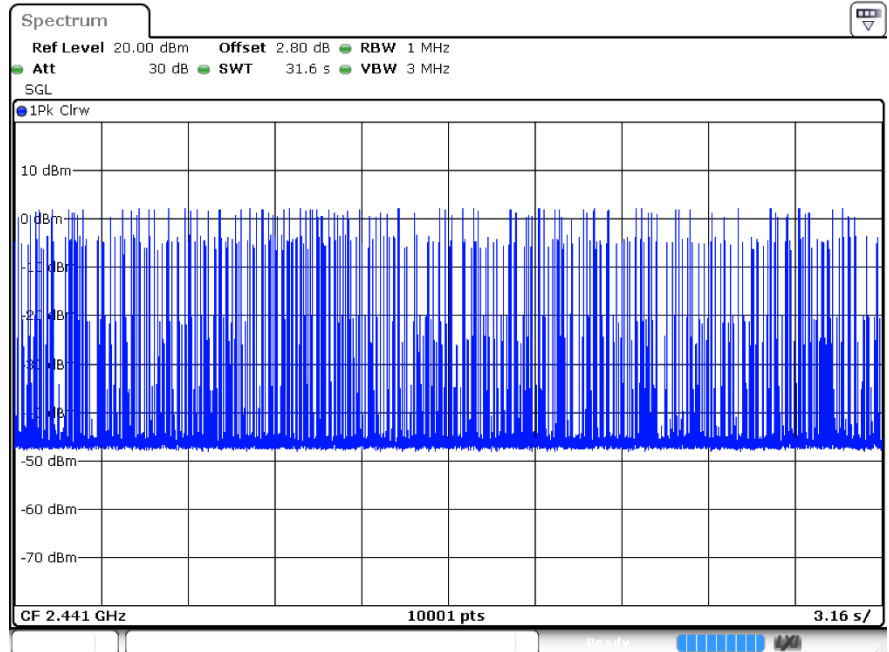
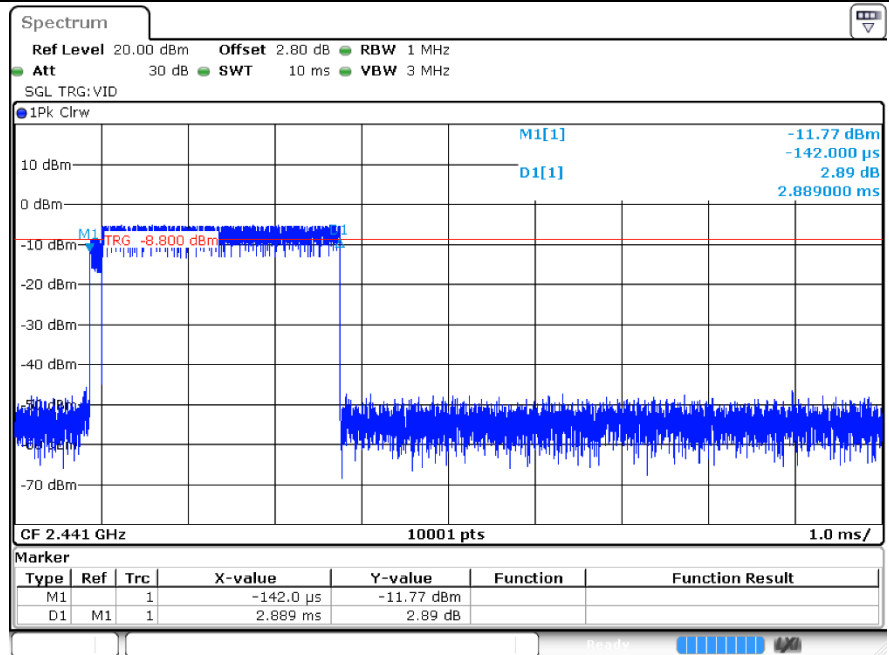
### Test Result

| Mode          | Packet | Channel | Burst Width<br>[ms/hop/ch] | Total<br>Hops[hop*ch] | Dwell Time[ms] | Limit [s] | Verdict |
|---------------|--------|---------|----------------------------|-----------------------|----------------|-----------|---------|
| GFSK          | DH5    | MCH     | 2.885                      | 104                   | 300.04         | 0.4       | Pass    |
| $\pi/4$ DQPSK | 2DH5   | MCH     | 2.889                      | 112                   | 323.568        | 0.4       | Pass    |
| 8DPSK         | 3DH5   | MCH     | 2.892                      | 103                   | 297.876        | 0.4       | Pass    |

# Test Graphs

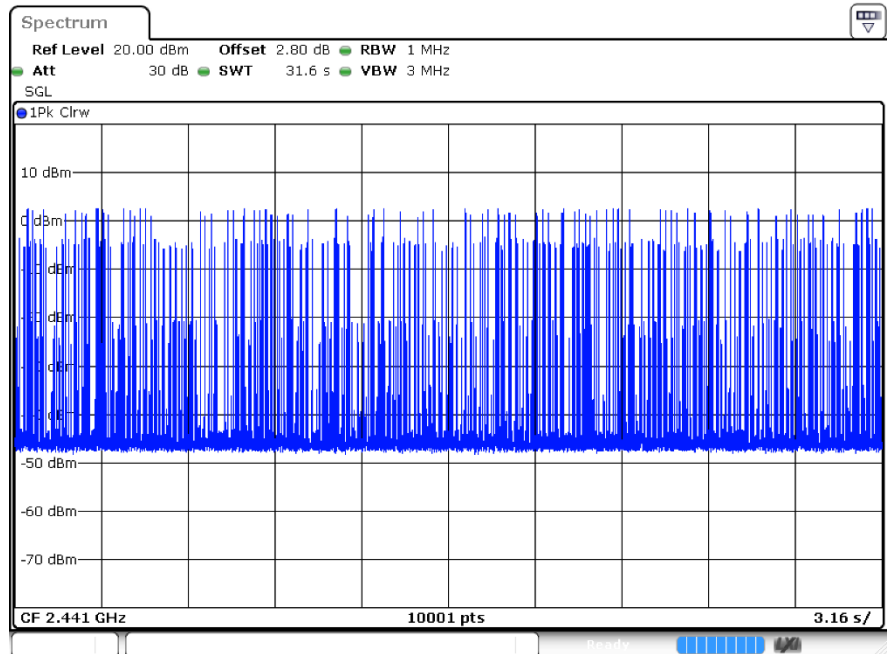
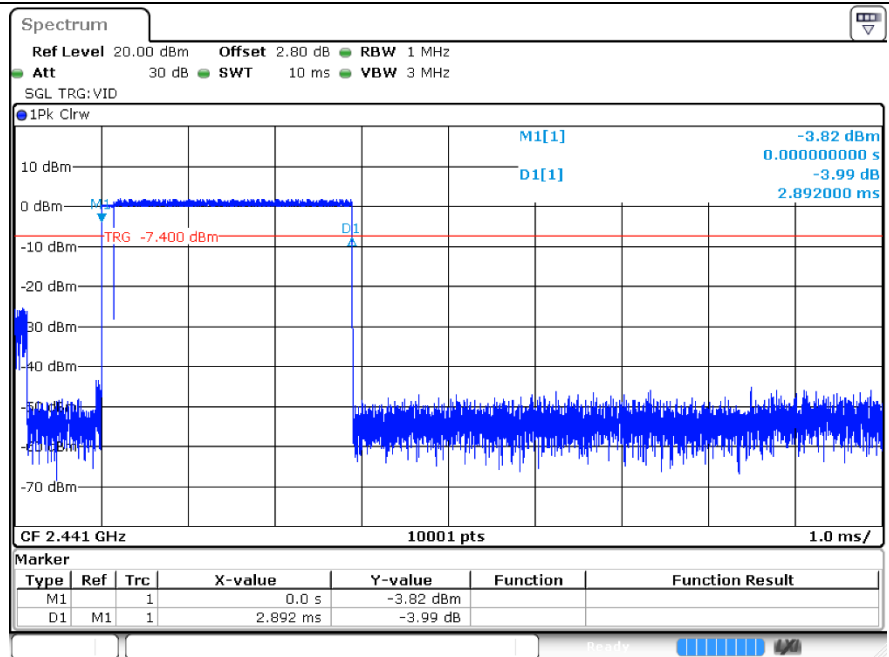


$\pi/4$ DQPSK  
\_2DH5/MCH





8DPSK\_3DH5/MCH

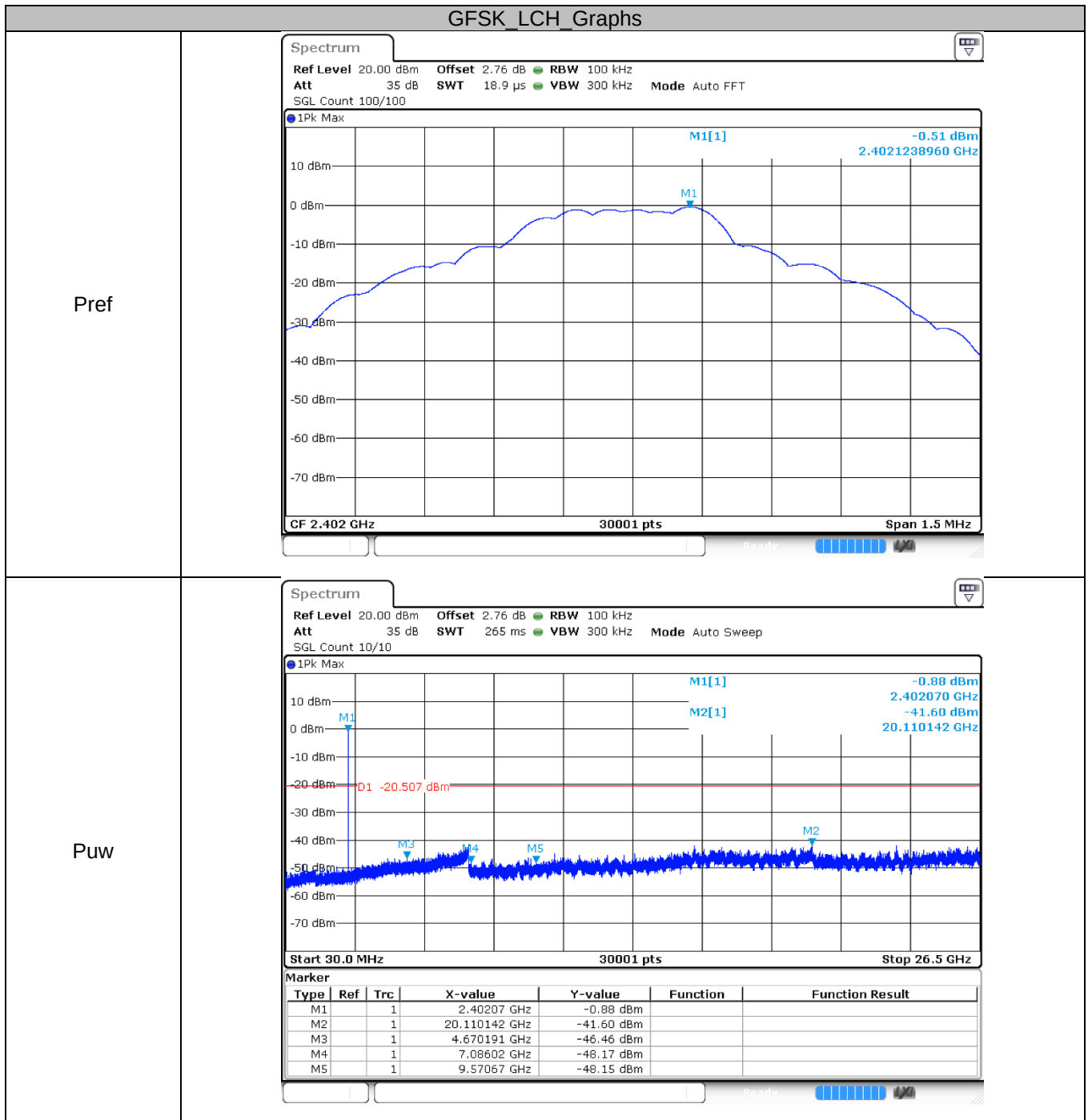


## 7 RF Conducted Spurious Emissions

### Test Result

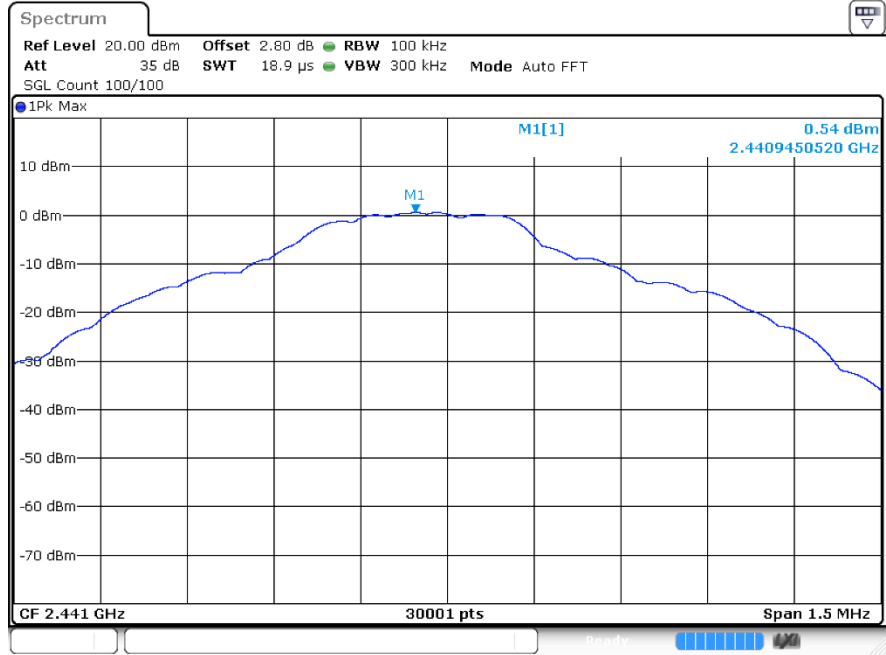
| Mode          | Channel | Max. Level [dBc] | Limit [dBc] | Verdict |
|---------------|---------|------------------|-------------|---------|
| GFSK          | LCH     | -41.09           | -20         | Pass    |
|               | MCH     | -40.93           | -20         | Pass    |
|               | HCH     | -41.88           | -20         | Pass    |
| $\pi/4$ DQPSK | LCH     | -38.32           | -20         | Pass    |
|               | MCH     | -40.66           | -20         | Pass    |
|               | HCH     | -40.35           | -20         | Pass    |
| 8DPSK         | LCH     | -40.01           | -20         | Pass    |
|               | MCH     | -40.49           | -20         | Pass    |
|               | HCH     | -40.4            | -20         | Pass    |

# Test Graphs

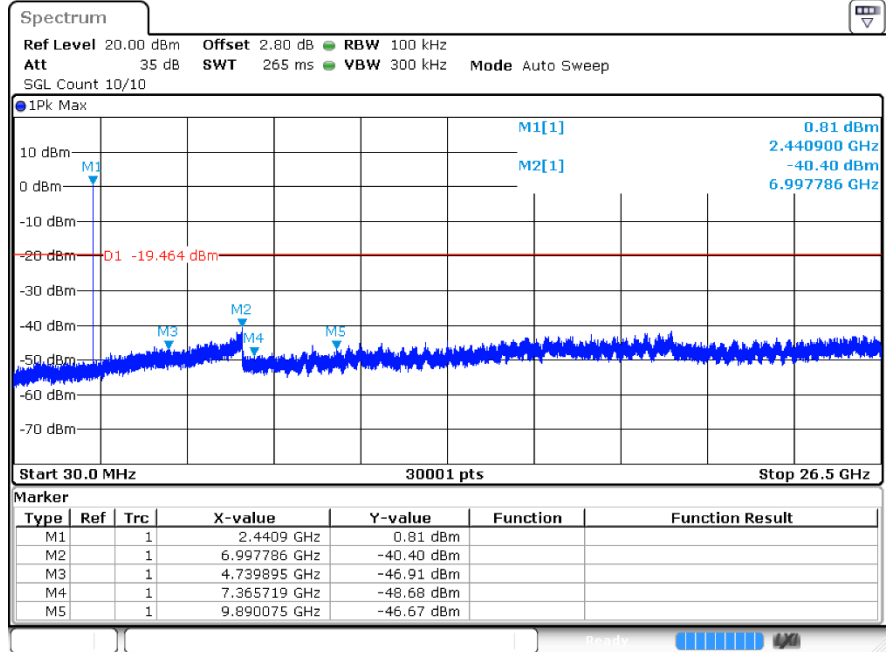


## GFSK MCH Graphs

Pref

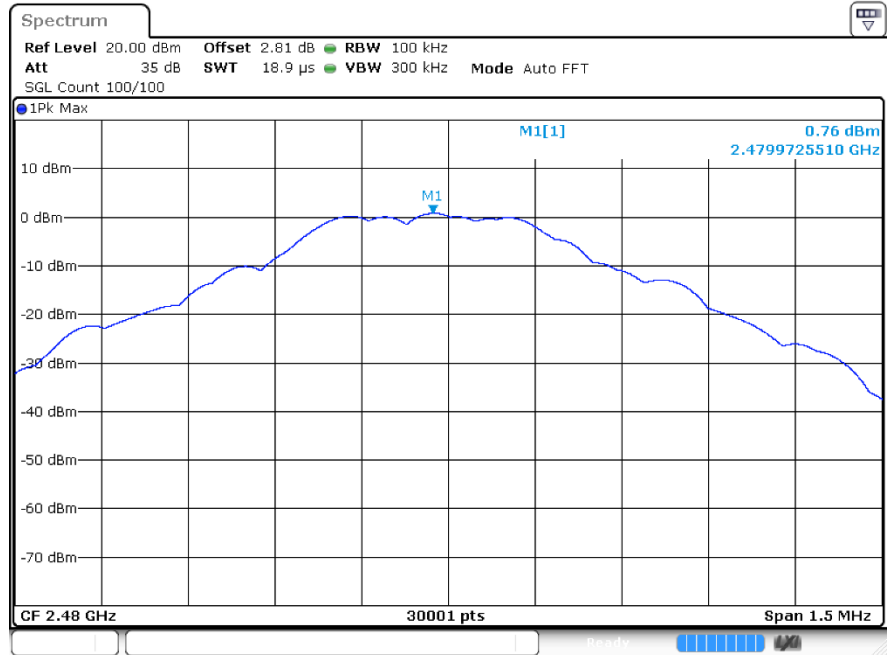


Puw

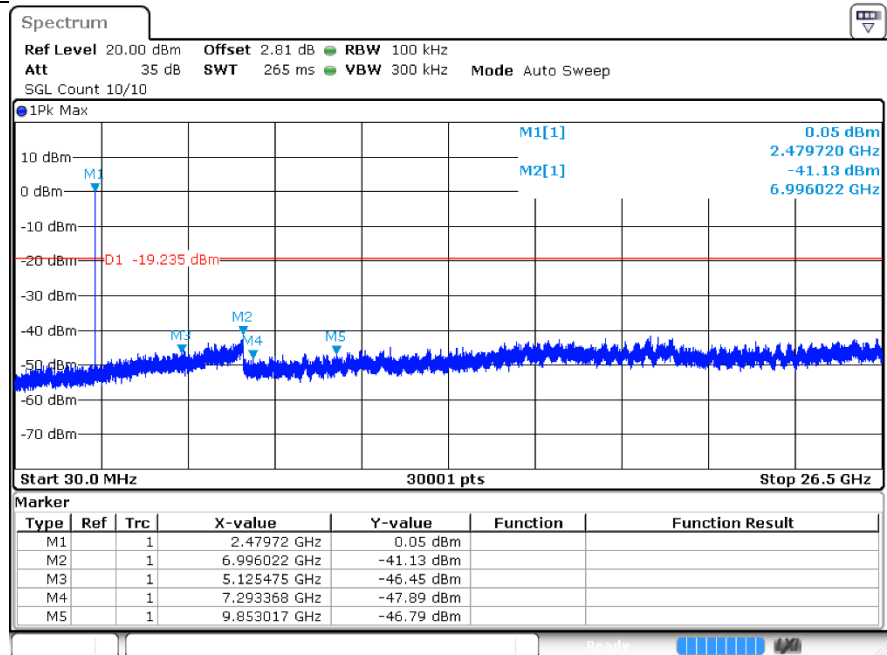


# GFSK HCH Graphs

Pref

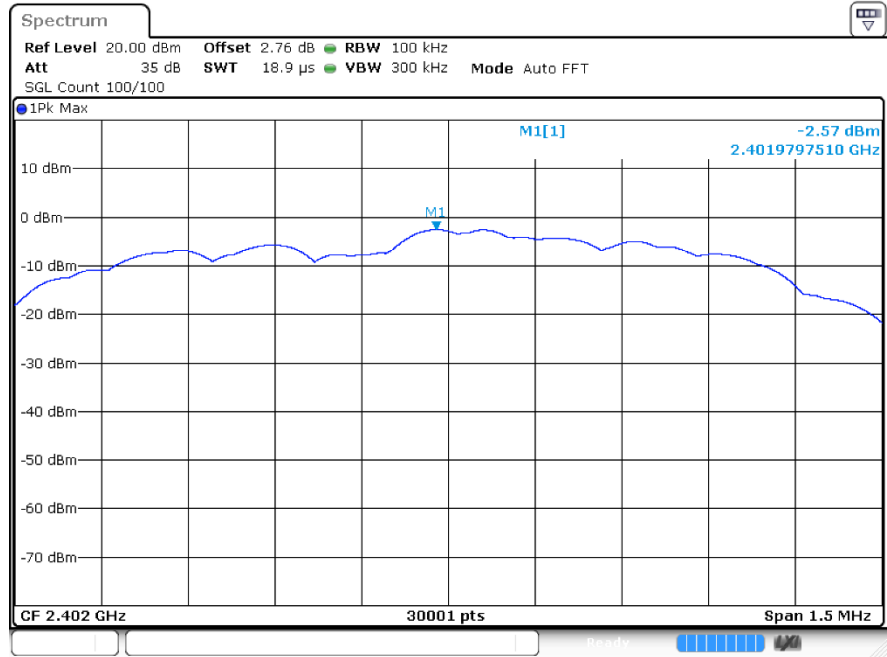


Puw

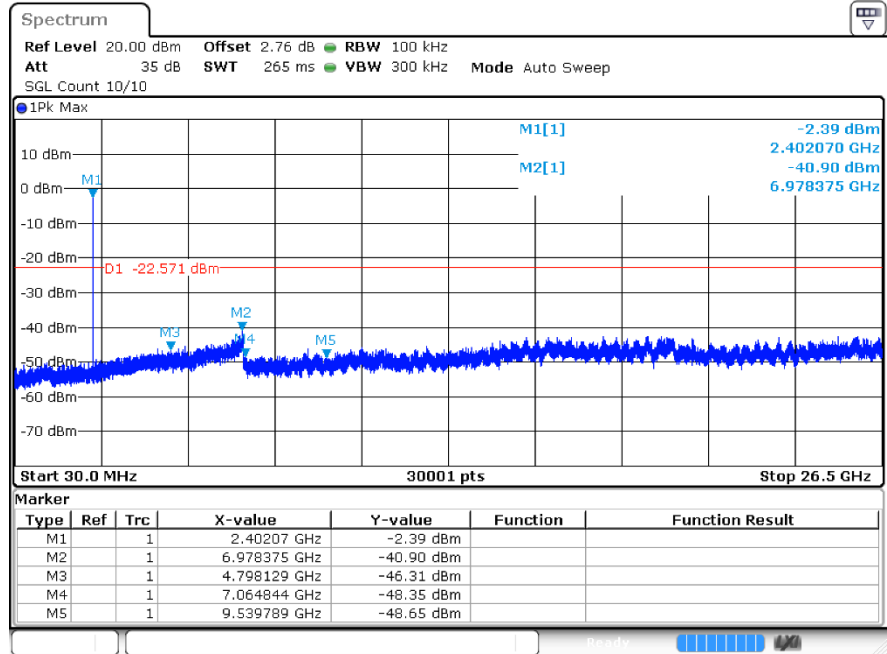


# $\pi/4$ DQPSK LCH Graphs

Pref

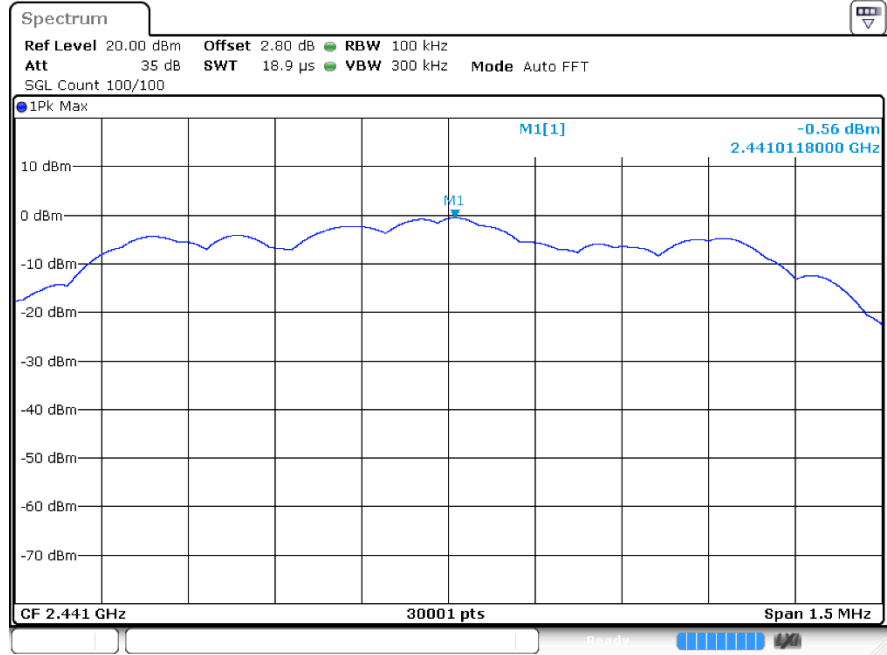


Puw

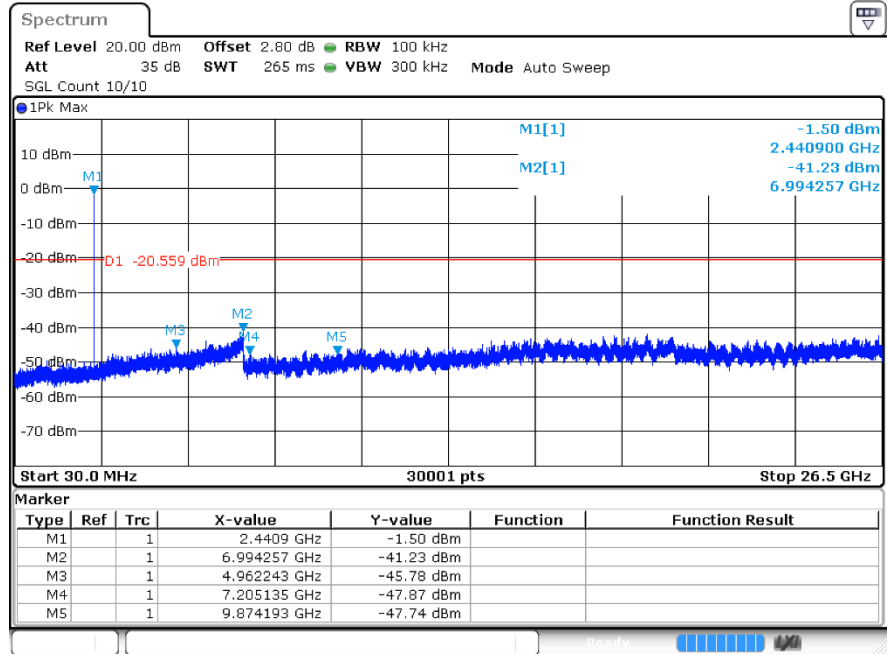


# $\pi/4$ DQPSK MCH Graphs

Pref

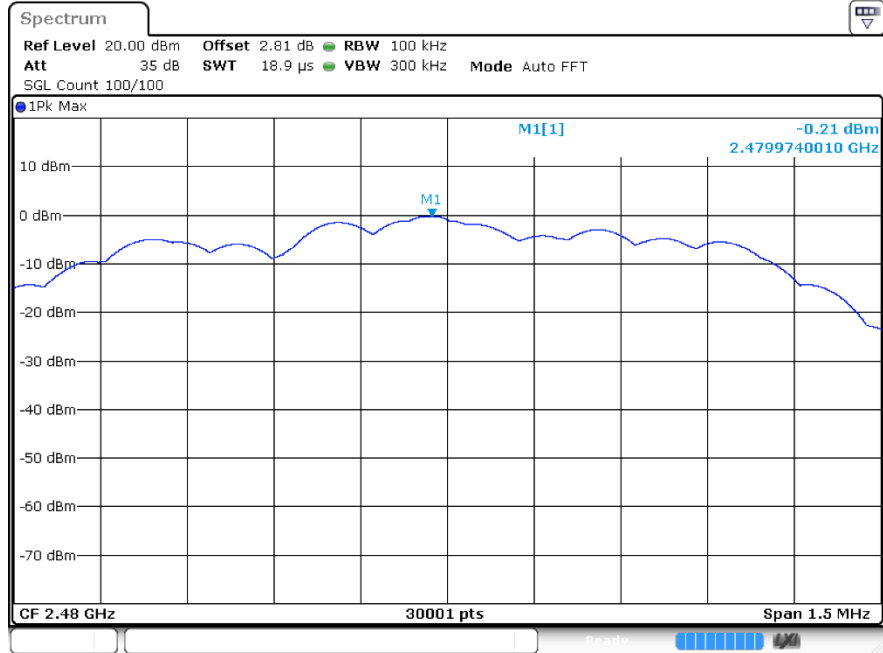


Puw

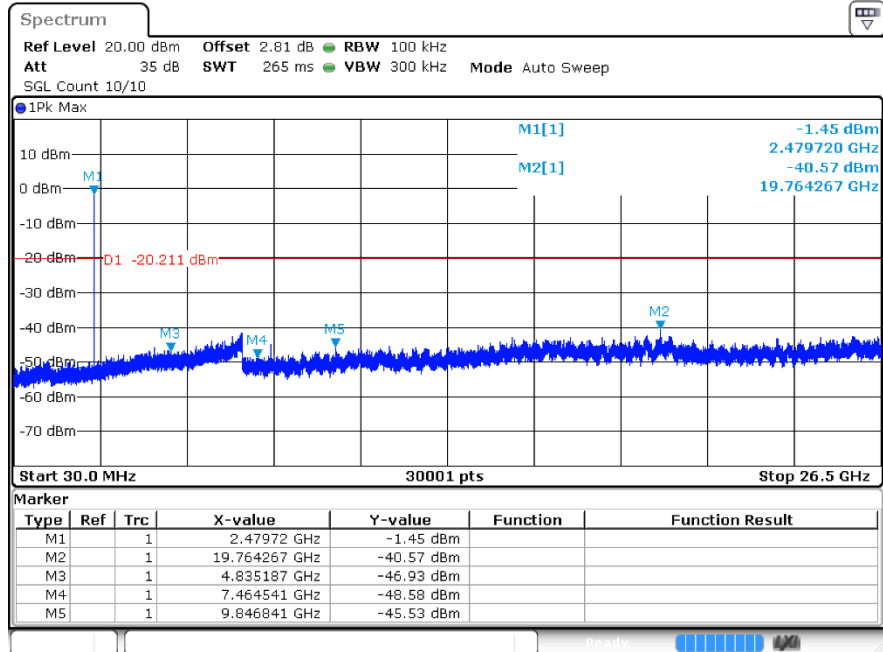


# $\pi/4$ DQPSK HCH Graphs

Pref



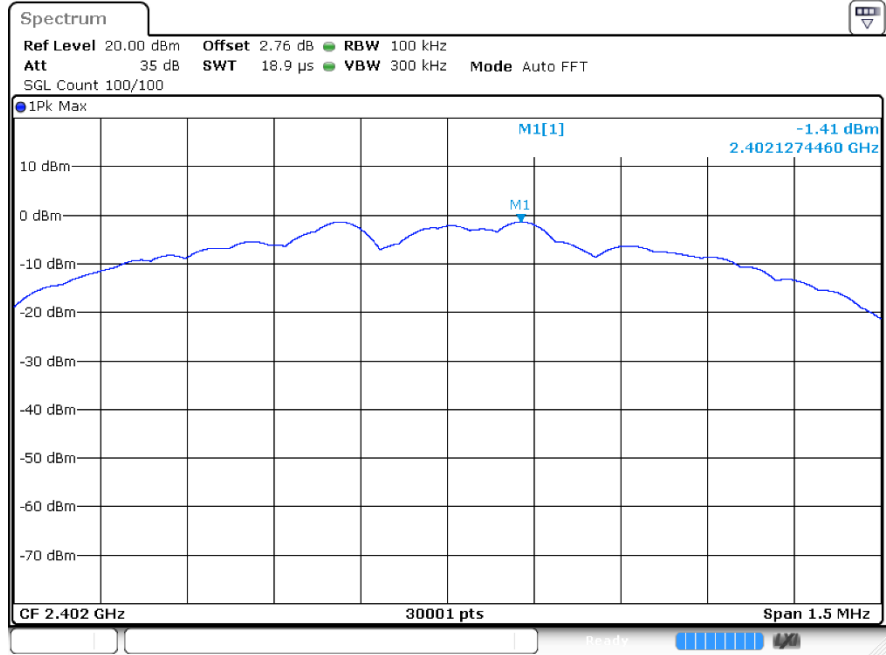
Puw



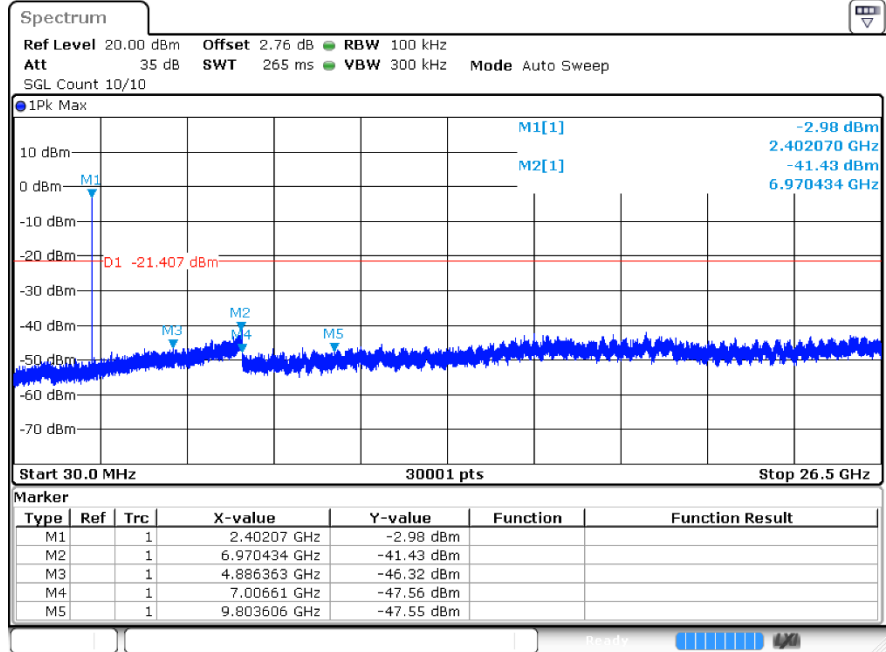


## 8DPSK LCH Graphs

Pref

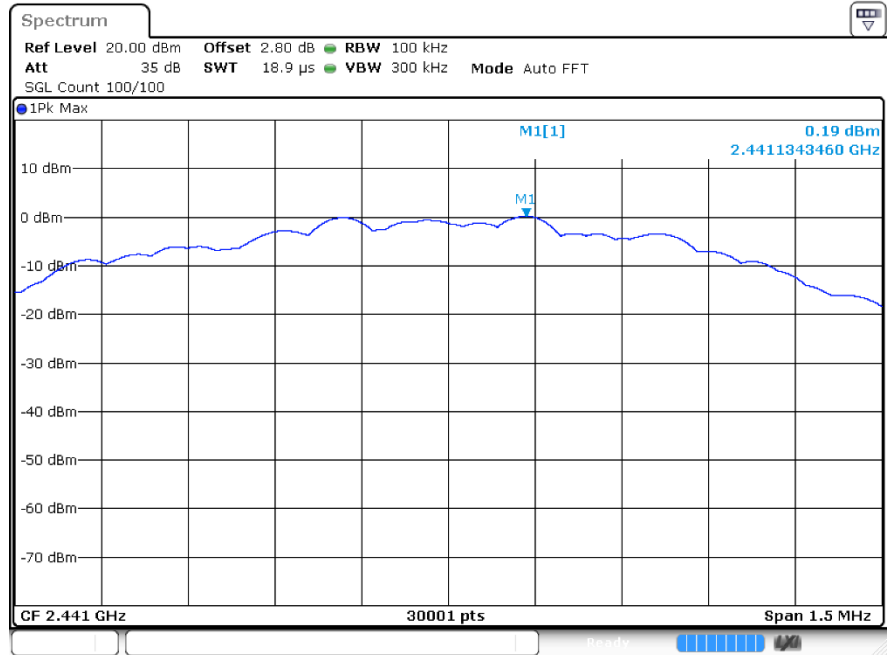


Puw

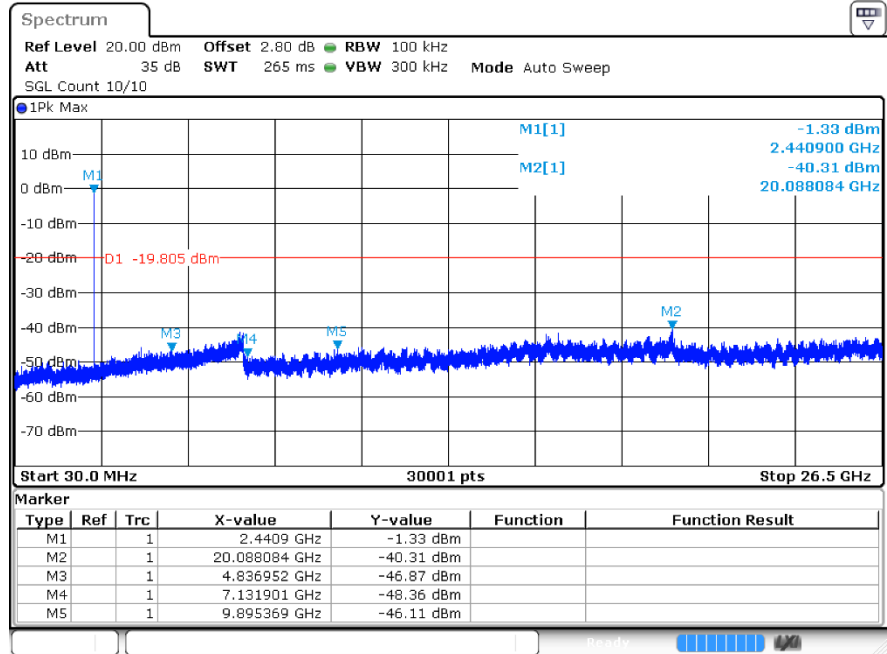


## 8DPSK MCH Graphs

Pref

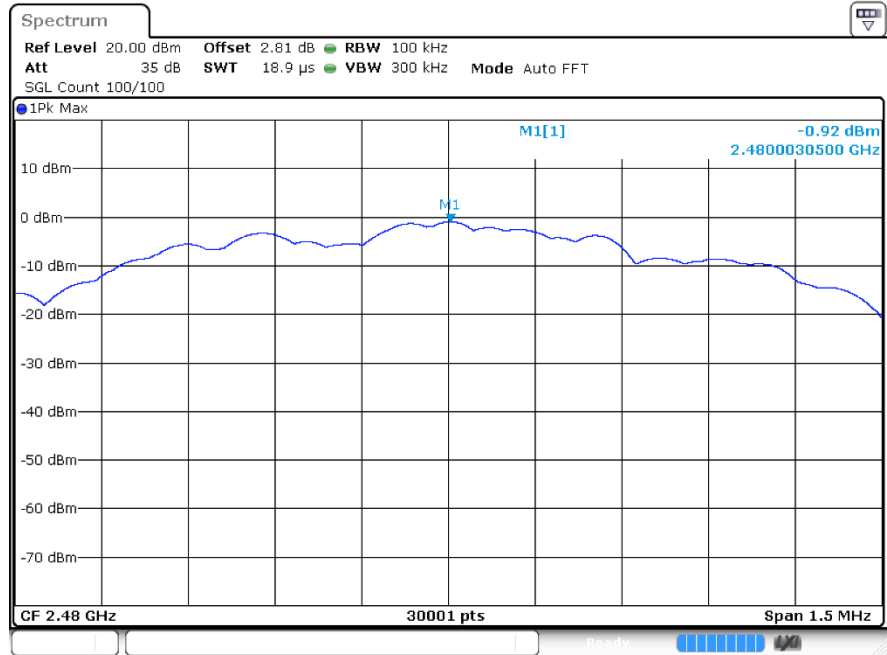


Puw

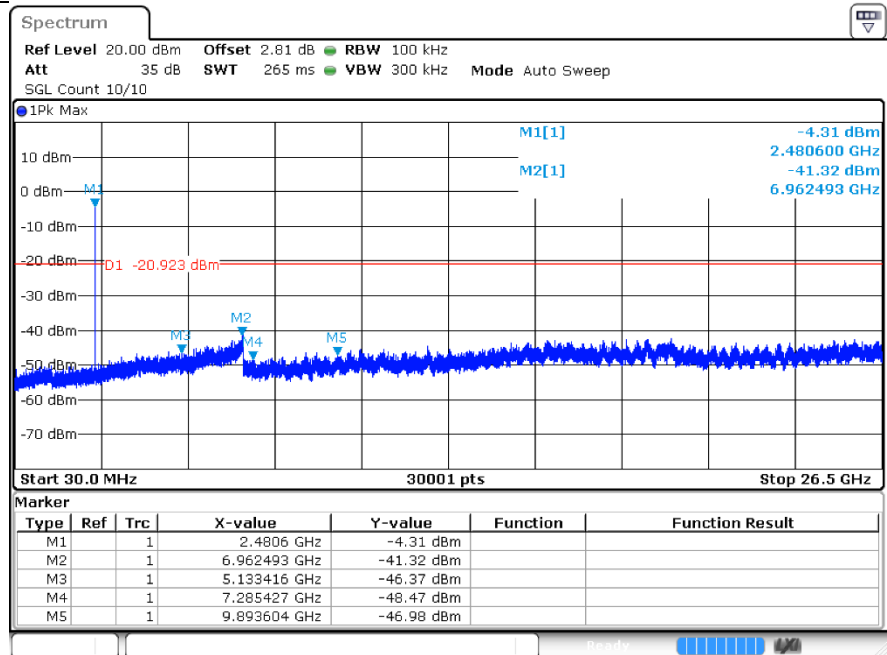


## 8DPSK\_HCH\_Graphs

Pref



Puw

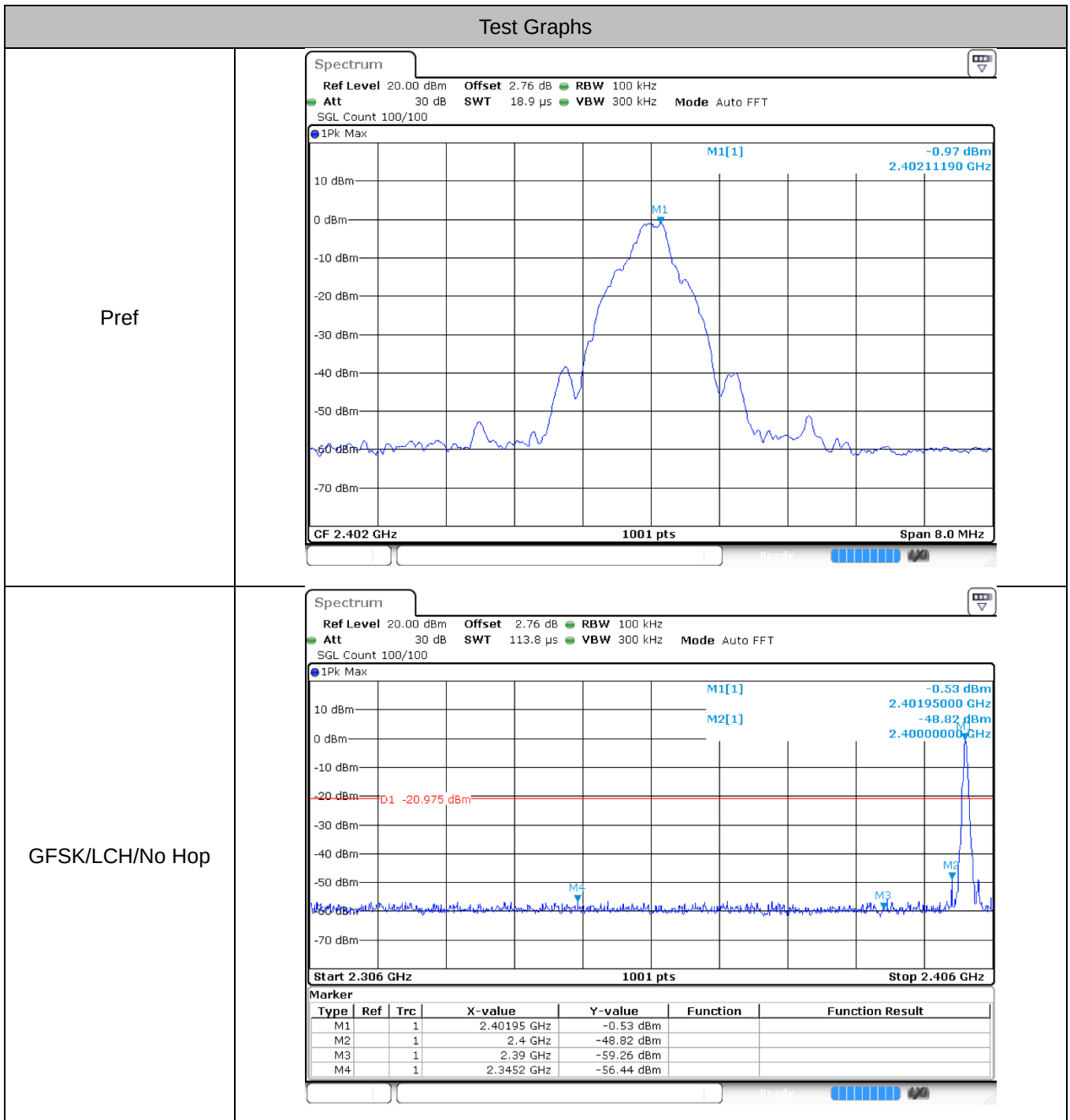


## 8 Band-edge for RF Conducted Emissions

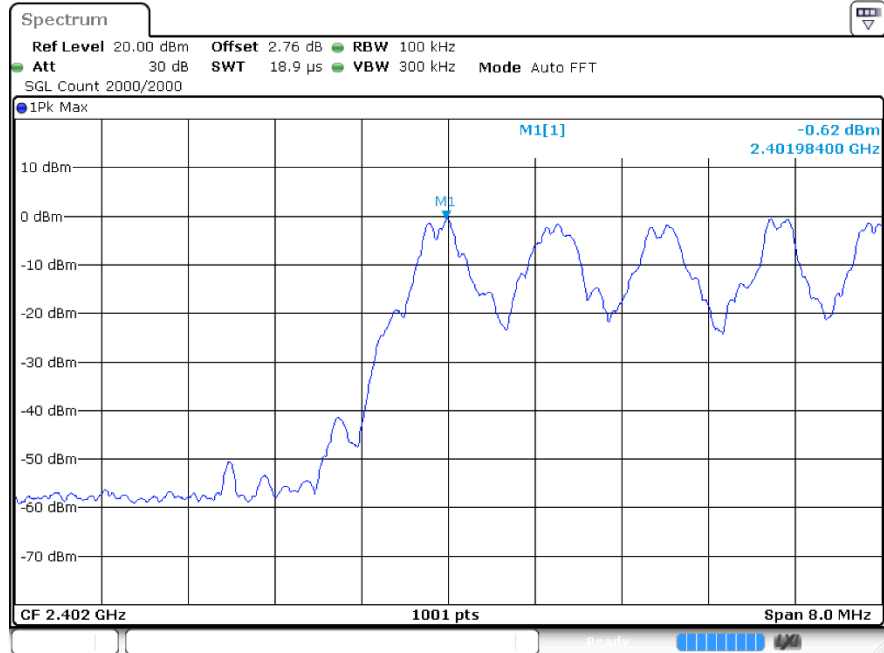
### Test Result

| Mode          | Channel | Carrier Frequency [MHz] | Frequency Hopping | Max Spurious Level [dBc] | Limit [dBc] | Verdict |
|---------------|---------|-------------------------|-------------------|--------------------------|-------------|---------|
| GFSK          | LCH     | 2402                    | Off               | -55.46                   | -20         | Pass    |
|               |         |                         | On                | -54.35                   | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -46.57                   | -20         | Pass    |
|               |         |                         | On                | -53.57                   | -20         | Pass    |
| $\pi/4$ DQPSK | LCH     | 2402                    | Off               | -53.25                   | -20         | Pass    |
|               |         |                         | On                | -53.03                   | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -48.14                   | -20         | Pass    |
|               |         |                         | On                | -55.66                   | -20         | Pass    |
| 8DPSK         | LCH     | 2402                    | Off               | -54.33                   | -20         | Pass    |
|               |         |                         | On                | -53.2                    | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -46.3                    | -20         | Pass    |
|               |         |                         | On                | -49.76                   | -20         | Pass    |

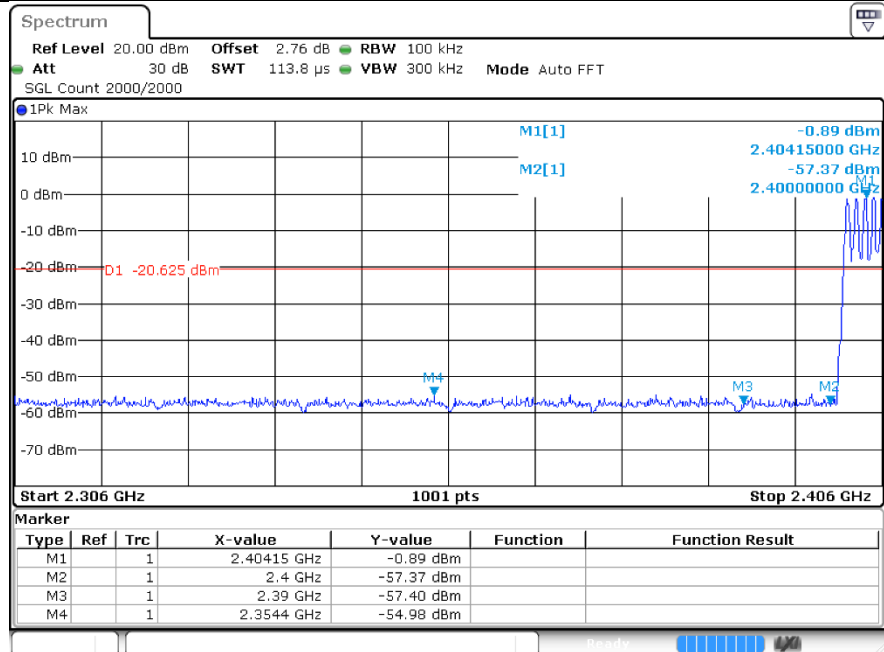
# Test Graphs



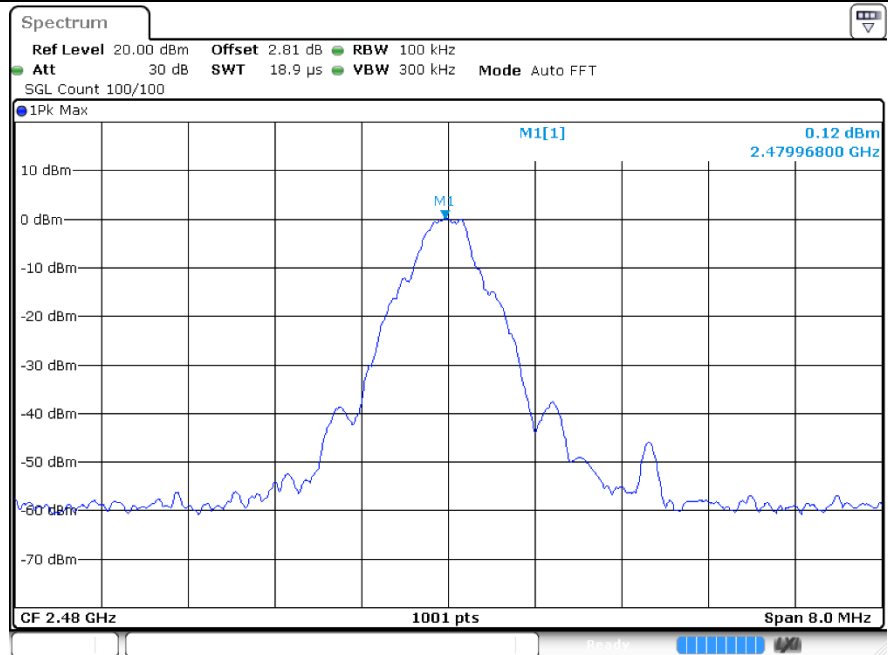
Ref



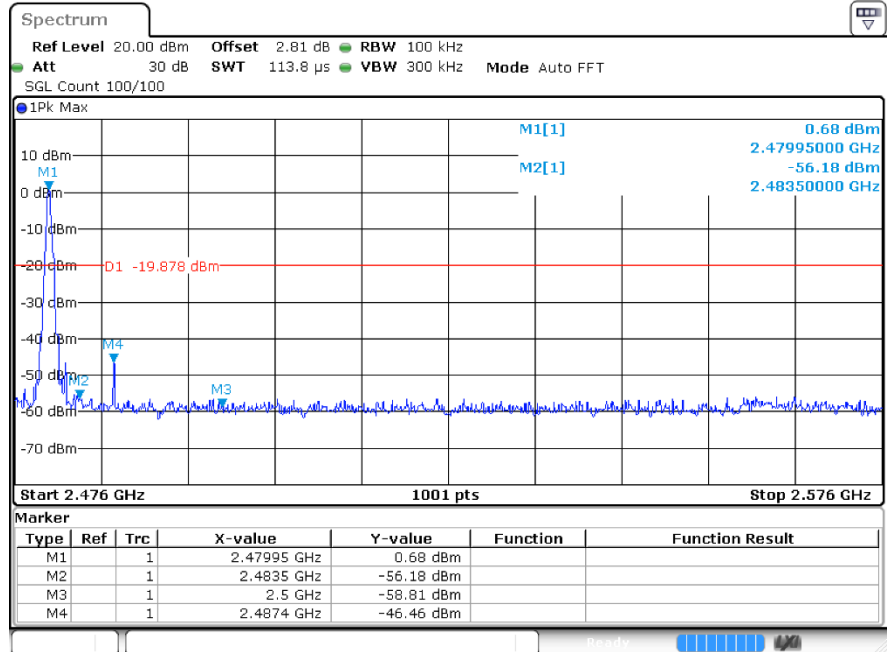
GFSK/LCH/Hop



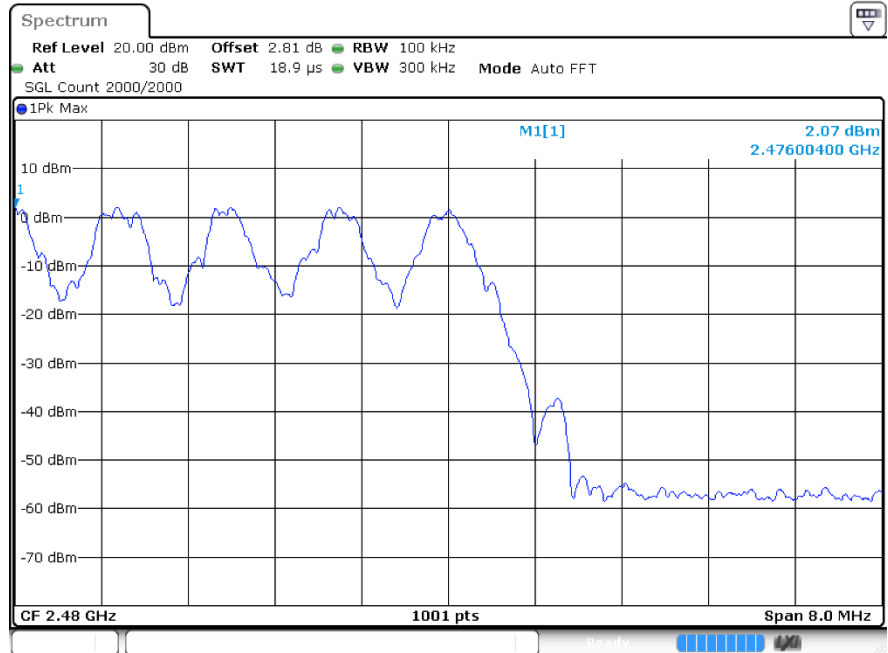
Ref



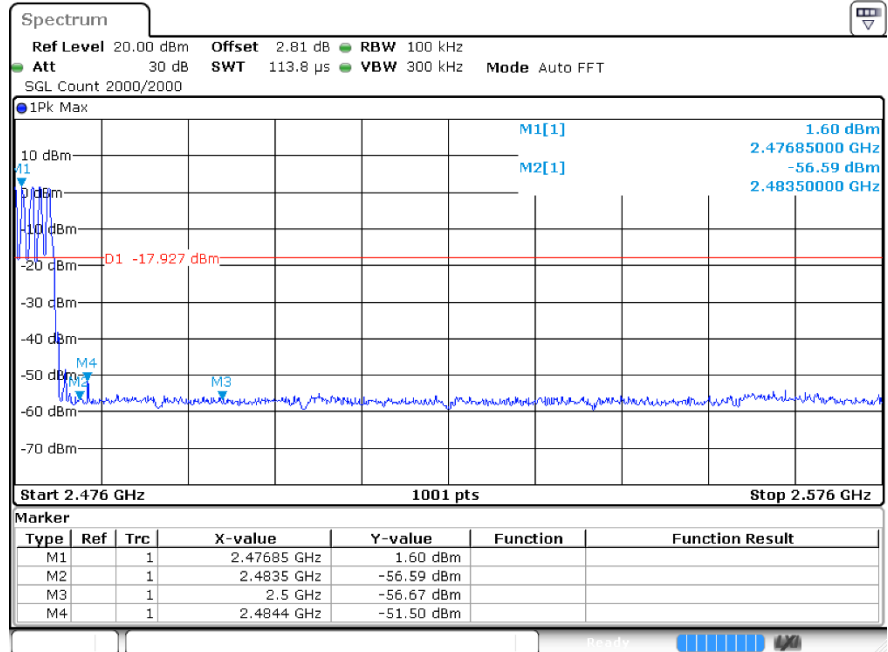
GFSK/HCH/No Hop



Ref.

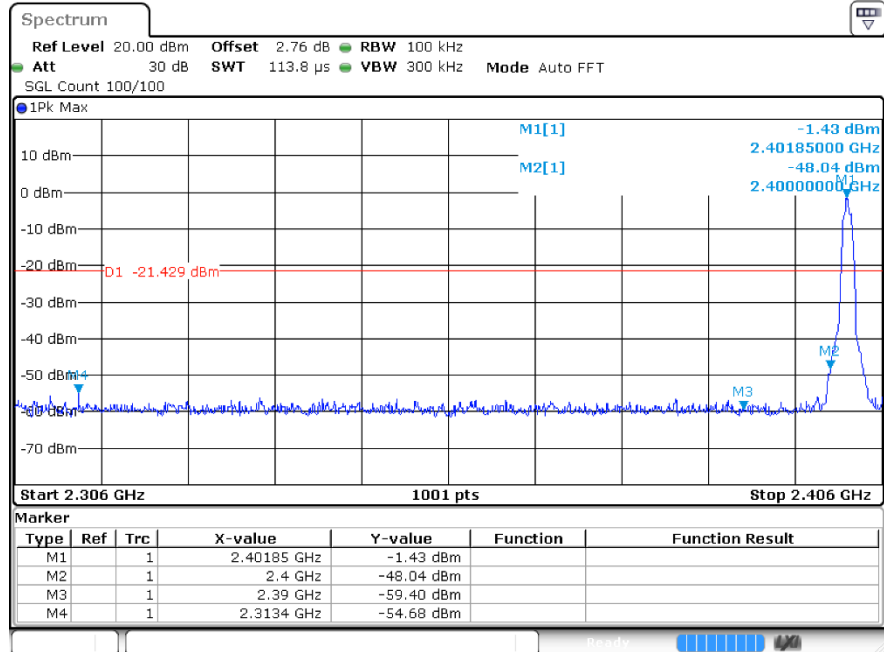


GFSK/HCH/Hop

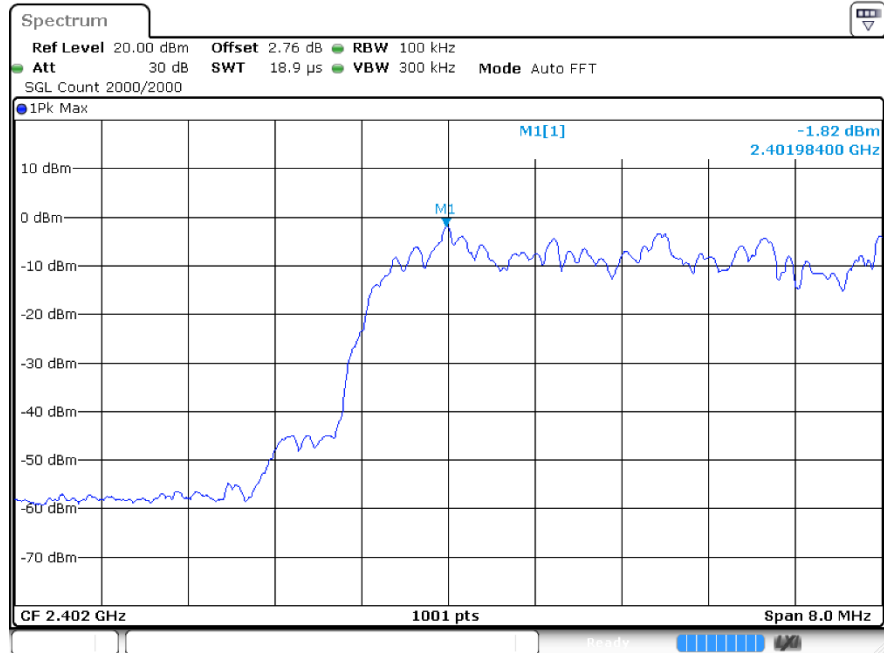
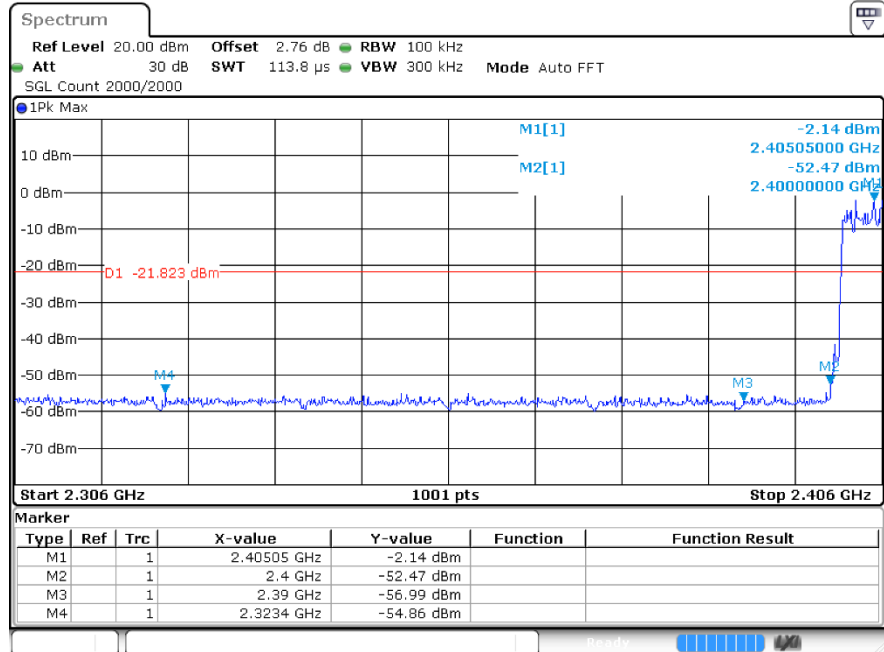




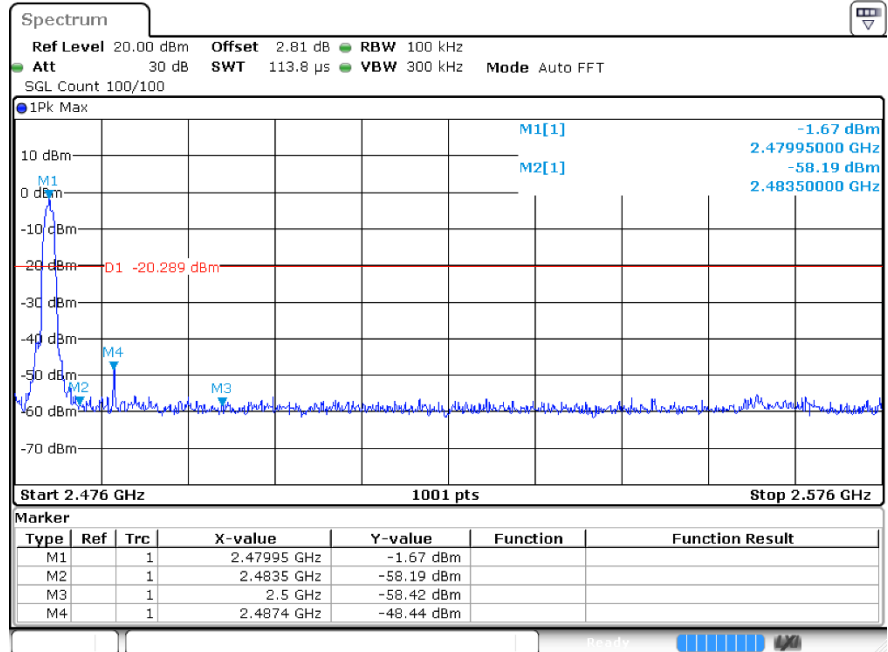
Ref


 $\pi/4$ DQPSK/LCH/No Hop


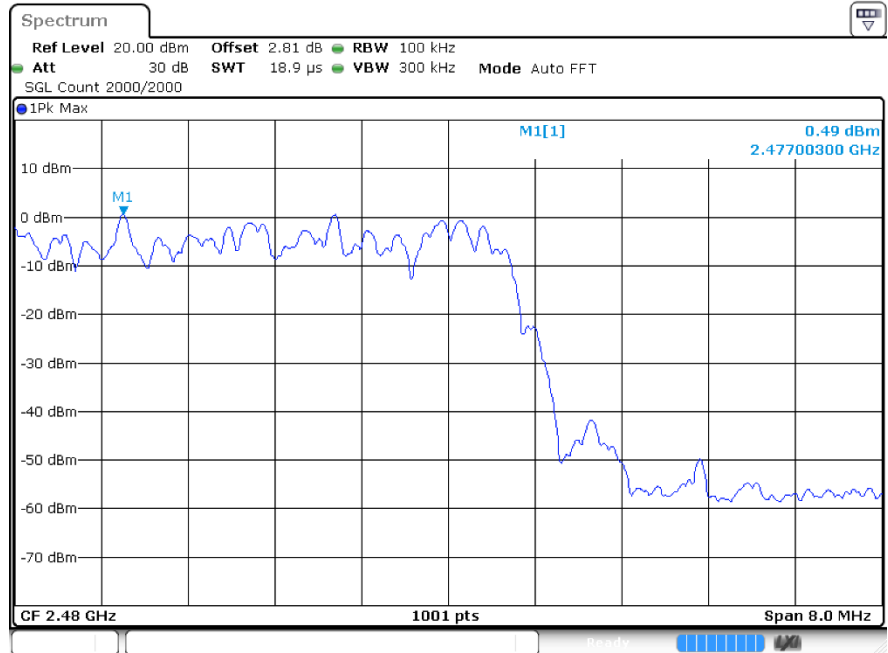
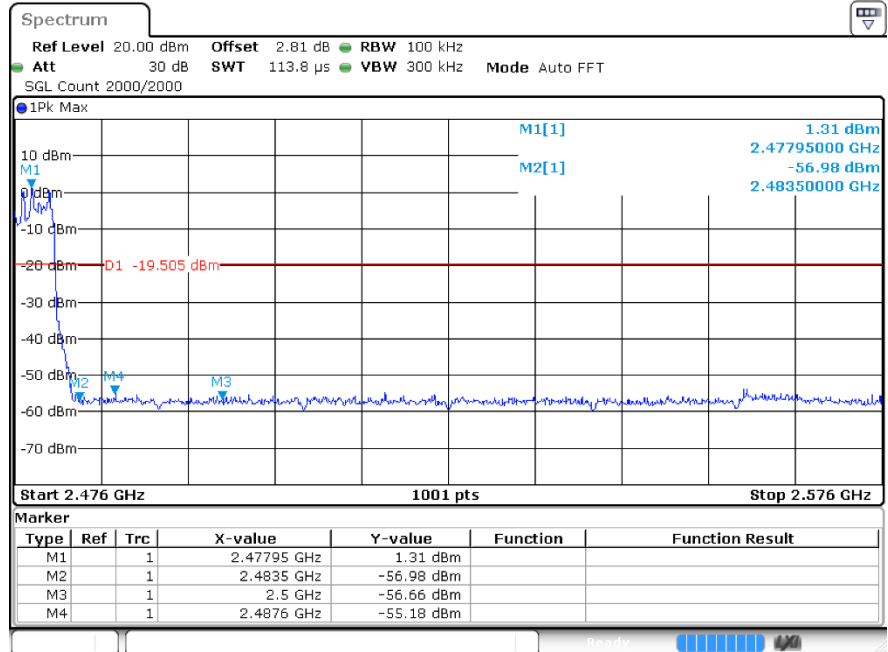
Ref


 $\pi/4$ DQPSK/LCH/Hop


Ref


 $\pi/4$ DQPSK/HCH/No Hop


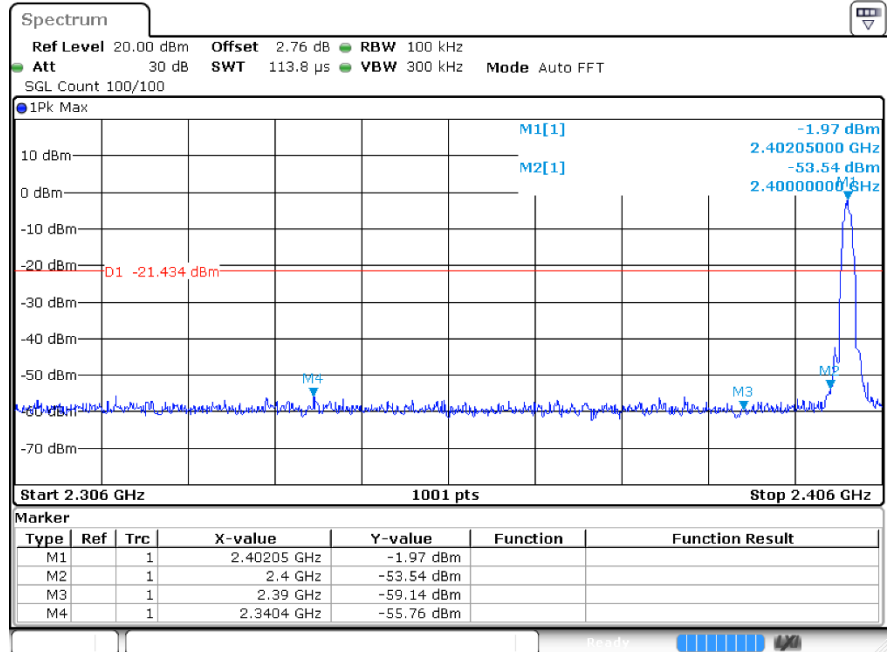
Ref


 $\pi/4$ DQPSK/HCH/Hop


Ref



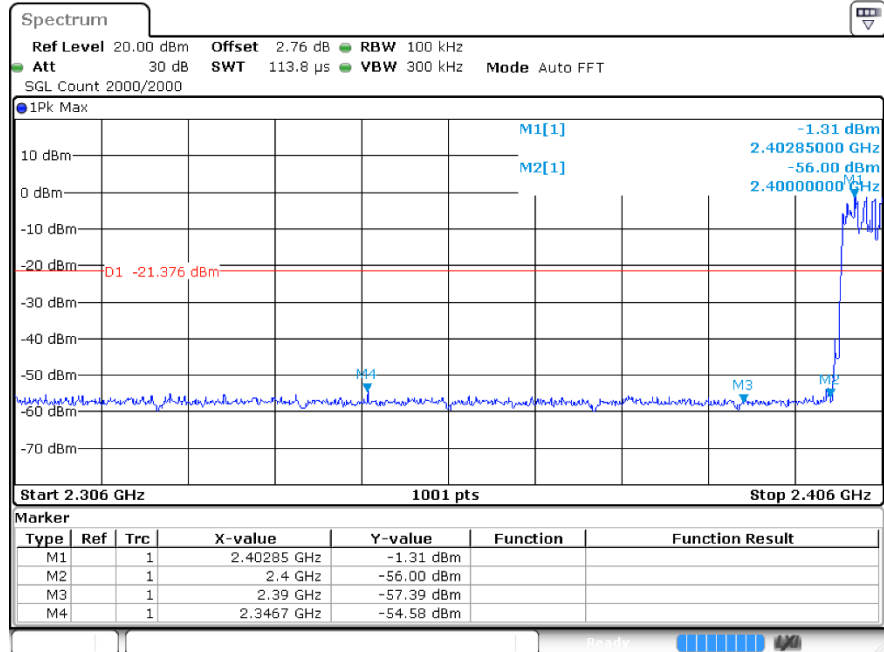
8DPSK/LCH/No Hop



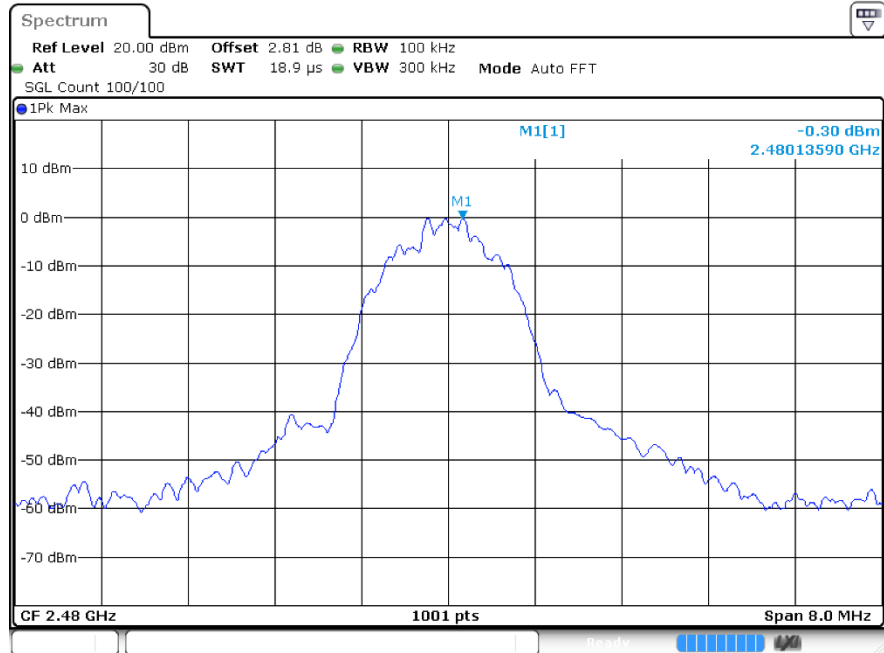
Ref



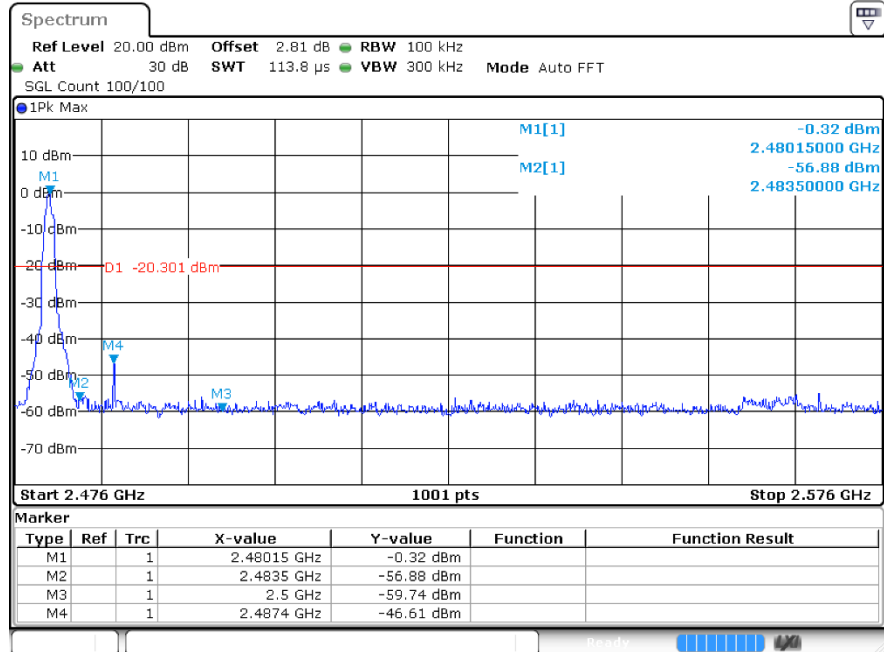
8DPSK/LCH/Hop



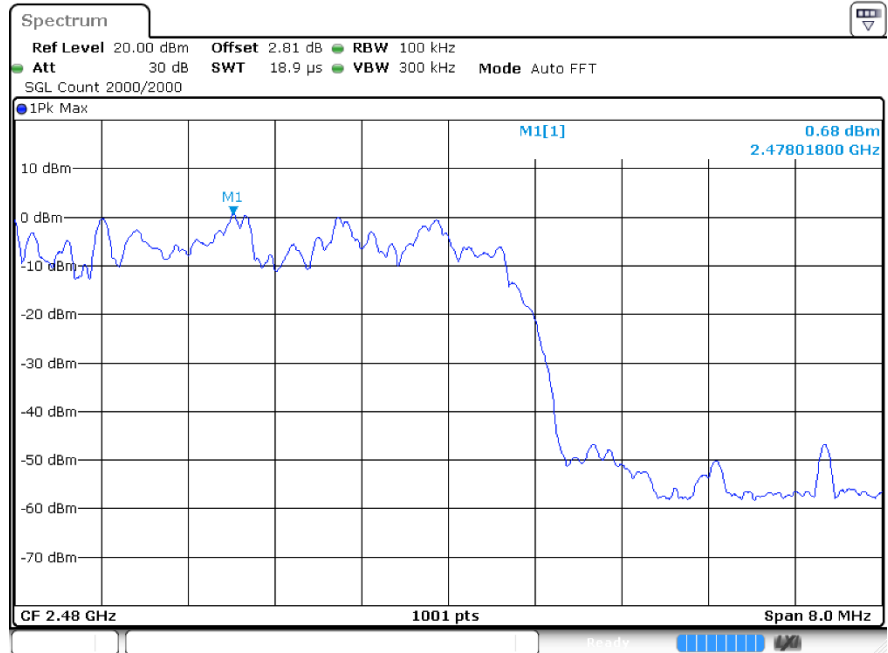
Ref



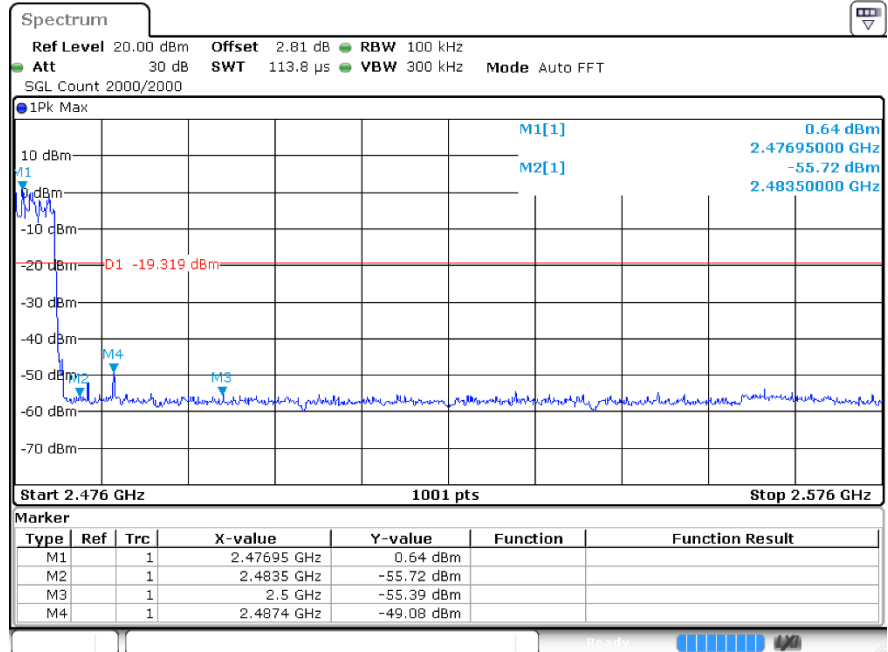
8DPSK/HCH/No Hop



Ref



8DPSK/HCH/Hop





## APPENDIX 2-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※END OF THE REPORT※※※※